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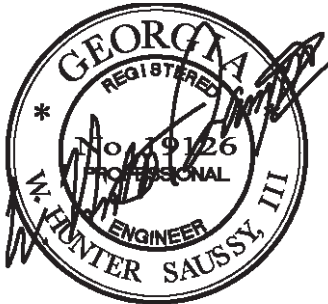
Project No. **215-11**



Set No.



Dalton Middle School Addition Dalton, Georgia



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BID SET DOCUMENTS

Volume 2 of 2



ISSUED SEPTEMBER 1, 2013

P R O J E C T M A N U A L



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PROJECT MANUAL FOR

Dalton Middle School Addition Dalton, Georgia

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Project No. 215-11

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P R O J E C T M A N U A L

T A B L E O F C O N T E N T S

**Dalton Middle School
Addition
Dalton, Georgia**

THE CONTRACTOR IS REQUIRED TO COMPARE THIS PROJECT MANUAL WITH THE INDEX BELOW FOR COMPLETENESS. IF ANY PAGES ARE MISSING OR ILLEGIBLE IT IS HIS RESPONSIBILITY TO REQUEST REPLACEMENTS FROM THE ARCHITECT.

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**SECTION D
SUPPLEMENTARY GENERAL CONDITIONS**

1.01 GENERAL CONDITIONS

- A Section "E", General Conditions, Articles E-01 to E-71, are a part of this Contract.

1.02 SUPPLEMENTS

- A The following supplements modify, delete and/or add to the General Conditions. Where any article, paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph, or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any article, paragraph, or subparagraph in the General Conditions is amended, voided, or superseded by any of the following paragraphs, the provisions of such article, paragraph or subparagraph not so amended, voided, or superseded shall remain in effect.

B **Article E-01:** Delete this paragraph.

1. Where a conflict exists between the requirements of the general conditions to the specifications and the technical provisions of the specifications the more stringent of the requirements shall govern. In cases where the conflict is not an issue of stringency or scope, the requirements of the technical specifications shall govern.
2. Form of Agreement; Severability: In the event that any one or more of the provisions contained herein shall, for any reason, be held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provisions of this agreement, but this agreement shall be construed as if such invalid, illegal or unenforceable provisions had never been contained herein.

C **Article E-4 - Copies of Contract Documents; Change** to read:

1. The Architect shall furnish to successful Contractor(s), free of charge, the following quantities of plans, specifications and addenda as determined by the amount of the project contract:
Up to \$500,000: 10 Sets.
\$500,000 to \$1,000,000: 12 Sets.
\$1,000,000 and above: 15 Sets.
2. Additional sets will be furnished at actual cost of reproduction, postage and 25% handling fee.

D **Article E-5 - Shop Drawings:**

1. Delete paragraph (d).
2. Add the following:
 - ‘(d) Complete shop drawings required for all products specified.’
 - ‘(e) The contractor shall review, approve and submit, with reasonable promptness, and in such a sequence as to cause not delay in the Work or the Work of the Owner or separate contractor, all shop drawings, product data, and samples required by the contract documents.’
 - ‘(f) By approving and submitting Shop Drawings, Product Data, and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, and that he has checked and coordinated the information contained within such submittals with the requirements of the work of the Contract Documents’
 - ‘(g) No portion of the Work requiring submission of Shop Drawings, Product Data, or Samples shall be commenced until the submittal has been reviewed by the architect and noted, by the Architect on the Shop Drawing or on a cover sheet attached to the Shop Drawing as ‘Reviewed’ or ‘Reviewed with comments’

E **Article E-11 - Surveys, Permits and Regulations:** Paragraph (a): Permits: Per Georgia Code 20-2-261(d) a Local Board of Education shall be exempt from county and municipal assessments and fees for county and municipal permits and inspections and exempt from county and municipal impact fees.

1. County building permits and impact fees to be excluded from the contractors bid.

- F **Article E-12 - Protection of Work and Property:** Add the following:
1. The Contractor shall sole responsibility for and will have control of construction means, methods, techniques, sequences, procedures, and for safety precautions and programs in connection with the work.
 2. The contractor is solely responsible for selecting methods and implementation of selected methods utilized to protect existing facilities, new and existing site features and improvements, new construction and other work of this contract as required to prevent damage to these elements fore the duration of the contract.
 3. Where existing or new site features and improvements and/or building features or construction are damaged as a result of failure to implement necessary protection, the contractor shall be responsible for the repair and/or replacement of the element(s) damaged without additional cost to the contract.
- G **Article E13 - Inspection of Work:** Paragraph (b) add the following:
- ‘(1) The architect shall be allowed to view, prior to covering of concealing, all underground or concealed work.’
 - ‘(2) Prior to covering the underground or concealed work the contractor shall notify the architect in writing, no less than 48 hours in advance of the time that the work is to be covered, that the work is ready for viewing by the architect/engineer.’
 - ‘(3) If any portion of the work should be covered contrary to the request of the Architect or to the requirements specified in the contract documents, it must, if requested by the architect in writing, be uncovered, for his observation. Removal and replacement of construction required shall be at the contractor’s expense.’
- H **Delete Article E-14** and substitute the following:
1. Article E-14 - Superintendence and Supervision by Contractor.-
 - a. **Superintendent of Contractor.**-The Contractor shall keep on his work during its progress and until the final certificate has been executed by the Architect a competent superintendent and any necessary assistants, all satisfactory to the Architect. The Contractor's Superintendent shall have at least five (5) years experience as Superintendent on projects of similar scope and complexity as this project and shall have been the Superintendent on at least one facility that includes requirements comparable to this facility.
 - 1) The project superintendent shall be on site at all times when work under this contract is being performed by any person or contractor (subcontractors) employed by the General Contractor or Sub Contractor(s). No unsupervised (by General Contractor’s Superintendent) work by subcontractors, tradesmen or employees will be permitted.
 - 2) The project superintendent shall be on site, as a minimum, five days a week, eight hours a day. This shall be considered to be an absolute minimum. In addition to these hours the superintendent shall be on site at any time work is being performed by employees of the contractor or employees of subcontractors, vendors, suppliers or other parties working under the General Contractor’s contract.
 - b. **Project Manager of the Contractor.**- If the Contractor performs his duties with the assistance of a Manager, the Project Manager shall have at least five (5) years experience as Project Manager on projects of similar scope and complexity as this project and shall have be the Project Manager on at least one facility that includes systems comparable to this project.
 - c. **The Superintendent nor the Project Manager** shall not be changed except with the consent of the Architect unless the either proves to be unsatisfactory to the Contractor and ceases to be in his employ. The Superintendent or the Project Manager shall represent the Contractor in his absence, and all directions given to either of them shall be as binding as if given to the Contractor. [See also Articles E-9, E-12, E-15(c), and E-60]
 - d. **The Contractor** shall, within seven days after notification of award of contract, submit name of proposed Project Superintendent an, if applicable, name of Project Manager with two references that can verify experience. Name the facilities required in (a) and (b) above with the names and telephone numbers of Owner and Design Professionals that can that can verify information. Approval of the Project Superintendent and, if applicable Manager by the Architect required prior beginning of construction on the Project. If initial submissions are rejected by Architect, Contractor will submit other candidates for such positions until acceptable to Architect.

- e. **Supervision by Contractor.**-The Contractor shall give efficient supervision of the work, using his best skill and attention. He shall carefully study and compare all drawings, specifications, and instructions and shall at once report to the Architect any error, inconsistency, or omission which he may discover, but he shall not be held responsible for their existence or discovery.
[See also Articles E-3, and E-40]

I **Article 15** -Changes in the Work;

1. Paragraph (f): Rock:
 - a. Paragraph (2); Rippable Rock: Delete this paragraph.
 - b. Paragraph (3); Trench Rock: Trench rock shall be further defined as that rock which is encountered in the excavation of trenches. Trench rock shall not apply to conditions where rock is encountered in mass removal conditions.
 - c. Refer to technical sections for definitions of rock. Provisions of this section (General Conditions) only apply if rock is not defined in other sections of the contract documents.
2. Paragraph (g), Costs to Owner, Allowances for Contractor, and Allowable Expenditures:
 - a. Expenses **not** eligible for reimbursement to be expanded to include: administrative costs including personnel, project management costs including personnel, home office expenses, extended home office and project overhead costs, costs associated with development of or revisions to shop drawings, engineering, drafting, mobilization and/or re-mobilization, and travel.
3. Paragraph Entitled 'Cost to Owner, Allowances for Contractor, And Allowable Expenditures':
 - a. Paragraphs (1) and (2): Change 20% overhead and profit to 15% overhead and profit.

- J **Article 18** - Delays and Extensions of Time: Paragraph (a); Change the last sentence to from '...Contractor's sole remedy for such delay shall be an extension of contract time and that the Contractor shall make no demand for damages or extended overhead.' **to** '...Contractor's **sole** remedy for such delay shall be an extension of contract time. The Contractor shall not be entitled to and shall not make demand for payment for damages, extended overhead, extended home office expenses, mobilization or re-mobilization, equipment rental, personnel costs, or other costs associated with the delay.

- K **Article 18** - Delays and Extensions of Time: Add the following to Paragraph (e):
'(e) The listing below defines the monthly anticipated adverse weather days for the contract period and is based upon NOAA (National Oceanic and Atmospheric Administration), NWS (National Weather Service), or similar data for the geographic location of the project.

MONTHLY ANTICIPATED ACTUAL ADVERSE WEATHER (CALENDAR DAYS)

January.....7	May.....4	September.....4
February6	June.....3	October.....3
March.....5	July.....4	November.....3
April.....4	August.....4	December.....6

1. General: The above schedule of anticipated adverse weather days shall constitute the base line for monthly (or portion thereof) weather time evaluations. Upon acknowledgment of the Proceed Order and continuing throughout the contract on a monthly basis, the Contractor shall record the actual adverse weather days at the work site on a calendar day basis (including scheduled work days on weekend and holidays) and compare the actual adverse weather days to the Monthly anticipated adverse work days listed above.
2. Definition of Adverse Weather Days: For the purpose of determining extensions in the contract time the following shall be the definition of adverse weather days:
 - a. For purpose of this subparagraph, the term "actual adverse weather days" shall only include days the work was impacted by adverse weather. Adverse weather occurring on a day which is not a scheduled work day will not be considered an actual adverse weather day.
 - b. Adverse weather days shall be those days on which the scheduled work cannot be performed due to weather conditions (rain, snow or ice only) **and** when the amount of rain fall exceeds 0.20" or snow and sleet exceed 4" from 8:00 A.M. to 5:00 P.M. on scheduled work days. Cold weather shall not be considered an adverse weather day.
 - c. Adverse weather days shall include only those days on which the event (rain, snow, or ice) occurs and shall not include days subsequent to the event.

- d. Extensions in time shall not be granted for adverse weather days occurring prior to the physical commencement of construction or after the date by which the building was scheduled to be dried-in (roofing, siding and walls in place to the extent that the building is protected from rainfall) on the initial base line schedule.
 - e. Should the project fall behind the Contractor's original base line construction schedule, no extensions will be given for inclement weather days beyond the initial scheduled dry-in date plus any additional days due Contractor during such originally scheduled period.
 - f. Adverse weather days shall not be allowed for days on which adverse weather occurs when the contractor has failed to implement appropriate measures to minimize the effect of adverse weather on the progress of the project.
3. Contractor's Base Line Schedule: The Contractor's construction schedule shall reflect the above anticipated adverse weather delays on all weather dependent activities. The number of adverse weather days shall be as defined in the table above.
 - a. No adjustments in contract time will be considered if the initial schedule does not include the required number of adverse weather days built into the schedule.
 4. Prerequisites for Request for Adjustments to Contract due to Adverse Weather: Prior to requesting adjustment to the contract time due to adverse weather the contractor shall develop and submit to the architect certain documents noted below. Failure to provide the required back up data will subject the request to rejection. Documents to be furnished to the architect include:
 - a. Contractor's daily reports clearly indicating the adverse weather conditions, including type of adverse weather (rain, snow or sleet), the amount of rainfall and the time that the rainfall occurred. The use of regional or climatological data from off-site sources will not be considered adequate support for extensions in time.
 - b. Contractor's daily reports clearly indicating the work underway at the time of the adverse weather and the impact that the adverse weather had on the activity.
 - c. A tabulation showing the actual adverse weather days compared the anticipated adverse weather days defined above.
 - d. Documentation showing that the contractor has implemented steps to mitigate the effects of unusually severe weather in compliance with the provisions of ARTICLE E-12(E), PROTECTION OF WORK AND PROPERTY of the GENERAL CONDITIONS.'
 5. Calculation of Adverse Weather Days:
 - a. The contractor shall submit, on a monthly basis, a tabulation of the number of adverse weather days occurring on site. The number of actual adverse weather days shall be measured chronologically from the first to the last day in each month.
 6. Requests for Adjustments to the Contract:
 - a. The contractor shall submit a written requests for adjustments to contract time on a monthly basis, Such requests shall include required supporting documentation as described herein.
 - b. Adjustments to Contract Time: The architect will review such request to determine if and adjustment in time is due. If the number of actual adverse weather days differs from the anticipated adverse weather days, the contract time period will be adjusted (either increased or decrease) the appropriate number of days. Adjustments to the contract time will be included in a 'no-cost' change order.
 - c. Adjustments in Contract Amount: No changes in the contract sum will be due or authorized due to adjustments of contract time due to weather.

L Article E-21 - The Owner's Right to Do Work: Add the following paragraph:

1. If in the opinion of the Architect, it is evident that the contractor has not completed or will not be able to substantially complete the work in accordance with the contract documents, due to default, negligence, or failure on the part of the contractor, or their subcontractors, the Owner may issue to the contractor a written notice to commence and continue correction of such defaults or neglects with diligence and promptness within a 48-hour period. If the contractor fails to correct such deficiencies within the first notice period, the Owner may issue a second 48-hour written notice to the contractor. If the contractor, within such 48-hour period after receipt of such second notice fails to commence and continue to correct any deficiencies, the Owner may, at his option, without prejudice, complete certain portions of the work as may be necessary, or augment the forces of the contractor with additional manpower as may be required to complete the work by the contracted completion date. In such case, an appropriate deductive change order shall be written, deducting from the contract price the actual costs incurred by the Owner to complete or augment the work including compensation for the Architect's additional services and expenses made necessary by such default, neglect or failure. Furthermore, if payments then or thereafter due the contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. Such

amounts charged to the contractor shall be subject to the approval of the Architect. Such actions, if taken by the Owner shall not be interpreted by the Contractor as a termination of the Contract, and the contractor is to continue to carry out the work or portion of the work as may be required by the contract during this time frame.

M Article E-24 - Application for Payments:

1. Refer to paragraph (b) Initial Breakdown and Periodical Payments:
"If payments are made on valuation of work done, such application shall be submitted at least fifteen days before each payment falls due, ..."
 - a. Delete "fifteen days" and in lieu thereof supply "thirty days".
 - b. Provisions of this Article are intended to supersede provisions of Prompt Pay Act.
 - c. The time period for payment shall start from the date of the approval by the architect.
2. Applications for payment shall be to the architect on or before the first day of the month.
3. Modify the requirements of this Section as defined in 'Attachment A' located at the end of this section.
4. Applications for Payment shall be notarized by the General Contractor submitting the application
5. Initial Pay Request: The initial pay request shall not be authorized until each of the following documents has been submitted and found to comply with the requirements of the contract documents:
 - a. Fully executed Owner/Contractor contract.
 - b. Required insurance certificates
 - c. Contractor's performance and payment bonds
 - d. Sub contractor's performance and payment bonds where required
 - e. Complete schedule of values (detailed cost breakdown)
 - f. Initial base-line schedule
6. Periodic Pay Requests: The monthly pay requests shall not be authorized until each of the following have been submitted and found to comply with the provisions of the contract requirements:
 - a. Updated project schedule
 - b. Lien Waiver and Release; Exhibit B, Attached hereto
7. Pay Requests; Project Closeout Process:
 - a. Unless otherwise agreed upon by the Owner and Architect, in writing, the contract retainage shall not be reduced until the contract work, including punchlist work and closeout documents, have been fully completed.
 - b. The contract retainage may, at the Owner/Architect's option, be reduced prior to the completion of the work. If the retainage is reduced the following conditions shall apply:
 - 1) The contractor shall submit to the architect a statement from the contractor's surety agreeing to the reduction of the retainage.
 - 2) The punchlist shall have been completed to the extent that the majority of the items identified on the punch list, as determined by the architect, have been completed and/or corrected.
 - 3) Work identified on orders of condemnation and notices of non-compliance have been corrected.
 - 4) All requested change order proposals, including those for credits due, have been submitted and costs have been found to be acceptable.
 - 5) Non-compliant and/or incomplete work: The value of the retainage shall be established by the architect by assigning values to each punch list item and doubling the sum of the value of the items. The minimum value of each item on the punch list shall be \$100.00. The value assigned to item by the each architect is final and not subject to debate.
 - 6) Close Out Documents: An amount equal to .25% of the contract amount or \$25,000, which ever is greater shall be retained until all of the required close out documents have been received. Close out documents include, but not limited to: As-built drawings, as-built survey, videos of sewers, record shop drawings, warranties, affidavits, operation and maintenance manuals, product data, videos of training sessions, attic stock as well as other specified activities and documents. Should complete close out documents not be received within the time frame allowed by the contract documents the amount defined above shall be deducted from the contractor's final payment.
8. It shall be understood that the Owner shall make progress payments on account of the contract for 90% (10% will be retained) of the value, based on the contract prices, including Owner approved and signed change orders, of labor and materials incorporated in the work and of materials suitably stored at the site thereof, as estimated by the Architect, less the aggregate of previous payments, until one-half (50%) of the contract sum is due (including all Owner approved and signed change orders) and provided that:
 - a. The work is not behind schedule as determined, by the Architect only, from the Architect approved, time scaled CPM schedule with monthly anticipated progress payment amounts submitted at or before the pre-construction meeting:

- b. The work is being performed in a satisfactory manner in compliance with the contract document as determined by the Architect;
- c. There are not outstanding claims or liens on the property; (Contractor shall submit, with pay request, a lien release form for each subcontractor requesting payments. See Exhibit B.)
- 9. Further payments, with total compliance of 8a., 8b., and 8c. shall be made in the amount of 100% of the value of the labor and/or materials incorporated in the work and of materials suitably stored at the site thereof unless:
 - a. The percentage of work complete falls behind the percentage required by the construction progress schedule, as described in 8a. by as much as 10%; or
 - b. The work is being performed in an unsatisfactory manner and/or non-compliant with the contract documents as determined by the Architect; or
 - c. There are outstanding claims or liens on the property.
- 10. In which event or events, the Owner shall reinstate the 10% retainage on all periodical payments to be paid while one or more of the events continues to exist. The Contractor shall be given written notice, by the Architect, of the reinstatement of the retainage. If the Contractor's actual progress becomes more than 10% behind the Contractor's anticipated progress, as described in 8a., the Owner may direct the withholding of payments to the contractor in amounts equal to the percentage behind the Contractor's anticipated progress, in addition to the 10% described in all Items of Article 24.
- 11. If the Contractor recovers all lost time and puts the work back on schedule (0% behind schedule) per schedule described in 8a. and remedies all breaches of 9b. and 9c, further payments shall be as described in 10.; unless Items 8a., 8b., and 8c. recur in which event or events the Owner shall reinstate paragraph 7.
- 12. No reduction in retainage shall be incorporated as an automatic in the contract. Any reduction in retainage shall only be considered on a job-by-job basis by the condition of the project at the time of issuance of the Certificate of Substantial Completion. No additional reduction in retainage will be allowed beyond that amount agreed to at the time of Substantial Completion. The Owner will not release remaining funds until the punch list is complete, and all required close-out documentation has been reviewed, accepted and turned over to the Owner.

N Article E-25 Certificates Of Payments:

- 1. Sub Paragraph "d": Change "legal rate in force at building" to "7% Per Year"
- 2. Provisions of this Article are intended to supersede provisions of Prompt Pay Act.

O Article E-27; Insurance and Hazards: Change Limit Amounts to the Following:

- 1. Owner's Protective Liability:
 - a. Bodily Injury:
 - 1) Each occurrence: \$1,000,000
 - 2) Aggregate: \$2,000,000
 - b. Property Damage:
 - 1) Each occurrence: \$1,000,000
 - 2) Aggregate: \$2,000,000
- 2. Contractor's Protective and Public Liability - Occurrence Basis:
 - a. General Aggregate: \$2,000,000.
 - b. Product & Completed Operations Aggregate: \$2,000,000.
 - c. Persons & Adv. Injury: \$1,000,000.
 - d. Each Occurrence: \$1,000,000.
 - e. Fire Damage (one Fire): \$ 50,000.
 - f. Medical Expenses (one Person): \$ 5,000.

P Article E-27; Insurance and Hazards; Add the following:

- 1. Contractual Liability Insurance (Hold Harmless).
 - a. Bodily Injury:
 - 1) Each occurrence : \$1,000,000
 - b. Property Damage:
 - 1) Each occurrence: \$1,000,000
 - 2) Aggregate: \$2,000,000
- 2. Comprehensive auto:
 - a. Combined Single Limit: \$1,000,000

3. Excess Liability (Umbrella Form):
 - a. Each Occurrence: \$1,000,000
 - b. Aggregate: \$1,000,000
4. Workers Compensation and Employers Liability:
 - a. Limits: Statutory Limits, but not less than the following:
 - 1) Each Accident: \$1,000,000.
 - 2) Disease Policy Limit: \$ 500,000.
 - 3) Disease, Each Employee: \$ 100,000.
5. Products and completed operations insurance shall be maintained for a minimum of period of two years after final payment.
6. Property damage liability insurance shall include coverage for the following hazards:
 - a. Explosion
 - b. Collapse
 - c. Underground

Q Article E-27; Builder's Risk (fire and extended coverage) Insurance:

1. The Builder's Risk Insurance shall be payable to the Contractor and the Owner, as their interests may appear, for the full amount of the Contract covering as a minimum fire, extended coverage, vandalism, and malicious mischief. The Contractor and the Owner shall be named in the policy or policies as an insured.
2. Builder's Risk Insurance Policies shall furnish coverage at all times for the full cash value of all completed construction (work in place), materials in place and/or stored at the site, foundations, and equipment in or adjacent to the Building or Buildings which are to be made a part of the Builder's Risk Insurance, whether or not the partial payment has been made by the Owner.
3. The Contractor may terminate this insurance on buildings covered as of the date said buildings are occupied by the Owner.
4. All insurance shall be carried with companies which are financially responsible. If any such insurance is due to expire during the construction period, the Contractor shall not permit coverage to lapse and shall furnish evidence of Coverage to the Owner.
5. All of the above Insurance/Bonding costs shall be furnished and paid for by the Contractor for the duration of the contract, and the cost of the premiums shall be included in the proposal.

R Article E-28. Affidavits: Add the following:

1. Prior to commencing work the contractor shall execute, and deliver to the Owner and Architect the attached 'Contractor Affidavit'

S Article E-38. Architect: Add the following:

- (d) The architect will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the work, and he (she) will not be responsible for the Contractor's failure to carry out the work in accordance with the Contract Documents. The Architect will not be responsible for or have control or charge over the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any work on this project.

T Article E-70; Utilities:

1. For additional requirements refer to Section 01500, Temporary Facilities.
2. Where conflicts exist between the General conditions and Section 01500, the provisions of Section 01500 shall govern.

U Delete the following Articles in the General Conditions:

1. E-29 Bond on Roof and Walls
2. E-57 Cash Allowances
3. E-58 Testing Services
4. E-59 Drilling and Log of Drilling Wells

END SECTION D

**ATTACHMENT
EXHIBIT "A"**

Section 1. Article 1 of Chapter 10 of Title 13 of the Official Code of Georgia Annotated, relating to general provisions affecting contracts for public works, is amended by adding at the end of said article a new Code section, to be designated as Code Section 13-10-2, to read as follows:

Code Section 13-10-2:

- (a) As used in this Code section, the term:
- (1) "Contractor" means a person having a direct contract with the Owner.
 - (2) "Lower tier subcontractor" means a person other than a contractor having a direct contract with a subcontractor.
 - (3) "Owner" means the state, any county, municipal corporation, authority, board of education, or other public board, public body, department, agency, instrumentality, or political subdivision of the state.
 - (4) "Owner's authorized contract representative" means the architect or engineer in charge of the project for the Owner or such other contract representative or officer as designated in the contract documents as the party representing the Owner's interest regarding administration and oversight of the project.
 - (5) "Subcontractor" means a person other than an Owner having a direct contract with the contractor.

- (b) In any contract for the performance of any construction project entered into on or after July 1, 1985, with an Owner, as defined in paragraph (3) of subsection (a) of this Code section, such contract shall provide for the following:

After work has commenced at the construction site, progress payments to be made on some periodic basis, and at least monthly, based on the value of work completed as may be provided in the contract documents plus the value of materials and equipment suitably stored, insured, and protected at the construction site, and at the Owner's discretion such materials and equipment suitably stored, insured, and protected off site at a location approved by the Owner's authorized contract representative when allowed by the contract documents, less retainage; and

- (1) Retainage to a maximum of 10 percent of each progress payment; provided, however, that when 50 percent of the contract value including change orders and other additions to the contract value provided for by the contract documents is due and the manner of completion of the contract work and its progress are reasonably satisfactory to the Owner's authorized contract representative, the Owner shall withhold no more retainage. At the discretion of the Owner and with the approval of the contractor, the retainage of each subcontractor may be released separately as the subcontractor completes his work.
- (2) If, after discontinuing the retention, the Owner's authorized contract representative determines that the work is unsatisfactory or has fallen behind schedule, retention may be resumed at the previous level. If retention is resumed by an Owner, the contractor and subcontractors shall be entitled to resume withholding retainage accordingly.

- (3) At substantial completion of the work or such other standard of completion as may be provided in the contract documents and as the Owner's authorized contract representative determines the work to be reasonably satisfactory, the Owner shall within 30 days after invoice and other appropriate documentation as may be required by the contract documents are provided pay the retainage to the contractor. If at that time there are any remaining incomplete minor items, an amount equal to 200 percent of the value of each item as determined by the Owner's authorized contract representative shall be withheld until such item or items are completed. The reduced retainage shall be shared by the contractor and subcontractors as their interests may appear.
 - (4) The contractor shall, within ten days from the contractor's receipt of retainage from the Owner, pass through payments to subcontractors and shall reduce each subcontractor's retainage in the same manner as the contractor's retainage is reduced by the Owner, provided that the value of each subcontractor's work complete and in place equals 50 percent of his subcontract value, including approved change orders and other additions to the subcontract value and provided, further, that the work of the subcontractor is proceeding satisfactorily and the subcontractor has provided or provides such satisfactory reasonable assurances of continued performance and financial responsibility to complete his work including any warranty work as the contractor in his reasonable discretion may require, including, but not limited to, a payment and performance bond.
 - (4) The subcontractor shall, within ten days from the subcontractor's receipt of retainage from the contractor, pass through payments to lower tier subcontractors and shall reduce each lower tier subcontractor's retainage is reduced by the contractor, provided that the value of each lower tier subcontractor's work complete and in place equals 50 percent of this subcontract value, including approved change orders and other additions to the subcontract value and provided, further, that the work of the lower tier subcontractor is proceeding satisfactorily and the lower tier subcontractor has provided or provides such satisfactory reasonable assurances of continued performance and financial responsibility to complete his work including any warranty work as the subcontractor in his reasonable discretion may require, including, but not limited to, a payment and performance bond.
- (c) This Code section shall not apply to:
- (1) Any contracts let by the Department of Transportation of this state for the construction, improvement, or maintenance of roads or highways in this state or purposes incidental thereto: or
 - (2) Any contracts whose value or duration at the time of the award does not exceed \$150,000.00 or 45 days in duration.
- (d) Contract and subcontract provisions inconsistent with the benefits extended to contractors, subcontractors, and lower tier subcontractors by this Code section shall be unenforceable; provided, however, that nothing in this Code section shall render unenforceable any contract or subcontract provisions allowing greater benefits to be extended to such contractors, subcontractors, or lower tier subcontractors, the provisions and benefits of this Code section being minimal only.
- (e) Nothing shall preclude a payor under this Code section, prior to making a payment, from requiring the payee to submit satisfactory evidence, including but not limited to all and/or any invoices, that all payrolls, material bills, and other indebtedness connected with the work have been paid.

In addition to the foregoing , before the Owner can implement the above amendment to the contract, a letter of consent from the Surety Company must be provided to the Owner ten (10) days prior to the contractor's request to the Owner to withhold no more retainage under the terms of Exhibit "A."

END OF EXHIBIT "A"

EXHIBIT B

LIEN WAIVER AND RELEASE

Person/Company Supplying the Work or Improvement

Name of Project: _____

Project Address: _____

Name of Owner: _____

ACKNOWLEDGMENT AND RELEASE FOR PRIOR PAYMENTS RECEIVED

The undersigned hereby acknowledges that the undersigned has received prior payments(s) for labor/services/equipment and/or material furnished to the above-designated project through _____, 20__ and does hereby release pro tanto any mechanic's lien, stop notice, equitable lien or labor and material bond rights that the undersigned has to the above extend only and does not cover any retention of items furnished after that date. This release is for the benefit of and may be relied upon by the owner, the prime contractor, the architect, and the principal and surety on any labor and material bond posted for the project.

NOTICE: THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGNED, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.

Title: _____

Date: _____

END OF EXHIBIT "B"

CONTRACTOR'S AFFIDAVIT

(This form is to be executed in compliance with the Official Code of Georgia Annotated Section 36-91-21(e). If the contractor is a partnership, the Affidavit shall be executed by all partners and any officer, agent, or other person who may have represented or acted for them in bidding for or procuring the contract. If the contractor is a corporation, all officers, agents, or other persons who may have acted for or represented the corporation in bidding for or procuring the contract shall execute the affidavit.)

STATE OF GEORGIA, COUNTY OF _____

_____, being duly sworn, hereby deposes and says
(Insert Name of Affiant)

that he/she has read, and is familiar with, the provisions of the official Code of Georgia Annotated Section 36-91-21(d) which provides as follows:

Whenever a public works construction contract for any governmental entity subject to the requirements of this chapter is to be let out by competitive sealed bid or proposal, no person, by himself or herself or otherwise, shall prevent or attempt to prevent competition in such bidding or proposals by any means whatever. No persons who desires to procure such work for himself or herself or for another shall prevent or endeavor to prevent anyone from making a bid or proposal therefor by any means whatever, nor shall such person so desiring work cause or induce another to withdraw a bid or proposal for work.

And that he/she has not directly or indirectly violated said provisions of the law.

Further, Affiant saith not.

This _____ Day of _____, 20_____.

Sworn to and subscribed before me this _____ Of _____ 20_____.

(Notary Public)

SECTION 00100
INSTRUCTIONS TO BIDDERS

OWNER: Dalton City Board of Education
412 South Hamilton Street
Dalton, Georgia
(706) 226-3521

PROJECT: Dalton Middle School
Roadway

ARCHITECT: James W. Buckley & Associates, Inc.
423 Pine Avenue, Suite 200
P.O. Box 466
Albany, Georgia, 31702

1.01 DEFINITIONS

- A. Bidding Documents include Advertisement or Invitation to Bid, Bidding Requirements, Instructions to Bidders, Bid Form, other sample bidding and contract forms, construction bond, and the proposed Contract Documents including any Addenda issued prior to receipt of Bids.
- B. All definitions set forth in General Conditions of the Contract for Construction or in other Contract Documents are applicable to Bidding Documents.
- C. Addenda: Written or graphic instruments issued by Architect prior to execution of Contract which modify or interpret Bidding Documents by addition, deletion, clarifications or corrections.
- D. Bid: Complete and properly signed proposal to do Work or designated portion thereof for sum stipulated therein supported by data called for by Bidding Documents.
- E. Base Bid: Sum stated in Bid for which Bidder offers to perform Work described as base, to which Work may be added or deducted for sums stated in Alternate Bids.
- F. Alternate Bid (or Alternate): Amount stated in Bid to be added to or deducted from amount of Base Bid if corresponding change in project scope or materials or methods of construction described in Bidding Documents is accepted.
- G. Unit Price: Amount stated in Bid as price per unit of measurement for materials or services described in Contract Documents.
- H. Bidder: One who submits Bid for prime contract with Owner for Work described in proposed Contract Documents.
- I. Sub-bidder: One who submits bid to Bidder for materials and labor for a portion of Work.
- J. **On-Site:** For the purposes of site grading activities and the application of unit cost allowances the term on-site shall be defined as the entire property/site on which the building(s) is/are located as defined by the site(s) property lines.
 - a. The site, for the purposes of this definition, is **not** limited to the area in which the work is being performed or any notations of the drawings regarding 'limits of work'

1.02 BIDDER'S REPRESENTATION

- A. Each Bidder by making his bid represents that: He has carefully reviewed the contract documents and found the documents to be complete and if not found to be complete, have notified Project Architect of missing drawings and/or specification sections or pages.

1. He has carefully read and understands the Bidding Documents and his Bid is made in Accordance therewith.
2. He acknowledges an understanding of the documents for other portions of Project being bid concurrently.
3. He is required to carefully compare Bidding Documents with each other and with other work being bid concurrently or presently under construction.
4. He has visited site and familiarized himself with local conditions under which Work is to be performed.
5. His Bid is based upon materials, systems and equipment described in Bidding Documents without exception.

1.03 BIDDING DOCUMENTS

- A. Copies: Bidders may obtain from Architect, complete sets of Bidding Documents in number and for deposit sum stated in Advertisement or Invitation. Bid documents obtained from sources other than Architect shall not be considered as suitable for bidding purposes.
 1. Deposit for one set refunded upon return of deposit sets in good condition within 10 days after bid time by General Contractor submitting bonafide bid. For treatment of other deposits refer to Invitation to Bid, Section A.
 2. Deposits not refunded for deposit sets returned prior to bid.
 3. Deposits refunded on Bid Documents returned in good condition, within prescribed period of time only. "Good Condition" shall be defined as Bid Documents returned in essentially the same condition as delivered to the contractors. Plans shall not have been disassembled, defaced, marred, marked or otherwise damaged.
 4. Bidder receiving contract award may retain Bidding Documents.
- B. Use **ONLY COMPLETE** sets of Bidding Documents in preparing bids; neither Owner or Architect assume any responsibility for errors or misinterpretations resulting from use of incomplete sets of Bidding Documents.
- C. Owner or Architect in making copies of Bidding Documents available on above terms, do so only for purpose of obtaining bids on Work and do not confer license or grant for any other use.

1.04 ELECTRONIC DOCUMENTS:

- A. Electronically formatted plans may, *at the architect's sole discretion*, be made available to the contractor(s) for use in developing bids. Should the architect determine that the use of electronic documents will be allowable in the development of bids, the following conditions shall apply:
 1. The recipient agrees to bound to the requirements contained herein and in the form of agreement for the electronic transfer. The opening, distribution and/or use of the electronic documents shall be considered as an acceptance of these conditions.
 2. Governing Documents: The hard copies (blue line or black line) of plans and specifications printed and maintained by the architect in the architect's office shall be considered to be the contract documents. If conflicts exist between the electronic documents and the hard copy of the contract documents maintained in the architect's office, the hard copy shall govern.
 3. The delivery of electronic documents to the contractor shall in no way be construed as changing the contract documents.
 4. Electronic data, if furnished, shall be provided to the contractor as a convenience to the contractor. Such delivery of electronic documents shall in no way eliminate or reduce the contractor's traditional and/or contractual responsibilities.
 5. Waiver of Liability: The contractor agrees to hold the Owner, architect and engineers harmless for any claims resulting from the use of the electronic documents regardless of the nature of the claim or the use of the electronic data.
 - a. The opening, distribution or use of electronic documents, by contractor(s), subcontractor(s), supplier(s) or other parties (recipients) shall be construed as and agreement to hold the Owner, architect and engineers harmless for any issues, claims, delays, or damages resulting from the use of such documents
 - b. The recipient shall waive all claims and/or damages against the Owner, architect and or engineers relating to corruption, degradation or disruption of data.
 - c. Recipient of electronic data shall defend and indemnify the Owner, architect and engineer(s) from any claim arising from any defect, error, omission or modifications not contained in the hardcopies of the contract documents.

6. Copy Right of Documents: The delivery of electronic documents to parties shall not be construed as authorization to use, copy or distribute electronic documents for any other use than that which is indicated herein and as defined in the agreement for transfer of electronic documents.
 - a. The architect expressly retains ownership of documents and copyright of said documents.
7. No Warranties on Accuracy of Electronic Documents: The architect and engineers do not in any way warrant that the plans and/or specifications are identical to the contract documents. If conflicts exist between the printed contract documents and the electronically formatted documents the printed documents shall govern
8. No Warranty as to Fitness: The recipient agrees that the electronic documents are an 'instrument of service' and not a 'product'. The architect and engineers in no way warrant the merchantability or fitness of the electronic documents. The architect expressly disavows any and all warranties whether expressed or implied regarding the accuracy of the electronic documents or the fitness of the documents for the intended use by the recipients.
9. Electronic Document Format: Should the architect determine that the use of electronic documents will be allowed in the development of bids, such documents will be furnished in **.pdf format** only. The documents will not be issued in the originally developed formats (Word, Word Perfect, AutoCad, Revit).

1.05 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

- A. Bidders promptly notify Architect of any ambiguity, inconsistency or error discovered upon examination of Bidding Documents or of site and local conditions.
- B. Bidders requiring clarification or interpretation of Bidding Documents make written request to Architect, to reach him at least ten (10) days prior to date for receipt of bids.
 1. Request for clarifications, either written or verbal (telephonic) shall be directed to Mr. Greg Smith, Project Architect at (229)-883-4698 **ONLY**.
 2. Clarifications from other parties shall not be considered binding.
- C. Any interpretation, correction or change of Bidding Documents made only by Addendum.
 1. Interpretations, corrections or changes of Bidding Documents made in any other manner are not binding, and bidders give no reliance upon such interpretations, corrections and changes.

1.06 FIELD VISITATION

- A. Prior to submission of bid each potential bidder SHALL visit the project site and examine existing conditions which may affect the work required to be performed under this contract.
- B. Claims by successful bidder for additional monies or time required due to factors which should have been discernable from thorough field visits to each site will not be considered.

1.07 INFORMATION AVAILABLE TO BIDDERS

- A. Contractors are advised that, in addition to the documents provided to each of the bidders, certain additional documents are available which may assist the bidder in the preparation of the bid(s).
 1. These documents are made available for the contractor's convenience.
 2. Potential bidders are encouraged to review these documents.
 3. Documents are available in the Architect's and / or owner's office.
- B. Documents which will be made available to the potential bidders include:
 1. Subsurface Investigation Report.
 2. Existing building plans
- C. Failure of bidder to consider information available in documents described above shall not be grounds for a future change order.

1.08 SUBSTITUTIONS

- A. Materials, products and equipment described in Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.
- B. No substitution considered unless written request for approval submitted by Bidder and received by Architect at least ten (10) days prior to date for receipt of bids.
 - 1. Include in each such request:
 - a. Name of material or equipment for which substitution requested.
 - b. Complete description of proposed substitute, including drawings, cuts, performance and test data
 - c. Any other information necessary for evaluation.
 - 2. Include statement setting forth any changes in other materials, equipment or work incorporation of substitute would require.
 - 3. Burden of proof of merit of proposed substitute is upon proposer.
 - 4. Architect's decision of approval or disapproval of proposed substitution is final.
- C. If Architect approves any proposed substitution, such approval set forth only in Addendum; do not rely upon approvals made in any other manner.
 - 1. Approval of Substitutions shall be written Addendum, issued prior to receipt of bids, Only.
 - 2. Verbal approval shall not be considered binding regardless of parties issuing approval.
 - 3. Suppliers of disapproved products will **NOT** be individually notified of disapproval.

1.09 ADDENDA

- A. It is the responsibility of each bidder presenting a bid to confirm with the Architect they have received all addenda. The contact person for confirmation of addenda is Gregory C. Smith at (229) 883-4698 or by fax at (229) 883-0936.
 - 1. Bidder shall ascertain prior to submitting his bid that he has received all Addendum issued, and acknowledge their receipt in his bid.
- B. Addenda will be E-mailed, mailed or delivered to all who are known by Architect to have received complete set of Bidding Documents from the architect.
 - 1. Copies of Addenda made available for inspection wherever Bidding Documents on file for that purpose
- C. Any explanation desired by a bidder regarding ambiguity, meaning, or interpretation of any portion of this Bid Document must be presented in writing to Gregory C. Smith, James W. Buckley & Associates, Inc., PO Box 466, 423 Pine Avenue, Suite 200, Albany, Georgia 31701; Phone 229-883-4698; Fax 229-883-0936; E-mail gcs@jwbuckley.com.
- D. A request for information must be received before by no later than five working days prior to the bid date in order to allow sufficient time to reply to all bidders before the deadline for submission of bids. Such explanations given to a bidder concerning this request for information will be furnished to all bidders as addenda.

1.10 FORM AND STYLE OF BIDS

- A. Submit bids in duplicate on forms indicated by Architect.
- B. Fill in all blanks on bid form by typewriter or manually in ink.
- C. Where so indicated by makeup of bid form, express sums in both words and figures, and in case of discrepancy between the two, amount expressed in words governs.
- D. Signer of Bid must initial any interlineation, alteration or erasure.
- E. Bid all requested alternates.
- F. Make no stipulations on bid form nor qualify bid in any manner.

- G. Include legal name of Bidder on each copy of Bid and state whether Bidder is a sole proprietor, partnership, corporation, or any other legal entity, and person or persons legally authorized to bind the Bidder to a contract sign each copy.
 - 1. If Bid submitted by corporation, give State of incorporation and affix corporate seal.
 - 2. If Bid submitted by an agent, attach current Power of Attorney certifying agent's authority to bind Bidder.

1.11 BID SECURITY

- A. If so stipulated in Advertisement or Invitation to Bid or Bidding Requirements, accompany each Bid with a bid security in required form and amount pledging that Bidder will enter into contract with Owner on terms stated in his Bid and will, if required, furnish bonds as described hereunder covering faithful performance of Contract and payment of all obligations arising thereunder.
 - 1. Should Bidder refuse to enter into such Contract or fail to furnish such bonds, if required, amount of bid security forfeited to Owner as liquidated damages, not as penalty.
- B. Bid security: In form of bid bond only; certified check or cashier's check not acceptable.
- C. Submit bid bond, written in form acceptable to Owner, with an acceptable surety, and Attorney-in-Fact who executes bond on behalf of surety affix to bond a certified and current copy of his Power of Attorney.
 - 1. Surety shall be licensed to conduct business in the state of Georgia.
 - 2. Surety shall be approved by the office of the Georgia Insurance Commissioner.
 - 3. Surety shall be listed in the most recent edition of the **FEDERAL REGISTER**.
- D. Owner reserves right to retain bid security of Bidders until one of following occurs:
 - 1. Contract executed and bonds, if required, furnished.
 - 2. Specified time elapsed so that Bids may be withdrawn
 - 3. All Bids rejected.

1.12 UNIT PRICES

- A. The Base Bids for this project shall include the total cost of items listed below as defined by the contract documents. Should conditions be encountered which required work to be performed beyond that defined in the contract, such work will be performed utilizing unit costs listed below applied to field determined quantities. This form shall be completed in its entirety.
 - 1. Unit Costs shall be used for changing quantities of work items from those indicated by the Contract Drawings.
- B. Unit prices shall include all labor, materials, overhead, profit, insurance, etc. to cover finished work of several kinds called for.
 - 1. Unit prices shall include required engineering, surveying, and testing.
 - 2. Where applicable unit costs shall include related work activities necessary to complete work.
 - 3. No additional surcharges shall be added to unit prices.
- C. Should changes to the contract quantities be requested a change order will be issued for modified scope based on unit costs contained herein.
- D. All unit prices indicated on the Bid Proposal form shall be bid.
 - 1. Only unit prices that are within the normal costs of work or materials being provide will be acceptable. If the unit prices are deemed to be unreasonable, the Owner may deem the bidder non-responsive and proceed to the next lowest bidder.
 - 2. All unit price quantities shall be agreed upon by the Contractor and the Architect.\
 - 3. The Owner and/or architect reserve the right to negotiate any unit prices considered to be unreasonable or excessive.
- E. Where unit prices used to adjust the contract cost, the quantities of materials (unsuitable soil, rock, ect) removed and replaced shall be determined by and independent land surveyor approved by the architect. The costs for the survey to be used for the quantifying of materials shall be paid by the contractor and included in the unit cost; unless otherwise noted.

1.13 BID BOND INSTRUCTIONS

- A. Prepare two copies of Bid Bond, one for Owner and one for Surety.
- B. Type or print Bidder's and Surety's names in indicated blanks.
- C. Date Bond prior to date of Bid Opening.
- D. Type or print description of construction in same language as in Advertisement or Invitation to Bid.
- E. Complete signatures on form.
 - 1. Corporate bidder affix corporate seal and sign in following manner:

ABC Construction Company

BY: _____
As President
- F. Affix Surety's corporate seal.
- G. Attach copy of Surety's agent's power of attorney.
 - 1. Copy of power of attorney must have original signature of Secretary or Assistant Secretary of Surety certifying copy.
 - 2. Affix Surety's corporate seal.

1.14 SUBMISSION OF BIDS

- A. Enclose all copies of Bid, and any other documents required to be submitted with Bid except bid security, if any, in sealed opaque envelope addressed to party receiving Bids and identified with Project name, Bidder's name and address, and portion of project or category of work for which Bid submitted.
- B. If bid security is required, enclose it, along with envelope containing Bid, in outer envelope and identify in similar manner.
- C. If Bid mailed, enclose outer sealed envelope in separate mailing envelope with notation "BID ENCLOSED" on face thereof.
- D. Deposit bids at designated location prior to time and date for receipt of bids indicated in Advertisement or Invitation to Bid, or any extension thereof made by Addendum.
 - 1. Bids received after time and date for receipt of bids returned unopened.
- E. Bidder assumes full responsibility for timely delivery at location designated for receipt of bids.
- F. Oral, telephonic or telegraphic Bids are invalid and receive no consideration.

1.15 CONTRACTOR LICENSE:

- A. Contractor License: Contractor shall be licensed in the State of Georgia in accordance with applicable licensing laws. Contractor to submit, as a part of bid proposal, a copy of the contractor(s) current state license. Failure to submit the license may subject the bid to rejection.

1.16 UTILITY CONTRACTOR NAME AND LICENSE

- A. Utility Contract License: Site utility work to be performed by contractor(s) licensed as utility contractor by the State of Georgia in accordance with Code Section 43-14-8.2. Provisions of this section apply to electrical contractors, plumbers, Hvac contractors, low voltage and utilities systems contractors as well as other contractors defined within the State of Georgia Code.

1.17 GEORGIA IMMIGRATION AND SECURITY REFORM ACT:

- A. Contractor(s) performing work on this project are subject to the requirements of the Georgia Security and Immigration Compliance Act of 2006; Chapter 300-10-1 of O.C.G.A.
- B. Contractor(s) and Sub-Contractor(s) shall verify that all trades on-site comply with applicable requirements. Submit documentation of compliance to the Owner prior to commencement of work by any trade.
- C. Pursuant to O.C.G.A. 13-10-91, every public employer, every contractor of a public employer, and every subcontractor of a public employer's contractor must register and participate in a federal work authorization program.
- D. The EEV / Basic Pilot Program can be accessed from the USDHS U.S. Citizenship and Immigration Services Internet website at <https://www.visdhs.com/EmployerRegistration>. Information and instructions regarding EEV / Basic Pilot Program Registration, Corporate Administrator Registration, and Designated Agent Registration can be found at that website address
- E. Contractor(s) performing work on this project are subject to the requirements of the Georgia Immigration and Security Reform Act.
 - 1. Contractor to verify that all trades on site comply with applicable requirements.
 - 2. Submit documentation of compliance to architect prior to commencement of work by any trade.
- F. Georgia Security and Immigration Compliance Act: The Contractor is to verify its compliance with O.C.G.A. § 13-10-91 for each subcontractor and each on-site operative, stating affirmatively that the individual, firm, or contractor who is contracting with the Owner or with successful bidder is participating in a federal work authorization program [Employment Eligibility Verification (EEV) operated by the U.S. Citizens and Immigration Services Bureau of the U. S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA)] in accordance with the applicability provisions and deadlines established in O.C.G.A. § 13-10-91 for portions of this contract.
 - 1. Provide EEV (Employment Eligibility Verification) User identification number.
 - 2. Complete attached form and include as part of submittal.

1.18 MODIFICATION OR WITHDRAWAL OF BID

- A. Bid may not be modified, withdrawn or canceled by Bidder during stipulated time period following time and date designated for receipt of Bids, and Bidder so agrees in submitting his Bid.
- B. Prior to time and date designated for receipt of Bids, modification or withdrawal of Bids submitted early permitted only by notice to party receiving Bids at place and prior to time designated for receipt of Bids.
 - 1. Submit such notice in writing over signature of Bidder or be by telegram, and if by telegram, written confirmation over signature of Bidder must be mailed and postmarked on or before date and time set for receipt of Bids,
 - 2. So word such notice as not to reveal amount of original Bid.
- C. Withdrawn Bids may be resubmitted up to time designated for receipt of Bids provided they are then fully in conformance with these Instructions to Bidders.
 - 1. Provide Bid security, if any is required, in an amount sufficient for Bid as modified or resubmitted.

1.19 CONSIDERATION OF BIDS

- A. Opening of Bids: Unless stated otherwise in Advertisement, properly identified Bids received on time will be opened publicly and read aloud, and an abstract of amounts of Base Bids and major Alternates, if any, made available to bidders.
 - 1. When stated that Bids will be opened privately, an abstract of same information may be made available to Bidders within a reasonable time.

- B. Rejection of Bids:
 - 1. Owner has right to reject any or all Bids and in particular to reject:
 - a. Bid not accompanied by required bid security or data required by Bidding Documents.
 - b. Bid in any way incomplete or irregular.
 - 2. The Owner reserves the right to reject the bid of any bidder who has previously failed to perform properly, or to complete on time, contracts of a similar nature; who is not in a position to perform the contract, or who habitually and without just cause neglected the payment of bills or otherwise disregards his obligations to subcontractors, material men, or employees.
- C. Acceptance of Bid (Award):
 - 1. Owner has right to waive any informality or irregularity in any Bid received.
 - 2. Owner will accept deductive alternates in order they are listed and will determine low Bidder on basis of Base Bid less accepted alternates.
 - 3. Owner has right to accept additive alternates in any order or combination.
 - 4. Owner intends to award contract to lowest responsible Bidder provided Bid submitted in accordance with requirements of Bidding Documents, is judged reasonable, and does not exceed funds available.
 - 5. If Contract is awarded, award made within 60 days of date of bid opening.

1.20 QUALIFICATION OF BIDDERS

- A. Bidders submit to with his bid, a properly executed Contractor's Qualification Statement, in form provided.

1.21 LIST OF SUBCONTRACTORS

- A. Selected Bidder submit to Owner within 48 hours of notification of award, list of subcontractors and major materials suppliers used if awarded Contract.
- B. Upon request, selected Bidder required to submit as soon as practical, after notification of award, all data required to establish to satisfaction of Architect and Owner, the reliability and responsibility of proposed Subcontractors to furnish and perform Work described in Sections of Specifications pertaining to such proposed Subcontractor's respective trades.
- C. Subcontractors proposed for Mechanical and Electrical Work must show evidence of at least two jobs of similar character and size installed within preceding two years.
- D. Prior to award of Contract, Architect will notify Bidder in writing if either Owner or Architect, after due investigation, has reasonable and substantial objection to any person or organization on such list.
 - 1. If Owner or Architect has reasonable and substantial objection to any person or organization on such list, and refuses in writing to accept such person or organization, bidder may, at his option, withdraw his bid without forfeiture of bid security or submit an acceptable substitute at no increase in Bid price.
 - 2. If Bidder fails to submit an acceptable substitute within seven (7) days of original notification, Owner then may, at his option, disqualify bidder, at no cost to Owner.
- E. Utilize only Subcontractors and other persons and organizations proposed by bidder, and accepted by Owner and Architect, on the Work for which they were proposed and accepted and do not change except with written approval of Owner and Architect.

1.22 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

- A. Required Bonds: Bidder furnish bonds covering faithful performance of Contract and payment of all obligations arising thereunder in full amount of Contract, with such acceptable sureties secured through Bidder's usual sources as agreeable to parties.

- B. Surety Bond: Acceptable Surety Companies: To be acceptable to Owner as Surety on Bonds, Surety comply with following provisions:
 - 1. Be licensed to do business in Georgia.
 - 2. Have been in business with record of successful continuous operations for at least five years.
 - 3. Have financial rating acceptable to Owner.
 - 4. Not expose itself to any loss on any one risk in amount exceeding twenty percent of its surplus to policy-holders.
 - 5. Fulfilled all of obligations on all other bonds given to Owner.
- C. Time of Delivery and Form of Bonds:
 - 1. Bidder deliver required bonds to Owner with executed Contract, or if Work commenced prior thereto in response to letter of intent, Bidder, prior to commencement of Work, submit evidence satisfactory to Owner that such bonds will be furnished.
 - 2. Unless otherwise specified in Bidding Documents, write bonds in form of those bound in this Project Manual.
 - 3. Bidder require Attorney-in-Fact who executes required bonds on behalf of surety to affix thereto a certified and current copy of his Power of Attorney.
 - 4. Date all bonds on or after date of Contract.

1.23 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

- A. Agreement Form: Unless otherwise provided in Bidding Documents, Agreement for Work will be written on Form of Agreement between Owner and Contractor as bound in this Project Manual.
- B. Contractor Indemnity: The Contractor agrees to indemnify and hold harmless the Owner and the Architect from any liabilities, damages and costs (including reasonable attorney's fees) to the extent caused by the negligent acts, errors or omissions of the Contractor, its subcontractors, or anyone for whom Contractor is legally responsible.

1.24 CONTRACT TIME

- A. Following is made part of Contract:

"The work to be performed under this Agreement shall be commenced within ten (10) days of receipt of notice to proceed, in writing, and substantially completed within the time set in the Bidders proposal.

"The work to be performed under this Agreement shall be commenced within ten (10) days of receipt of notice to proceed, in writing, and substantially completed before July 15, 2014.

1.25 SCHEDULE

- A. If the Contractor fails to commence actual physical work with an adequate force and equipment within ten (10) days of the date specified in the written Notice to Proceed, the Owner reserves the right to null and void the Contract Award.
- B. Contractor shall notify the Engineer and Owner in writing before any billable work takes place.

1.26 TAXES

- A. Project is subject to Federal Excise and Georgia Sales Taxes, and must be included in Bidder's proposal.
 - 1. Contractor shall pay all applicable taxes.

1.27 VENDOR PERFORMANCE

- A. The successful bidder shall be required to truly perform well and fulfill all the undertakings, covenants, terms, conditions, and agreements of the contract. The successful bidder and his employees shall have the current federal, state, and local licenses, permits, and certificates required to perform their work.

- B. The successful bidder shall provide trained and properly licensed personnel having available the appropriate types of tools, and equipment to complete the project in a professional manner.

1.28 INCURRING COSTS

- A. The Owner is not liable for any costs incurred by bidder in preparing or submitting proposals.

1.29 PERMITS AND FEES

- A. Surveys, Permits and Regulations: Paragraph (a): Permits: Per Georgia Code 20-2-261(d) a Local Board of Education shall be exempt from county and municipal assessments and fees for county and municipal permits and inspections and exempt from county and municipal impact fees.
 - 1. Cost for County building permits and impact fees to be excluded from the contractors bid.
 - 2. Contractor responsible for other fees, including tap fees, not specifically identified above, unless noted otherwise in the contract documents.
- B. Contractor to obtain necessary and required building permits.
- C. The contractor shall be responsible for the filing of the 'notice of intent' as required for the erosion control permit.

1.30 PRODUCT AND QUALITY ASSURANCE:

- A. All products and/or parts required by this contract shall be in accordance with the specifications. The Owner reserves the right to reject any products and/or parts that they deem not to meet the basis of design and/or the project specifications.

1.31 MATERIAL SAFETY DATA SHEETS AND TECHNICAL DOCUMENTATION:

- A. The successful bidder shall submit copies of MSDS's on all chemicals that may be utilized to perform the work associated with this RFQ. The Owner and architect shall approve the MSDS's for each product, prior to its use. Provide technical data sheets (shop drawings) on all new chemicals utilized, prior to their use.

1.32 EXPERIENCE DOCUMENTATION:

- A. The successful bidder shall have a minimum off five (5) years experience in the industry under the present company name. The successful bidder shall submit a copy of current licenses, permits, certifications, and proof of training for employees performing work associated with this contract.

1.33 CHANGES

- A. The Owner may order changes in the schedule, work, and/or materials consisting of additions, deletions, or modifications. The contract sum and the contract time will be adjusted accordingly. All such changes shall be authorized by a written change order, signed by the Owner, prior to its performance.
- B. The Owner reserves the right to identify and negotiate reductions or changes by the successful bidder which would be to the advantage of the Owner. The cost or credit to the Owner from a change in the work and/or material consisting of additions, deletions, or modifications shall be determined by mutual agreement.

1.34 PROMPT PAY ACT

- A. The contractor(s) is (are) hereby notified that the Contract Documents shall take precedence over All provisions of the PROMPT PAY ACT.
- B. Should conditions be encountered where the provisions of this contract are found or believed to be in conflict with the provisions of the Prompt Pay Act, the provisions of this contract shall govern.

- 1.35 SEVERABILITY: If any portion of the contract documents shall be held to be invalid or unenforceable for any reason, the remaining provisions of the contract documents shall continue to be valid and enforceable. If a court finds that any provision of the contract documents is invalid or unenforceable, but that by limiting such provision it would become valid and enforceable, then such provision shall be deemed to be written, construed, and enforced as so limited.
- 1.36 WAIVER: The failure of either party to enforce any provisions of the contract documents shall not be construed as a waiver or limitation of that party's right to subsequently enforce and compel strict compliance with every provision of the contract documents.
- 1.37 POLICIES STATEMENTS
- A. Non-Bias Statement: The Local Board of Education supports all Federal, State and Local equal opportunity policies. Bias related activities, including, but not limited to, discrimination, racial slurs, sexual harassment will not be tolerated.
 - B. Drug Free/Tobacco Free Statement: The Local County Board of Education supports a drug free work place and does not tolerate any use or possession of drugs and/or alcohol on its premises or use of such substances prior to performing any work on behalf of the Board of Education. Use of tobacco is prohibited in all buildings and all premises of the Board of Education.
 - C. Local Business: Contractors shall note that the Owner supports local business enterprises.
- 1.38 SAFE SCHOOL STATEMENT
- A. Individuals working within a school building, or on a school site, to submit to a background check pertaining to felony convictions and sex offender convictions. Violent felons and sex offenders shall not be allowed within a school building or on a school site while school staff or students are in the building or on the site. Convicted predatory sex offenders shall not be allowed on property at any time. All decisions made in this effort to promote a safe school environment shall be accessed at the sole discretion of the Owner and Architect.
- 1.39 DEFAULT BY A CONTRACTOR:
- A. In the event goods and/or services furnished under this contract, for any reason, do not conform to the intent of this contract document and/or any terms agreed upon prior to the award of the contract, the Owner/architect may reject the goods and/or services. Following specific instructions by the Owner/Architect, the successful bidder shall immediately remove the goods and/or cease providing the services, without expense to the Owner and replace all rejected goods and/or services with goods and/or services conforming to the contract documents and/or terms agreed upon.
 - B. Should the contractor default in the performance of the previous paragraph, Owner shall issue, within forty-eight (48) hours, written notice detailing the default. The Owner has the right to procure such goods and/or services from other sources and shall have the absolute right to deduct from any monies due to the contractor, the difference between the contract price and the actual cost of the goods and/or services to be replaced or substituted. The price paid by the Owner in this event shall be the prevailing market price at the time the substitute purchase is made.
- 1.40 RELEASE OF LIABILITY:
- A. It is expressly understood that the Owner and Architect shall not be liable to any Contractor and that said Contractor will hold harmless Owner and Architect, its officers, employees and agents from any loss, damage, expense or liability by reason of property damage, excluding loss of use thereof, or personal injury of whatsoever nature of any kind (including death) arising out of or in connection with the performance and installation work pursuant to this bid or any special contract resulting from this bid by Contractor occasioned by the negligent acts or omissions of employees, officers or agents of Contractor.

1.41 ATTACHMENTS

Attachments A, B, C, D, E and F are hereby incorporated by their reference into the contract documents.

END OF SECTION 00100

**ATTACHMENT A
VENUE AND JURISDICTION**

PROJECT: _____

OWNER: _____

CONTRACTOR: _____

Contractor agrees that with respect to any claims which the Owner may have against the Contractor arising out of this contract or its performance or on account of any work done under or pursuant to the Contractor for indemnity shall be controlled and governed by law of Georgia, and actions pursuant to any such claims may be filed and prosecuted against the Contractor in the courts of the County in which the project is located. For this purpose, the Contractor does hereby waive all questions of venue and jurisdiction and does hereby submit itself to the venue and jurisdiction of the courts of the county in which the project is located.

Contractor further agrees that any claims for personal injury and/or property damage which any person may have against the Contractor arising out of this contract or its performance or on account of any work done under or pursuant to the contract shall be controlled and governed by the law of Georgia, and actions pursuant to any such claims may be filed and prosecuted against the Contractor does hereby waive all questions of venue and jurisdiction and does hereby submit itself to the venue and jurisdiction of the county in which the project is located.

Contractor does hereby appoint: _____

a resident of the county in which the project is located as its agent to receive service of any such actions, and service upon such agent shall be good and valid service upon the Contractor. Service may be perfected upon the Contractor by serving its agent or the Judge of Probate Court of the county in which the project is located, and such service shall in all respect be good and valid service of said action upon the Contractor. It shall be the obligation of the Contractor to keep its agent for service and the Judge of Probate Court of the county in which the project is located informed and advised of all times of the address to which any such suits served upon them shall be sent.

Signed: _____ Title: _____

This _____ day of _____, 20 _____.

Notary Public: _____

_____ County, Georgia

My commission expires

ATTACHMENT B

300-10-1-.02 Public Employers, Their Contractors, and Subcontractors Required to Verify New Employee Work Eligibility Through a Federal Work Authorization Program.

(1) Pursuant to O.C.G.A. 13-10-91, every public employer, every contractor of a public employer, and every subcontractor of a public employer's contractor must register and participate in a federal work authorization program, as follows:

(a) On or after July 1, 2007, every public employer shall register and participate in a federal work authorization program to verify the work eligibility information of all new employees.

(b) No public employer shall enter into a contract for the physical performance of services within this state unless the contractor registers and participates in a federal work authorization program to verify the work eligibility information of all new employees.

(c) No contractor or subcontractor who enters into a contract with a public employer shall enter into such a contract or subcontract in connection with the physical performance of services within this state unless such contractor or subcontractor registers and participates in a federal work authorization program to verify the work eligibility information of all new employees.

(2) In accordance with O.C.G.A. 13-10-91, the requirements of paragraphs (b) and (c) of paragraph (1) shall apply to public employers, their contractors and subcontractors, as follows:

(a) On or after July 1, 2007, to public employers, contractors, or subcontractors of 500 or more employees;

(b) On or after July 1, 2008, to public employers, contractors, or subcontractors of 100 or more employees; and

(c) On or after July 1, 2009, to all other public employers, their contractors, or subcontractors.

(3) As of the date of enactment of O.C.G.A. 13-10-91, the applicable federal work authorization program is the "Employment Eligibility Verification (EEV) / Basic Pilot Program" operated by the U. S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA). Public employers, contractors and subcontractors subject to O.C.G.A. 13-10-91 shall comply with O.C.G.A. 13-10-91 and this rule by utilizing the EEV / Basic Pilot Program. The EEV / Basic Pilot Program can be accessed from the USDHS U.S. Citizenship and Immigration Services Internet website at <https://www.vis-dhs.com/EmployerRegistration>. Information and instructions regarding EEV / Basic pilot Program Registration, Corporate Administrator Registration, and Designated Agent Registration can be found at that website address.

(4) All rules, regulations, policies, procedures and other requirements of the EEV / Basic pilot program or any other federal work authorization program defined in Rule 300-10-1-.01 and permitted to be used to satisfy the requirements of O.C.G.A. 13-10-91 and these rules, shall be considered additional requirements of this rule.

(5) In accordance with O.C.G.A. 13-10-91, public employers, contractors, and subcontractors may utilize any other federal work authorization program operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603, as such work authorization programs become available.

(6) A copy of these Chapter 300-10-1 rules, including any forms prescribed or available to administer and effectuate these rules, shall be published on the Georgia Department of Labor's website.

(7) In accordance with the provisions of O.C.G.A. 13-10-91, these rules in Chapter 300-10-1 do not apply to any contract or agreement relating to public transportation. Rules and forms applicable to any contract or agreement relating to public transportation may be found on the Georgia Department of Transportation's website.

(8) The rules of Chapter 300-10-1 shall be enforced without regard to race, religion, gender, ethnicity, or national origin.

Authority O.C.G.A. Sec. 13-10-91. **History:** Original Rule entitled "Public Employers, Their Contractors, and Subcontractors Required to Verify New Employee Work Eligibility Through a Federal Work Authorization Program" adopted. F. May 25, 2007; effective June 18, 2007, as specified by the Agency.

ATTACHMENT C

GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT of 2006

CONTRACTOR AFFIDAVIT AND AGREEMENT

COMES NOW before me, the undersigned officer duly authorized to administer oaths, the undersigned Contractor, who, after being duly sworn, states as follows:

By executing this affidavit, the undersigned Contractor verifies its compliance with O.C.G.A. § 13-10-91 and Georgia Department of Labor Rule 300-10-1 et al, stating affirmatively that the individual, firm, or corporation which is contracting with the **Dalton Public Schools, Dalton, Georgia**, has registered with and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. § 13-10-91 and Georgia Department of Labor Rule 300-10-1-.02.

The undersigned Contractor further agrees that, should it employ or contract with any Sub-Contractor(s) in connection with the physical performance of services pursuant to the contract with the **Dalton Public Schools, Dalton, Georgia**, of which this affidavit is a part, the undersigned Contractor will secure from such Sub-Contractor(s) similar verification of compliance with O.C.G.A. § 13-10-91 and Georgia Department of Labor Rule 300-10-1-.02 through the Sub-Contractor's execution of the Sub-Contractor Affidavit required by Georgia Department of Labor Rule 300-10-1-.08, or a substantially similar Sub-Contractor Affidavit.

The undersigned Contractor further agrees to maintain records of such compliance and provide a copy of each such verification to the **Dalton Public Schools, Dalton, Georgia**, at the time the Sub-Contractor(s) is retained to perform such service.

EEV / Basic Pilot Program* User Identification Number: _____

Company Name: _____

Address: _____

City: _____ State: _____ ZIP: _____

Name: _____ Title: _____

Signature: _____ Date: _____

Notary Public: _____, _____ County, Georgia.

This _____ Day of _____, 20____. My Commission Expires: _____

* As of the effective date of O.C.G.A. § 13-10-91, the applicable federal work authorization program is the "EEV / Basic Pilot Program" operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

ATTACHMENT D

GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT of 2006

SUB-CONTRACTOR AFFIDAVIT

COMES NOW before me, the undersigned officer duly authorized to administer oaths, the undersigned Sub-Contractor, who, after being duly sworn, states as follows:

By executing this affidavit, the undersigned Sub-Contractor verifies its compliance with O.C.G.A. § 13-10-91 and Georgia Department of Labor Rule 300-10-1 et al, stating affirmatively that the individual, firm, or corporation which is engaged in the physical performance of services under a Contract with _____, Contractor, on behalf of the **Dalton Public Schools, Dalton, Georgia**, has registered with and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. § 13-10-91 and Georgia Department of Labor Rule 300-10-1-.02.

EEV / Basic Pilot Program* User Identification Number: _____

Company Name: _____

Address: _____

City: _____ State: _____ ZIP: _____

Name: _____ Title: _____

Signature: _____ Date: _____

Notary Public: _____, _____ County, Georgia.

This _____ Day of _____, 20____. My Commission Expires: _____

* As of the effective date of O.C.G.A. § 13-10-91, the applicable federal work authorization program is the "EEV / Basic Pilot Program" operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

ATTACHMENT E

GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT AFFIDAVIT

Project Name and Number

Contractor's Name:

CONTRACTOR AFFIDAVIT

By executing this affidavit, the undersigned Contractor verifies its compliance with O.C.G.A. §13-10-91, stating affirmatively that the individual, firm, or corporation which is contracting with the **Dalton Public Schools, Dalton, Georgia**, has registered with and is participating in a federal work authorization program*, in accordance with the applicability provisions and deadlines established in O.C.G.A. 13-10-91.

The undersigned further agrees that, should it employ or contract with any subcontractor(s) in connection with the physical performance of services pursuant to this contract with the **Dalton Public Schools, Dalton, Georgia**, Contractor will secure from such subcontractor(s) similar verification of compliance with O.C.G.A. § 13-10-91 on the Subcontractor Affidavit provided in Rule 300-10-01-.08 or a substantially similar form. Contractor further agrees to maintain records of such compliance and provide a copy of each such verification to the Georgia Department of Transportation at the time the subcontractor(s) is retained to perform such service.

EEV / E-Verify™ User Identification Number

Date of Authorization

BY: Authorized Officer or Agent
(Contractor Name)

Date

Title of Authorized Officer or Agent of Contractor

Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN
BEFORE ME ON THIS THE

____ DAY OF _____, 201__

Notary Public

[NOTARY SEAL]

My Commission Expires: _____

*any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603

ATTACHMENT F

AFFIDAVIT OF NON-COLLUSION

STATE OF GEORGIA

COUNTY OF CRISP

Personally appeared before me, _____, who being first duly sworn says that he is a member of the firm of: _____ and further says that his firm, association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the submission of a bid on the above-name project.

Further, _____ swears and affirms that all legal formalities require for the proper execution of affidavits pursuant to the laws of his state have been complied with and further agrees, on behalf of himself, his firm, association, or corporation, that in any subsequent prosecution for perjury of himself, his firm, association, or corporation, it shall not be a defense to such charge of perjury that said formalities were not in fact complied with.

SWORN before me
this _____ day of _____, 2011

Notary Public

My Commission Expires:

(Notary Seal)

END OF SECTION 00100

SECTION E

GENERAL CONDITIONS

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SECTION E GENERAL CONDITIONS

Article E-01. The General Conditions of the Contract, Articles E-01 to E-71, inclusive, bound herein and hereafter referred to as the "General Conditions," shall govern in the event of any conflict with any other provisions of the contract documents unless notice to the contrary shall have been issued by the Owner bearing the imprimatur of the Owner as follows:

"By order [NAME OF Owner], Owner".

Article E-02. Drug-Free Work Place Act.-The Contractor Acknowledges that he is fully aware of the contents and requirements of Chapter 24 of Title 50 of the Official Code of Georgia. The Contractor, upon submission of a proposal in connection with this contract, does hereby certify that he and his subcontractors are in compliance with the aforesaid code section.

Article E-03. Trade Names.-When reference is made in the contract documents to trade names, brand names, or to the names of manufacturers, such references are made solely to indicate that products of that description may be furnished and are not intended to restrict competitive bidding. If it is desired to use products of trade or brand names or of manufacturers' names which are different from those mentioned in the bidding documents, application for the approval of the use of such products must reach the hands of the Architect at least ten days prior to the date set for the opening of bids. The latter provision is a restriction which applies only to the party making a submittal. Therefore, the aforesaid restriction does not inhibit the Architect from adding trade names, brand names or names of manufacturers by addendum. The burden of proving acceptability of a proposed product for use in place of a product or products designated by trade name or names, brand name or names, or by the name or names of manufacturers in the contract documents rests on the party submitting the request for approval. The written application for approval of a proposed product must be accompanied by technical data which the party requesting approval desires to submit in support of his application. The Architect will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed product with previous users, evidence of reputation of the manufacturer for prompt delivery, evidence of reputation of the manufacturer for efficiency in servicing its products, or any other written information that is helpful in the circumstances. The application to the Architect for approval of a proposed product must be accompanied by a schedule setting forth in which respects the material or equipment submitted for consideration differ from the material or equipment designated in the bidding documents. The degree of proof required for approval of a proposed product as acceptable for use in place of a named product or named products is that amount of proof necessary to convince a reasonable person beyond all doubt. To be approved, a proposed product must also meet or exceed all express requirements of the contract documents. If the submittal is approved by the Architect, an addendum will be issued to all prospective bidders. Issuance of an addendum is a representation to all bidders that the Architect in the exercise of his professional discretion established that the product submitted for approval is acceptable meets or exceeds all express requirements. In the event a submittal shall have been rejected by the Architect and there shall have been a request for a conference as provided in this article pursuant to which conference the said submittal shall have been found to comply with the requirements of this article, a separate addendum covering the said submittal will be issued prior to the opening of bids. In order for the Architect to prepare an addendum intelligently, an application for approval of a product must be accompanied by a copy of the published recommendations of the manufacturer for the installation of the product together with a complete schedule of changes in the drawings and specifications, if any, which must be made in other work in order to permit the use and installation of the proposed product in accordance with the recommendations of the manufacturer of the product. [See Article E-43 which requires the Contractor to do all cutting and fitting that may be required to make the several parts of his work come together properly and fit] Unless requests for approvals of other products have been received and approvals have been published by addendum in accordance with the above procedure, the successful bidder may furnish no products of any trade names, brand names, or manufacturers' names except those designated in the contract documents. Any party who alleges that rejection of a submittal is the result of bias, prejudice, caprice or error on the part of the Architect may request a conference with a representative of the Owner, *Provided:* That the request for said conference, submitted in writing, shall have reached the Owner at least five days prior to the date set for the opening of bids, time being of the essence.

Article E-1. Definitions.-

(a) *Contract Documents.*-The contract documents are as described in the Form of Agreement, Article E-71 of the General Conditions. [See also Article E-71 for specimen of form of agreement] [See also Article E-30]

(b) *Parties.*-The Owner, the Contractor and the Architect are those mentioned as such in the form of agreement. They are treated throughout the contract documents as if each were of the singular number and masculine gender.

(c) *Subcontractor.*-The term subcontractor as employed herein includes only those having direct contract with the Contractor. It includes one who furnishes materials worked to a special design according to the plans and specifications of this work but does not include one who merely furnishes materials not so worked.

(d) *Notices.*-Written notices shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered mail to the last business address known to him who gives the notice.

(e) *Work.*-The term "work" of the Contractor or subcontractor includes labor or materials or both.

(f) *Work Included.*-Contractor shall provide all labor, materials and equipment necessary to completely and properly supply and install, in proper operating condition, the products specified in each individual section or shown on the drawings, unless specifically indicated to be supplied and/or installed by the Owner.

(g) *Time Limits.*-All time limits stated in the contract documents or shown on the construction progress schedule are of the essence of the contract. [See also Article E-46]

(h) *Applicable Law.*-This contract shall be governed by the law of Georgia.

(i) *Specifications.*-The term "Specifications" shall include all written matter in the bound volume or on the drawings and any addenda or modifications thereto. [See also Article E-49]

(j) *Order of Condemnation.*-An order of condemnation shall be in writing, shall be dated, shall be signed by the Architect, shall be addressed to the Contractor with a copy to the Owner, and shall contain three elements as follows:

FIRST ELEMENT: Description of work...

- (1) which has been omitted or
- (2) which is unexecuted as of the date of the order of condemnation, the time for its incorporation into the work under the construction progress schedule having expired [See also Article E-46], or
- (3) which has not been executed in accordance with the methods and materials designated in the contract documents.

SECOND ELEMENT: Citation of the provision or provisions of the contract documents which has or have been violated.

THIRD ELEMENT: Fixing of a reasonable space of time within which the Contractor shall have made good the deficiency which said space of time shall not be deemed to be an extension of contract time for filing the Notice of Readiness for Final Inspection pursuant to Article E-41 nor shall it be deemed to be authorization for amendment to the construction progress schedule. [See also Articles E-19, E-20, and E-50].

An order of condemnation may be issued for failure of the Contractor to supply enough skilled workmen or enough materials or proper materials. The order of condemnation in such event being based on Article E-46, *q.v.* and upon the definition of work as set forth under Article E-1(e), *q.v.* [See also Article E-26]

(k) *Proceed Order.*-The proceed order is a written notice from the Owner pursuant to which the Contractor shall commence physical work on the site. [See Article E-46] A proceed order is a condition precedent to the execution of any work on the site by the Contractor.

(l) *Work Order.*-A work order is a written notice from the Owner issued separately to the Contractor for each subcontractor. A work order is a condition precedent to the execution of any work on the site by a subcontractor.

(m) *Change Order Form.*-The change order form is the instrument by which adjustments in the contract sum are effected pursuant to changes made in accordance with Case (a), Case (b), or Case (c) of Article E-15 or in accordance with Subparagraph (i) of Article E-15. The change order form shall be accompanied by a breakdown in the form prescribed in a specimen which the Owner will supply to any bidder upon request. The Architect shall certify to the amount of the adjustment. The change order form shall be signed by the Contractor and the Owner. The breakdown is only for the purpose of enabling the Architect and the Owner to make a judgment on the dollar amount of the adjustment in the contract sum. No condition, term, qualification, limitation, exception, exemption, modification, or proviso shall appear in the breakdown. The breakdown shall be in the exact form and language of the above-mentioned specimen. In the event any condition, term, qualification, limitation, exception, exemption, modification, or proviso shall appear in a breakdown it shall be invalid unless expressly recited in the change order form under Paragraph 3, "Description of Change". Only such conditions, terms, qualifications, limitations, exceptions, exemptions, modifications and provisos as are recited under Paragraph 3, "Description of Changes", are valid. [See also Article E-15]

(n) *Install, Deliver, Furnish, Supply, Provide.*-Such words mean the work in question shall be put in place by the Contractor ready for use unless expressly provided to the contrary.

(o) *Article Not Plenary.*-This article is not entire, plenary, or exhaustive of all terms used in the general conditions which require definition. There are definitions of other terms under articles to which the terms are related.

(p) *Grounds for Issuance of Notice of Declaration of Default.*-It shall be a sufficient ground for the issuance of a notice of declaration of default that the Contractor has been unfaithful or delinquent in the performance of the contract or any of it in any respect. Without limitation of the foregoing and without subtracting from any right or defense of the Owner under other provisions of the contract documents, the Contractor acknowledges and agrees that it is *ipso facto* grounds for issuance of a notice of declaration of default under the performance bond of the Contractor shall have neglected or failed for any reason to remedy a breach of an order of condemnation within thirty (30) days after the Owner shall have given written notice of said breach to the Contractor and the surety on the performance bond with written demand of the Owner for curing the delinquency. The Architect does not have authority to declare the Contractor in default.

(q) *Cross-references and Citations of Articles and Paragraphs of the General Conditions.*-Cross-references and citations of articles and paragraphs of the general conditions are for the convenience of the Contractor, Architect, and the Owner and are not intended to be plenary or exhaustive nor are they to be considered in interpreting the contract documents or any part of the contract documents.

(r) *Meaning of words and phrases.*-Unless the context or the contract documents taken as a whole indicate to the contrary, words used in the contract documents that have usual and common meanings shall be given their usual and common meanings and words having technical or trade meanings shall be given their customary meaning in the subject business, trade or profession.

Article E-2. Identification, Correlation, and Intent of Documents.-

(a) *Identification.*-The Architect shall identify the contract documents.

(b) *Correlation and Intent.*-The contract documents are complementary, and what is called for by one shall be as binding as if called for by all. The intention of the documents is to include all labor and materials, equipment, and transportation necessary for the proper execution of the work. It is not intended, however, that materials or work not covered by or properly inferable from any heading, branch, class or trade of the specifications shall be supplied unless distinctly noted on the drawings. Materials or work described in words which so applied have a well-known technical or trade meaning shall be held to refer to such recognized meanings. [See also Article E-9] In the event the Architect shall have used such phrases anywhere in the Contract Documents as: "Work indicated on the drawings and herein specified", "work shown and specified", "in accordance with drawings and specifications", "indicated on the drawings and specifications", "in accordance with specifications and applicable drawings", "these specifications and the accompanying drawings", as indicated on the drawings and as specified herein", or similar expressions, they shall not be deemed to be and are not a defeasance of the provisions under the present article of the general conditions, and they are not to be construed as requiring work to be called for both in the specifications and in the drawings in order to be a requirement under the contract. Any of the aforesaid conjunctive expressions and phrases or any cross-references between drawings and specifications, between specifications and specifications, or between drawings and drawings to the contrary notwithstanding, the contract documents are complementary, and what is called for by one shall be as binding as if called for by all [See also Articles E-1(m), E-36, E-37, and E-45]

(c) *Examination.*-Before submitting proposals, bidders shall examine all drawings and specifications and shall be fully informed as to the extent and character of the work required by the Contract Documents. Consideration will not be granted for alleged misunderstanding of the materials to be furnished or the work to be performed; it being understood that the tender of a proposal carries with it the agreement to all items and conditions referred to throughout the project manual (specifications) and/or the drawings.

Article E-3. Complete, Definite, and Clear Instructions and Schedules of Drawings.-

(a) *Refinement of Documents.*-The Contractor shall do no work without complete, definite, and clear drawings and specifications. In the event the contract documents are not complete, definite, and clear the Contractor shall make demand upon the Architect in writing for additional instructions, and shall furnish the Owner a copy of the aforesaid demand. With reasonable promptness the Architect shall furnish complete, definite, and clear instructions in writing, or by means of drawings, or in writing and by means of drawings. [See also Article E-2, E-14, E-18, and E-39] Such additional instructions if given orally shall be confirmed in writing or by drawings or both within a reasonable space of time. All such additional instructions shall be consistent with the contract documents, true development thereof, and reasonable inferable therefrom. The work shall be executed in conformity with the aforesaid instructions. The Architect shall furnish the Owner a copy of all additional instructions issued to the Contractor. [See also Article E-16 and E-39]

(b) *Schedules.*-The Contractor and the Architect shall jointly prepare a schedule, subject to change from time to time in accordance with the progress of the work, fixing the dates at which the various details drawings will be required, and the Contractor shall furnish them in accordance with that schedule. [See also Article E-5(b)]

Article E-4. Copies of Contract Documents Furnished to Contractor.-The Architect shall furnish to the contractor, free of charge, such number of copies of contract documents as shall be reasonably necessary for the execution of the work.

Article E-5. Shop Drawings.-

(a) *Submission and Approval.*-The Contractor shall submit no shop drawings which do not comply with the contract documents. The Contractor shall review all shop drawings prior to submission. He shall submit such reasonable number of shop drawings as shall be required by the Architect for the work of the various trades, and the Architect shall pass upon them, making proper corrections. The Contractor shall make any proper corrections required by the Architect, file with him two corrected copies, and furnish such other copies as may be needed. The Architect's approval of such drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications nor shall it relieve him from the responsibility for errors of any sort in shop drawings or schedules.

(b) *Schedule.*-The Contractor and the Architect shall jointly prepare a schedule, subject to change from time to time in accordance with the progress of the work, fixing the dates for submission of shop drawings by the Contractor and for furnishing of approval by the Architect. The Contractor shall submit in accordance with the schedule, and the Architect shall furnish approval in accordance with the schedule. The schedule must be consistent with the construction progress schedule required under Article E-50 of the general conditions.

(c) *Definition.*-Shop drawings are drawings, schedules, data, catalogue cuts, manufacturers' published recommendations, charts, bulletins, brochures, illustrations, circulars, roughing drawings or formulae distributed by Contractors, subcontractors, manufacturers, materialmen, or suppliers for use in installing work. [See also Articles E-3(b), E-18 and E-53]

(d) *Drawings and Details.*-It is the intent that the project be built in accordance with the Architect's drawings and specifications, therefore, submissions of plans and details of items the Architect's drawings have shown are not required. However, if actual or anticipated job conditions, manufacturer's recommendations, or other reasons approved by the Architect, require that the installation be other than as the Architect detailed it, then plans and detailed drawings shall be prepared by the Contractor to clearly indicate the changes required. Changes are subject to the Architect's approval and are not chargeable as cost additions to the Contract Documents. Submit minimum four (4) copies of plans and details along with a written request for and description of the changes. Review stamps placed on shop drawings do not constitute or authorize changes to the Contract. Changes can only be made in accordance with Article E-15, Changes In The Work.

Article E-6. Drawings and Specifications at the Site.-

(a) *Documents at Site.*-The Contractor shall keep at the site one copy of all drawings and specifications in good order and available to the Architect and to his representatives.

(b) *Record Documents.*-The set of drawings and specifications kept at the job site shall be labeled, "Record Documents" on which all changes to the construction contract documents shall be made with colored pens. Changes to drawings and specifications shall be made concurrently with construction progress. Do not conceal any work until required information is recorded. Drawings shall be legibly marked to record actual construction:

- (1) Depths of various elements of foundations in relation to finish floor elevation.
- (2) Horizontal and vertical locations of underground utilities and appurtenances, referenced to finish floor elevation or permanent surface improvements.
- (3) Location of internal utilities and appurtenances concealed in the construction and referenced to finish floor elevation or other accessible features of the structure.
- (4) Field changes of dimensions and detail.
- (5) Changes made by field order or change order.
- (6) At contract close-out, deliver Record Documents to the Architect indicating:
 - (a) Date
 - (b) Project title and number
 - (c) Signature of Contractor or his authorized representative.

Article E-7. Ownership of Drawings and Models.-All drawings, specifications, and copies thereof furnished by the Architect are his property. They are not to be used on other work and, with the exception of one set, are to be returned to him on request at the completion of the work. All models are the property of the Owner.

Article E-8. Samples.-The Contractor shall furnish for approval all samples as directed. The work shall be in accordance with approved samples.

Article E-9. Materials, Appliances, Employees.-

(a) *Payment for.*-Unless otherwise stipulated, the contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other facilities necessary for the execution and completion of the work. [See also Articles E-2 and E-70]

(b) *Quality of materials and workmanship.*-Unless otherwise stipulated, all materials shall be new, and both the workmanship and materials shall be of good quality. The Contractor shall, if required furnish satisfactory evidence as to the kind and quality of materials and work. The burden of proof is on the Contractor. [See also Article E-13]

(c) *Quality and discipline of employees.*-The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him. [See also Article E-14]

Article E-10. Royalties and Patents.-The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when a particular process or the product of a particular manufacturer or manufacturers is specified, but if the Contractor has information that the process or article specified is an infringement of a patent he shall be responsible for such loss unless he promptly gives such information to the Owner. [See also Article E-11]

Article E-11. Surveys, Permits and Regulations.-

(a) *General.*-The Owner shall furnish all surveys unless otherwise specified. Permits and licenses of a temporary nature necessary for the prosecution of the work shall be obtained and paid for by the Contractor. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be obtained and paid for by the Owner unless otherwise specified. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work. If the Contractor observes that the drawings or specifications are at variance therewith, he shall promptly notify the Owner in writing, and any necessary changes shall be adjusted as provided in the contract for changes in the work. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules or regulations without such notice to the Owner, he shall bear all costs arising therefrom. Building permits, access permits and all other similar temporary permits required for prosecution of the work shall be obtained and paid for by Contractor. Fees for building plan review, water connections, sewer connections and similar fees shall also be paid by Contractor. [See also Articles E-10 and E-42]

(b) *Georgia State Plumbing Code.*-The latest edition of the Georgia State Plumbing Code with all amendments as of the date of the opening of bids shall govern the installation of all work and is adopted and incorporated into the contract documents and made a part thereof by reference, Provided, however: That the drawings and specifications shall be adhered to in all cases where they call for quality of materials, quality of workmanship, or quality of construction which is equal to or in excess of the quality required by the Georgia State Plumbing Code and Provided also: That there may be no variances from the drawings and specifications except to the extent that the said variances shall be necessary in order to comply with the Georgia State Plumbing Code. It shall be the responsibility of the Contractor to familiarize himself with the requirements of the Georgia State Plumbing Code. If there are any express requirements in the drawings or specifications which are at variance with the Georgia State Plumbing Code, all changes in the work necessary to eliminate the said requirements and make the work conform to the Georgia State Plumbing Code shall be adjusted as provided in the contract for changes in the work.

(c) *Georgia State Electrical Code.*-The latest edition of the Georgia State Electrical Code with all amendments as of the date of the opening of bids shall govern the installation of all work and is adopted and incorporated into the contract documents and made a part thereof by reference, Provided, however: That the drawings and specifications shall be adhered to in all cases where they call for quality of materials, quality of workmanship, or quality of construction which is equal to or in excess of the quality required by the Georgia State Electrical Code and Provided also: That there may be no variances from the drawings and specifications except to the extent that the said variances shall be necessary to comply with the Georgia State Electrical Code. It shall be the responsibility of the Contractor to familiarize himself with the requirements of the Georgia State Electrical Code. If there are any express requirements in the drawings or specifications which are at variance with the Georgia State Electrical Code, all changes in the work necessary to eliminate the said requirements and make the work conform to the Georgia State Electrical Code shall be adjusted as provided in the contract for changes in the work.

(d) *Call-Before-You-Dig Law.*-Pursuant to House Bill No. 1651, Contractor shall call the "Utilities Protection Center" at 1-800-282-7411 for assistance in locating gas lines and other underground utilities; and shall comply fully with the requirements of this law.

Article E-12. Protection of Work and Property.-

(a) *Duty to Protect Property.*-The Contractor shall continuously maintain adequate protection of all his work from damage [See also Article E-24] and shall protect all other property from damage, injury, or loss arising in connection with the work regardless of who may be the Owner of said property. He shall make good any such damage, injury, or loss except such as may be directly the result of errors in the contract documents or such as shall be caused directly by agents or employees of the Owner. [See also Article E-27]

(b) *Safety Precautions.*-The Contractor shall comply with the rules and regulations of OSHA for safety and prevention of accidents, and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work arising out of and in the course of employment on work under the contract. The Contractor alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliance, and methods, and for any damage which may result from their improper construction, maintenance, or operation. He shall erect and properly maintain at all times as required by the conditions and progress of the work proper safeguards for the protection of workmen and the public and shall post danger warnings against any hazards created by the construction operations. He shall designate a responsible member of his organization on the work whose duty shall be the prevention of accidents. In the absence of notice to the contrary, filed with the Architect in writing with copy to the Owner, this person shall be the superintendent of the Contractor. [See also Article E-14]

(c) *Emergencies.*-In an emergency affecting the safety of life or of the work or of adjoining property, the Contractor, without special instruction or authorization from the Architect or Owner, shall act, at his discretion, to prevent such threatened loss or injury. Any remuneration claimed by the Contractor on account of emergency work shall be determined in accordance with allowances permitted on force account under Case (c) of Article E-15 of the general conditions.

(d) *Blasting.*-In the absence of an express provision in the contract permitting blasting, there shall be no blasting. If blasting is permitted under the contract and under the Law which is applicable to the premises [including but not limited to "Georgia Blasting Standards Act of 1978" as amended], such blasting shall in all events be done in such manner as to prevent all scattering. (See also Article E-27)

(e) *Rain Water, Surface Water, and Back-up.*-The Contractor shall protect all work, including but not limited to excavations and trenches, from rain water, surface water, and back-up of drains and sewers. The Contractor shall furnish all labor, pumps, shoring, enclosures, and equipment necessary to protect and to keep the work free of water.

(f) *Underground Gas Pipe Law.*-The Contractor by signing the contract acknowledges that he is fully aware of the contents and requirements of Georgia Law 1969, Pages 50 and following, and any amendments and regulations pursuant thereto, (Acier – III)

(the preceding requirements being hereinafter referred to as the "underground gas pipe law"), and the Contractor shall comply therewith. The Contractor acknowledges that the Contractor is the "person" defined in the above-mentioned underground gas pipe law (a) who will engage in the activities which are regulated thereby, (b) who is required to examine maps filed pursuant thereto, (c) who is required to give written notice to gas companies with in accordance therewith, (d) who is required to receive written statements from gas companies as prescribed thereby, and (e) who is to perform and do certain things referred to therein only after observing the precautions with respect to underground gas pipes and facilities which are prescribed therein. These provisions of the contract do not repeal the restrictions under Subparagraph (d) of Article E-12 of the general conditions nor do they limit or reduce the duty of the Contractor otherwise owed to the Owner, to other parties, or to both. The Contractor agrees that the foregoing provisions supplement Articles E-12 and E-27 of the general conditions. The Contractor agrees and acknowledges that any failure on his part to adhere to the underground gas pipe law shall not only be a violation of law but shall also be a breach of contract and a specific violation of the provision under Article E-12 of the general conditions which pertains to safety precautions.

(g) *High Voltage Act.*-The Contractor by signing the contract acknowledges that he is fully aware of the contents and requirements of Act No. 525, Georgia Laws 1960, Pages 181 and following, any amendments thereto, and Rules and Regulations of the Commissioner of Labor pursuant thereto (the preceding requirements being hereinafter referred to as the "high voltage act"), and the Contractor shall comply therewith. The signing of the contract shall also confirm on behalf of the Contractor that he (1) has visited the premises pursuant to Article E-15 (g) of the general conditions and has taken into consideration the location of all electric power lines on and adjacent to all areas onto which the contract documents require or permit the Contractor either to work, to store materials, or to stage operations, and (2) that the Contractor has obtained from the Owner of the aforesaid electric power lines advice in writing as to the amount of voltage carried by the aforesaid lines. The Contractor agrees that he is the "person or persons responsible for the work to be done" as referred to in the high voltage act and that accordingly the Contractor is solely "responsible for the completion of the safety measures which are required by Section 3 of the high voltage act before proceeding with any work..." The Contractor agrees that prior to the completion of precautionary measures required by the high voltage act he will neither bring nor permit the bringing of any equipment onto the site (or onto any area or areas onto which the contract documents require or permit the Contractor to work, to store materials, or to stage operations) with which it is possible to come within eight feet of any high voltage line as defined in the high voltage act, and the Contractor assumes complete and sole responsibility for any accident or accidents which may occur as a result of contact with a high voltage line or lines pursuant to operations arising out of performance of the contract. The foregoing provisions apply to power lines located (a) on the site and (b) on any area or areas onto which the contract documents require or permit the Contractor either to work, to store materials, or to stage operations, or (c) within working distance for equipment or materials being used on (a) and (b) above. These provisions of the contract do not limit or reduce the duty of the Contractor otherwise owed to the Owner, to other parties, or to both. The Contractor agrees that the foregoing provisions supplement Articles E-12 and E-27 of the general conditions. The Contractor agrees and acknowledges that any failure on his part to adhere to the high voltage act shall not only be a violation of law but shall also be a breach of contract and a specific violation of the provision under Article E-12 of the general conditions which pertains to safety precautions. The Contractor is notified that the Rules and Regulations promulgated by the Commissioner of Labor under date of January 11, 1967, contain a statement under Section 12 that...

"The Division of Inspection of the Department of Labor will act in an advisory capacity to any person, firm, or corporation contemplating any operations near high voltage lines as defined in the Act..."

(h) *Building Construction Safeguards.*-The Contractor acknowledges and agrees that he is the person responsible under the law and that he is the person EMPLOYING or directing others to perform labor within the meaning of Georgia Laws 1967, p. 792, as amended; Ga. Code Ann. Sections 54-406 through 54-411. He acknowledges and agrees likewise that he will comply with the aforesaid law.

Article E-13. Inspection of Work.-

(a) *Access to Work.*-The Architect and his representatives shall at all times have access to the work wherever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and for inspection. [See also Article E-9]

(b) *Notice to Architect from Contractor Prior to Covering Work.*-If the specifications, the Architect's instructions (either in the specifications or issued later in writing), laws, ordinances or any public authority require any work to be specially tested or approved, the Contractor shall give the Architect timely notice in writing of its readiness for inspection, and if the inspection is by (Acier – III)

any authority other than the Architect, of the date fixed for such inspection. [See also Article E-58] Inspections by the Architect shall be made promptly and where practicable at the source of supply. If any work should be covered without approval or consent of the Architect, it must, if required by the Architect, be uncovered for examination at the Contractor's expense. [See also Article E-58]

(c) *Re-examination or Re-testing of Work Covered Pursuant to Consent of Architect.*-Re-examination or retesting of questioned work covered pursuant to consent of the Architect may be ordered by the Architect, and if so ordered the work must be uncovered by the Contractor. If such work be found in accordance with the contract documents the Owner shall pay the cost of re-examination and replacement or of re-testing. If such work be found not in accordance with the contract documents the Contractor shall pay such cost unless he shall show that the defect in the work was caused by another Contractor, and in that event the Owner shall pay such cost. Re-examination or re-testing under the terms of Article E-13(c) applies only to work which has been covered with consent of the Architect. Work covered without consent of the Architect must be uncovered for examination as provided under Article E-13(b).

(d) *Inspection Does Not Relieve Contractor.*-Under the contract documents the Contractor has assumed the responsibility of furnishing all services, labor, and materials for the entire work in accordance with such documents. No provisions of this article nor any inspection of the work by the Owner, representatives of the Owner, resident engineer inspector, clerk-of-the-works, engineers employed by the Architect, representatives of the Architect, or the Architect shall in any way diminish, relieve, or alter said responsibility and undertaking of the Contractor; nor shall the omission of any of the foregoing to discover or to bring to the attention of the Contractor the existence of any work or materials injured or done not in accordance with said contract documents in any way diminish, relieve, or alter such obligation of the Contractor nor shall the aforesaid omission diminish or alter the rights or remedies of the Owner as set forth in the contract documents. The resident engineer inspector has no power to make decisions, to accept or reject work, or to consent to the covering of work. The resident engineer inspector owes no duty to the Contractor. [See also Articles E-38, E-41, and E-60]

(e) *False Start.*-In the event notice of readiness pursuant to Article E-13(b), above, shall have been issued prematurely by the Contractor, his action shall be deemed to be a "false start", and the Contractor shall be liable for the damage resulting from the aforesaid false start, including but not limited to the salary, professional fees, and travel and living expense of the person or parties inconvenienced by the aforesaid false start. [See also Article E-41 for further example of "false start"]

Article E-14. Superintendence and Supervision by Contractor.-

(a) *Superintendent of Contractor.*-The Contractor shall keep on his work during its progress and until the final certificate has been executed by the Architect a competent superintendent and any necessary assistants, all satisfactory to the Architect. The superintendent shall not be changed except with the consent of the Architect unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in his employ. The superintendent shall represent the Contractor in his absence, and all directions given to the superintendent shall be as binding as if given to the Contractor. [See also Articles E-9, E-12, E-15(c), and E-60]

(b) *Supervision by Contractor.*-The Contractor shall give efficient supervision of the work, using his best skill and attention. He shall carefully study and compare all drawings, specifications, and instructions and shall at once report to the Architect any error, inconsistency, or omission which he may discover, but he shall not be held responsible for their existence or discovery.

[See also Articles E-3, and E-40]

Article E-15. Changes in the Work.-

(a) *Owner's Right to Make Changes.*-The Owner without invalidating the contract may authorize or order extra work or may authorize or order changes by altering, adding to, or deducting from the work, the contract sum being adjusted accordingly. The

Contractor hereby expressly agrees that the Contractor shall have no right to a claim for damages or extended overhead because of changes made by the Owner. Such work is hereinafter designated "change" or "changes". All such changes shall be performed under the conditions of the original contract except that any claim for extension of time caused thereby shall be adjusted at the time of signing of the change order form. [See Article E-1 for definition of the change order form]

(b) *Cost to Owner for Changes.*-The cost to the Owner of any change shall be determined in one or more of the following ways:

CASE(a) By estimate and acceptance into a lump sum.

CASE(b) By unit prices named in the contract or subsequently agreed upon. Unit prices are net including overhead and profit. Neither establishment of unit prices in the contract nor later agreement to unit prices shall entitle the Contractor to execute any change under Case(b) prior to issuance of an authorization or order of the Owner in writing.

CASE(c) By force account, which is defined as expenditures allowed under Article E-15(h) plus a percentage or percentages as stated under Article E-15(h).

(c) *Changes Forbidden without Consent of Owner.*-Neither the Architect nor the Contractor shall make any change whatsoever in the work without authorization or order of the Owner in writing except in emergency as described hereinbelow. The making of any change without authorization or order of the Owner in writing is a breach of contract except in emergency as referred to under Article E-12. In the absence of authorization or order of the Owner given in advance in writing (except in emergency as referred to under Article E-12) the Contractor shall have no claim for payment, repayment, reimbursement, remittance, remuneration, compensation, profit, cost, overhead, expense, loss, expenditure, allowance, charge, demand, hire, wages, salary, tax, cash, assessment, price, money, bill, statement, dues, recovery, restitution, benefit, recoupment, exaction, injury, damages, or time based upon or resulting from any change. [See also Articles E-53 and E-60]

(d) *Notice of Demand of Contractor for Extraordinary Remuneration or for Damages.*-For a change in the work the Contractor shall be entitled to no claim other than or in excess of allowances permitted under Article E-15(h) unless prior to commencement of execution of the change (a) the Contractor shall have notified the Owner in writing of the nature of the claim and (b) the Owner shall have agreed in writing to the claim. Commencement of execution of a change authorized by the Owner in the absence of the aforesaid written notice from the Contractor and written agreement to the claim by the Owner shall be deemed to be and is conclusive proof that the Contractor acknowledges that he makes no claim other than or in excess of allowances permitted under Article E-15(h).

(e) *Subsurface Conditions.*-Material below the surface of the earth is assumed to be earth and other material that can be removed by power shovel or similar equipment. Should conditions encountered below the surface of the ground be at variance to conditions indicated by drawings or specifications [See also Article E-15(g)], the Contract sum shall be adjusted as provided in the contract for changes in the work upon claim by either party made in writing within a reasonable time after the first observance of the conditions, PROVIDED: The Contractor shall in any event give written notice to the Owner before proceeding to execute any change resulting from subsurface conditions and, PROVIDED FURTHER: That, except as referred to hereinbelow the Owner shall not be liable to the Contractor for any claim (OCCASIONED by the aforesaid subsurface conditions) other than or in excess of the allowances permitted under Article E-15, and PROVIDED FURTHER: That the Owner shall not be liable to the Contractor for any claim occasioned by the aforesaid subsurface conditions except in accordance with and pursuant to authorization of the Owner issued in writing prior to commencement of execution of the aforesaid change to which authorization the Contractor shall have taken no exception. If exception to the authorization be taken by the Contractor the Owner may issue an order pursuant to Article E-15(i). Commencement of execution of work pursuant to Article E-15(i) shall not exclude the recovery of damages by the Contractor under other articles of the general conditions, but the cost to the Owner for the changes executed pursuant to the aforesaid order shall not exceed the "net allowable expenditures" permitted to the Contractor under Article E-15(h) plus the "allowances for overhead and profit" permitted under Article E-15(h).

(f) *Rock.*-If rock, as hereinafter defined, is encountered, no claim for additional compensation for changes shall lie against the Owner in the absence of previous authorization by the Owner in writing, and the cost to the Owner for any changes shall be determined as provided in the contract for changes. CAUTION: No rock for which extra compensation is expected to be received shall be removed except pursuant to and in conformity with a written authorization or order of the Owner. Unless otherwise

provided no removal of rock as defined herein shall be included in the base bid. Shale, rotten stone, or stratified rock that can be loosened with a pick or removed by power shovel or similar equipment shall not be classified as rock. Rock is defined as follows:

- (1) *Mass rock* is defined as any material which cannot be excavated with a single-tooth hydraulic ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (Caterpillar D 8K or equivalent) and occupying an original volume of at least one cubic yard.
- (2) *Rippable rock* is defined as any material which cannot be excavated with a single engine pan (Caterpillar 621 or equivalent) which is pushed by a crawler tractor (Caterpillar D 8K or equivalent) and occupying an original volume of at least one cubic yard.
- (3) *Trench rock* is defined as any material that must be removed from a trench which cannot be excavated with a backhoe having a bucket curling factor rated at not less than 18,300 pounds (Caterpillar Model 215 or equivalent) and occupying an original volume of at least one-half cubic yard.

(g) *Existing Conditions.*-The Contractor in undertaking the work under this contract is assumed to have visited the premises and to have taken into consideration all conditions which might affect this work. No consideration will be given any claim based on lack of knowledge of existing conditions except where existing conditions are such as cannot be readily ascertained. Any claims relating to conditions which were not readily ascertainable shall be adjusted as provided in the contract for changes in the work.

(h) *Cost to Owner, Allowances for Contractor, and Allowable Expenditures.*-In Cases (a) and (c), the "allowance for overhead and profit" combined, included in the total cost to the Owner, shall be based upon the following schedule:

- (1) For the Contractor an allowance for work which he performs with his own forces, not to exceed 20% of his "net additional allowable expenditures", if any, for changes.
- (2) For a subcontractor an allowance for work which he performs with his own forces, not to exceed 20% of his "net additional allowable expenditures", if any, for changes. A subcontractor shall receive no allowance for overhead and profit on work not performed by his own forces. Under this contract, the forces of a subcontractor of a subcontractor are deemed to be and are the forces of the subcontractor. [See also Articles E-36 and E-37]
- (3) For the Contractor an allowance for work performed by his subcontractor, not to exceed 7½% of the amount, if any, due the subcontractor for changes.

The above percentages shall be applied to the "net additional allowable expenditures", if any, as limited and defined herein. If the net difference between "allowable expenditures" and savings results in a decrease in expenditures, the amount of credit allowed the Owner shall be the net decrease without any credit for profit and overhead. "Net additional allowable expenditures" as used herein shall mean the difference between all "allowable expenditures" and savings. The term "allowable expenditures" is limited to and defined as items of labor or materials, the use of heavy construction equipment [such as scrapers, backhoes, excavators, bulldozers, draglines, motor graders, and like equipment], and all such items of cost as public liability and workmen's compensation insurance, social security and old age and unemployment insurance, and (in cases where there is an extension of time) *pro rata* expenditures for time of foremen employed in the direct superintendence of productive labor in execution of changes. All expenditures not included in the term "allowable expenditures" as limited and defined in this article shall be considered as overhead, including, but not limited to, insurance other than that which is mentioned in this article, bond premiums, supervision, travel (meals, transportation, and lodging), superintendence, [except *pro rata* time of foremen as referred to herein], timekeepers, clerks, watchmen, hand tools, small tools, incidental job burdens, engineering, drafting, and office expense. Any other provisions in the contract documents to the contrary notwithstanding, only demonstrable, direct, out-of-pocket expenditures for the changes plus percentages as set forth hereinabove shall be allowable to the Contractor for changes. No wages of a foreman shall be allowable for a change carried on concurrently with contract work unless the claim includes a demand for extension of time caused by the authorizing or ordering of the change.

(i) *Execution of Changes Pursuant to Order.*-In the event neither Case (a), Case (b), nor Case (c) can be mutually agreed upon as the method of determining the cost to the Owner for a change, the Contractor, provided he receives a written order from the Owner, shall proceed on force account under Case (c), and he shall keep and present in such form as the Architect may direct a correct account of the expenditures together with vouchers. Allowable expenditures shall in no event exceed current costs for like services and materials, the burden of proof being on the Contractor.

(j) *Stipulated Maximum Sum.*-Under Case (b) and Case (c), the Owner shall prescribe the limits of any authorization or order for a change by means of an authorization or order in writing stipulating the maximum sum of money committed toward execution of the said change, and the Contractor shall have no authority to perform any change which will cost the Owner in excess of the stipulated maximum sum. It shall be solely the Contractor's responsibility to apply in writing to the Owner and to the Architect for an enlargement of the scope of the authorization or order by an increase in the said stipulated maximum sum if during the course of the performance of a change on force account under Case (c) the additional cost of the change to the Owner as established in accordance with allowable expenditures and allowances for profit and overhead permitted under Article E-15(h) is approaching the said stipulated maximum sum, and it shall likewise be the responsibility of the Contractor to apply for an enlargement of the scope of the authorization or order if the total value of units at any agreed unit price under Case (b) is approaching the said stipulated maximum sum. For changes in the work no claim for payment, repayment, reimbursement, remittance, remuneration, compensation, profit, cost, overhead, expense, loss, expenditure, allowance, charge, demand, hire, wages, salary, tax, cash, assessment, price, money, bill, statement, dues, recovery, restitution, benefit, recoupment, exaction, injury or damages shall lie against the Owner for any amount in excess of such amount as shall have been mutually agreed to under Case (a) or in excess of such amount as shall have been established as the stipulated maximum sum under Case (b) or Case (c). The cost to the Owner for any change in the work, except a change based upon agreed unit prices under Case (b), shall be established in accordance with the schedule of allowances and percentages stipulated under Article E-15(h).

(k) *Breakdown of Expenditures, Cases (a) and (c).*-To accompany all change orders, the Contractor shall furnish a breakdown of expenditures for labor and materials by units and quantities in the form prescribed by the Owner, and the breakdown shall be accompanied by the following declaration: "I do solemnly swear, under criminal penalty of a felony for false statement subject to punishment by not less than one year nor more than twenty years of penal servitude, that the costs shown hereinabove do not exceed current costs for like services or materials and that the quantities shown do not exceed actual requirements. "For all force account changes the Contractor shall promptly and in no event later than thirty (30) days after receipt of written demand therefor pursuant to Article E-15(h) submit to the Architect a complete, accurate, and final breakdown and account, together with vouchers, showing all expenditures and percentages allowable under Case (c). For all unit price changes the Contractor shall promptly and in no event later than thirty (30) days after receipt of written demand therefor pursuant to Article E-15(h) submit to the Architect an accurate account of the quantity of work performed under Case (b). In any case, the Architect shall certify to the amount [including under Case (a) and Case (c) the allowance prescribed in the contract for overhead and profit] due the Contractor. [See also Article E-1(l) and E-50] The Contractor shall obtain and furnish as back-up to the Contractor's breakdown a separate breakdown for each subcontractor's charges prepared by each subcontractor on the letterhead of the subcontractor and properly signed by the subcontractor.

(l) *Payment on Account.*-If the Contractor desires to obtain payment on account before any change in the work has been completed, a change order certified by the Architect and signed by the Contractor and the Owner must have been executed for so much of the change as has been completed at the time of the filing of the request for payment on account.

(m) *Form and Execution of Change Orders.*-Change orders shall be certified by the Architect and signed by the Contractor and the Owner in accordance with the form of change order prescribed by the Owner, copies of which shall be furnished to any bidder upon request. No request for payment of the Contractor for account of a change shall be due nor shall any such request appear on a periodical estimate or demand for final payment until (1) the claim shall have been certified by the Architect and (2) a change order shall have been executed by the Contractor and the Owner. [See also Article E-1(l)]

(n) *Time of Submission of Claims ["Statement of Claim"].*-Budgeting and cash flow being of material importance to the Owner, no claim of the Contractor on account of any change or on account of any alleged negligence of the Architect or Owner whether said claim shall be accrued or prospective, shall be valid unless a "statement of claim" in full accompanied by vouchers and other supporting data shall have been filed with the Owner by the Contractor not later than thirty (30) days after receipt of written request therefor by the Contractor from the Owner, time being of the essence. The "statement of claim" shall contain a concise and clear recital of the ground or grounds on the basis of which the claim is asserted, including a designation of the provision or provisions of the contract documents on which the claim is based. The statement of claim shall indicate the dollar amount of the claim.

(o) *Claims Distinguished.*-Claims for damage arising out of alleged negligence of the Architect or Owner as provided for under Article E-16 are distinguished from claims for allowances for changes as provided for under Article E-15. Claims for damages must be filed entirely separately pursuant to Article E-16, and claims for allowances for changes must be filed entirely separately pursuant to Article E-15 unless the Contractor and Owner agree in writing otherwise. [See also Article E-39(c)]

(p) *Conditions Different from Those Indicated in Contract Documents.*-The parties contemplate delays necessary to complete tests, to redesign, and to perform change order work in the event conditions encountered at the site are different from those indicated in the contract documents or to perform change order work to correct errors in the plans and specifications. Execution of any change must be authorized. In such event there shall be an adjustment in the contract sum as provided in the contract for changes in the work, but no claim for damages shall lie against the Owner for the aforesaid delays. Such delays are not a breach of contract because the parties contemplate such delays as a natural and probable consequence of construction operations. The parties agree that such delays constitute no wrong or injury, create no right to a claim for damages, and are not a ground for claiming extraordinary remuneration.

(q) *Rental Rates and Wage Rates.*-Within five (5) days after execution of the form of agreement and in any event prior to the commencement of any work on the site the Contractor shall submit in accordance with the style and format of a specimen to be furnished by the Owner for consideration of the Owner (1) a proposal for rental rates on heavy construction equipment which shall apply in the event work is performed under Case (c) of Article E-15 and (2) a proposal for wage rates of operating engineers which shall apply in the event of the execution of any work under Case (c) of Article E-15. Under penalty of false swearing a principal of the contracting firm shall certify that the proposal for rental rates and proposal for wage rates do not exceed current costs for like services. The Owner will in no event consider a rental rate in excess of 80% of the rate set forth in the latest edition of the "Compilation of Nationally Averaged Rental Rates for Construction Equipment" of the Associated Equipment Distributors unless the rates proposed in excess of 80% are supported by proof satisfactory to the Owner that the excess rates are reasonable, the decision of the Owner to be final, binding, and conclusive on all parties. Rental rates shall be payable only for the actual time the equipment is required on the site in the reasonable opinion of the Architect whose decision in this respect shall be final, binding, and conclusive on all parties.

(r) *Unit Prices.*-The term "net" as used in reference to "unit prices" means in respect to all change orders performed in accordance with Case (b) of Article E-15 of the general conditions that the unit prices offered by the Contractor and accepted by the Owner shall be inclusive of all sums for payment, repayment, reimbursement, remittance, remuneration, compensation, profit, cost, overhead, expense, loss, expenditure, allowance, charge, demand, hire, wages, salary, tax, cash, assessment, price, money, bill, statement, dues, recovery, restitution, benefit, recoupment, exaction, or injury. Upon request of the Owner in writing and within such reasonable space of time as the Owner shall designate in writing the Contractor shall submit for consideration of the Owner proposals in writing for unit prices to be applied in the event work is authorized by the Owner to be performed under Case (b) of Article E-15. Under penalty of false swearing a principal of the contracting firm shall certify that the unit prices submitted do not exceed current costs for like services or materials.

Article E-16. Claims.-

(a) *Extra cost.*-If the Contractor maintains that any instructions by drawings or otherwise involve extra cost to the Owner under this contract, he shall give the Owner and the Architect written notice thereof within a reasonable time after the receipt of such instructions, and in any event before proceeding to execute any change except in emergency endangering life or property. The allowances to the Contractor shall then be as provided under Article E-15. No claim for extra cost shall be valid unless so made.

(b) *Protest.*-All references to arbitration are deleted from the contract documents. Decisions of the Architect shall be rendered in all cases as provided for under the general conditions of the contract, but no decisions of the Architect shall deprive the Owner or the Contractor of any form of redress which may be available under the laws of the State of Georgia to contracting parties. Any decision of the Architect shall be final and binding on the Contractor in the absence of written notice of protest from the Contractor received by the Owner by registered mail within twelve days of the date of the decision of the Architect. [See also Articles E-3 and E-39]. The Owner shall have twelve days from the date of receipt of a protest within which to investigate and make reply. There is no provision under the contract for execution of work "under protest". A protest must contain (1) the date of the decision of the Architect to which exception is taken, (2) a statement of the issues, (3) a citation of the provision or provisions of the contract documents which govern the issue or issues, (4) a summary of the logical principle or principles on which the protest is based, and (5) a summary of the legal grounds for taking exception.

(c) *Shall be Based on the Legal Assertions of the Contractor.*-The Contractor shall assert claims solely on the basis of (a) principles of logic and (b) principles of law to which the Contractor, himself, prescribes. He shall not protest a decision or request a conference on the ground merely that a subcontractor, materialman, or supplier has protested to the general Contractor. Accordingly, the Contractor shall file no claim nor shall he make a request for a conference with the Owner regarding a claim except as it shall be for the purpose of asserting in the exercise of the Contractor's best judgement such views, requests, and legal

propositions as he deems the Contractor is entitled to maintain independently of any right of any subcontractor, materialman, or supplier against the general Contractor. [See also Article E-36]

(d) *Conference with the Owner.*-

(1) *Effect of.*-The Owner has no legal obligations to confer orally with the Contractor about the terms of the contract or its performance and may insist that all transactions and all intercourse shall be in writing. Agreement of the Owner to confer with a Contractor shall not be construed as an offer of the Owner to reconsider or alter the Owner's policies, practices, procedures, or prior position, nor shall such agreement constitute a waiver of any right or defense of the Owner. Such a conference is without prejudice to any rights or defense of the Owner. After the conference there will be nothing to confirm since the Owner does not engage itself to do or not to do a thing by agreeing to confer with the Contractor. It is expressly agreed that no conference between the Contractor and the Owner shall cure any failure of the Contractor to give any notice nor shall it cure any breach of any time limit or revive any right in the contract.

(2) *Conditions precedent to.*-A proposal from the Contractor for a conference in respect to (a) a dispute, (b) a controversy, or (c) an interpretation or construction of any provision of the contract documents shall contain (a) a statement of the issue or issues, (b) a citation of the provisions of the contract documents which govern the issue or issues, (c) a precise summary of the logical principle or principles on which the issue or issues are based, and (d) a summary of the legal grounds which the Contractor takes with respect to the issue or issues.

(3) *Basis for and Terms of.*-All conferences between the Owner and the Contractor shall be pursuant to, under the terms of, and in accordance with this article of the general conditions.

Article E-17. Deductions for Uncorrected Work.-If the Architect and Owner deem it inexpedient to correct work injured or done not in accordance with the contract, an equitable deduction from the contract price shall be made therefor; but there is no duty on the part of the Owner to accept any work injured or done not in accordance with the methods and materials designated in the contract documents, nor does the Contractor have the right to demand that there shall be acceptance or work injured or done not in accordance with the methods and materials designated in the contract documents.

Article E-18. Delays and Extensions of Time.-

(a) *Grounds.*-If the Contractor be delayed at any time in the progress of the work by any act or neglect of the Owner or the Architect, or of any employee of either, or by any separate Contractor employed by the Owner, or by changes ordered in the work, or by strikes, lockouts, pickets, inclement weather, unforeseeable subsurface conditions, fire, unusual delay in transportation, unavoidable casualties, or any causes beyond the Contractor's control, or by any cause which the Architect shall decide to justify the delay, then the time of completion shall be extended for such reasonable time as the Architect may decide. The Contractor expressly agrees that the Contractor's sole remedy for such delay shall be an extension of contract time and that the Contractor shall make no demand for damages or extended overhead.

(b) *Filing of Claim.*-No such extension shall be made for delay occurring more than ten (10) days before claim therefor is made in writing to the Architect with copy to the Owner. In the case of a continuing cause of delay, only one claim is necessary, but no claim for a continuing delay shall be valid unless the Contractor, within ten days from the cessation of the delay, shall have given notice in writing to the Architect, with copy to the Owner, as to the amount of additional time claimed.

(c) *Delay in Furnishing Drawings.*-[See also Article E-5] If no schedule or agreement stating the dates upon which drawings or approval of shop drawings shall be furnished is made, then no claim for delay shall be allowed on account of failure of the Architect to furnish drawings or approval of shop drawings until two weeks after demand therefor and not then unless such claim be reasonable.

(d) *No Damages for Delay.*-In the event of any delay, not the fault of the Contractor, the Contractor shall be entitled to an extension of time for completion only, and not shall be entitled to any additional payment on account of such delay. Without limiting the foregoing, except as otherwise specifically provided under Article E-15 or E-22, the Contractor shall not be entitled to payment or compensation of any kind from the Owner for direct, indirect or impact damages, including but not limited to costs of acceleration arising because of hindrance or delay from any cause whatsoever, whether such hindrances or delays be reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable; provided, however, that this provision

shall not preclude recovery by the Contractor of damages for hindrances or delays due solely to fraud or bad faith on the part of the Owner or his agents.

Article E-19. Correction of Work before Final Payment.-

(a) *Orders of Condemnation.*-The Contractor shall remove from the premises within the space of time designated in orders of condemnation all work condemned by the Architect as failing to conform to the contract, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute the work in accordance with the contract and without expense to the Owner and shall bear the expense of making good all work of other Contractors destroyed by such removal or replacement. The Contractor shall supply any omitted work and perform all unexecuted work within the space of time fixed by the Architect in orders of condemnation. [See also Article E-1(i)]

(b) *Remedy of the Owner for Breach of Order of Condemnation.*-If the Contractor does not make a good deficiency within the reasonable space of time fixed in an order of condemnation, the Owner may—

- (1) Remove the condemned work and store it at the expense of the Contractor. If the Contractor does not pay the expenses of such removal and storing within ten days after receipt of written demand of the Owner, the Owner may upon three days' notice in writing to the Contractor sell such materials at private sale or at auction and shall account for the net proceeds thereof after deducting all proper costs incurred by the Owner, and
- (2) Supply omitted work, perform unexecuted work, replace and re-execute work not done in accordance with the methods and materials designated in the contract documents and deduct the cost thereof from any payment then or thereafter due the contractor, Provided: That the Architect shall approve the amount charged to the Contractor. [See also Article E-21]

The remedies stated in this article are in addition to the remedies otherwise available to the Owner, do not exclude such other remedies, and are without prejudice to any other remedies. Time limits stated in orders of condemnation are of the essence of the contract. Unless otherwise agreed to by the Owner in writing, the making good of condemned work shall physically commence at the site in not more than seven days after receipt of the order of condemnation except that in case of emergency correction shall physically commence at the site at once and except that the Contractor shall in any event physically commence the correction at the site early enough to complete within the space of time allowed in the order of condemnation. The Owner will give prompt consideration to reasonable requests for delay in commencement of making good on orders of condemnation. The making good of condemned work shall be completed within the space of time allowed in the order of condemnation unless the Contractor shall have requested from the Architect an increase in the amount of time allowed and the Architect shall have given notice to the Contractor in writing, with copy to the Owner, stating the additional amount of time, if any, allowed.

(c) *Notice of Correction from Contractor.*-The Contractor shall give prompt notice in writing to the Architect, with copy to the Owner, upon completion of the correction of any work, the supplying of any omission of any work or materials to the performance of any unexecuted work condemned by the Architect. [See also Article E-1] In the absence of such notice, it shall be and is presumed under this contract that there has been no correction, supplying remedy, or performance of unexecuted work.

Article E-20. Correction of Work After Final Payment.-Neither (1) the final certificate, (2) nor any decision of the Architect, (3) nor payment, (4) nor any provision in the contract shall relieve the Contractor of responsibility for faulty materials, faulty workmanship, or omission of contract work, and he shall remedy any defects or supply any omissions resulting there from and pay for any damage to other work resulting therefrom. The Owner shall give notice of observed defects or omissions with reasonable promptness. The Contractor shall within the space of time designated in orders of condemnation and without expense to the Owner correct, remedy, replace re-execute, supply omitted work or remove from the premises all work condemned by the Architect. The Contractor shall give prompt notice in writing to the Architect, with copy to the owner, upon completion of the supplying of any omitted work or the correction of any work condemned by the Architect. In the absence of said notice, it shall be and is presumed under this contract that there has been no correction of the condemned work or supplying of omitted work. If the Contractor does not remove, make good the deficiency, correct, or remedy faulty work, or supply any omitted work within the space of time designated in orders of condemnation without expense to the Owner, the Owner, after ten days' notice in writing to the Contractor, may remove the work, correct the work, remedy the work or supply omitted work at the expense of the Contractor. In case of emergency involving health, safety of property. or safety of life the Owner may proceed at once. Correction of defective work executed under the plans and specifications or supplying of omitted work whether or not covered by warranty of a subcontractor or materialman, remains the primary, direct responsibility of the Contractor. The foregoing obligation of the Contractor shall remain in effect until the same shall have been extinguished by the operation of the statute of limitations. As additional security for the fulfillment of such obligation, but in no way limiting the same, the Contractor warrants and guarantees (1) that all work executed under the plans and specifications shall be free from defects of materials and workmanship

for a period of one year from the date of final certificate of the Architect, and (2) that for not less than one year from the date of the final certificate of the Architect, or for such greater space of time as may have been designated in the specifications, products of manufacturers shall be free from defects of materials or workmanship. Whenever written guaranties or warranties are called for, the Contractor shall furnish the aforesaid for such period of time as may be stipulated. The aforesaid instruments shall be in such form as to permit direct enforcement by the Owner against any subcontractor, materialman, or manufacturer whose guaranty or warranty is called for, and the Contractor agrees that...

(a) The Contractor is jointly and severally liable with such subcontractors, materialmen, or manufacturers.

(b) The said subcontractors, materialmen, or manufacturers are agents of the Contractor for purposes of performance under this article, and the Contractor, as principal, ratifies the warranties or guaranties of his aforesaid agents by the filing of the aforesaid instruments with the Owner. The Contractor as principal is liable for the acts or omissions of his agents.

(c) Service of notice on the Contractor that there has been a breach of any warranty or guaranty will be sufficient to invoke the terms of the instrument, Provided: That the Owner shall have furnished the Contractor with a copy of notice served on the subcontractor, materialmen, or manufacturer.

(d) The Contractor will bind his subcontractors, materialmen, and manufacturers to the terms of this article.

The calling for or the furnishing of written warranties shall in no way limit the contractual obligation of the Contractor as set forth hereinabove. The remedies stated in this article are in addition to the remedies otherwise available to the Owner, do not exclude such other remedies, and are without prejudice to any other remedies. [See also Articles E-1(i), E-25 and E-60]

Article E-21. The Owner's Right to Do Work.-If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this contract, the Owner, after three days' written notice to the Contractor may without prejudice to any other remedy he may have make, good the deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor, Provided: However, that the Architect shall approve the amount charged to the Contractor. [See also Articles E-19(b)(2) and E-22]

Article E-22. Right of the Owner to Terminate Contract.-In the event that any of the provisions of this contract are violated by the Contractor or by any of his subcontractors, the Owner may serve written notice upon the Contractor and the surety of the Owner's intention to terminate the contract, such notices to contain the reasons for such intention to terminate the contract, and unless within ten (10) days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement of correction be made, the contract shall, upon the expiration of said ten (10) days, cease and terminate. In the event of any such termination the Owner shall immediately serve notice thereof upon the surety and the Contractor and the surety shall have the right to take over and perform the contract; Provided, however, that if the surety does not commence performance thereof within ten (10) days of the mailing to such surety of notice of termination, the Owner may take over the work and prosecute the same to completion by contract or by force account for the account and at the expense of the Contractor and the Contractor and his surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may take possession of and utilize in completing the work such materials, appliances, and plant as may be on the site of the work and necessary therefor. [See Article E-15 for description of "force account"] [See also Article E-26]

Article E-23. Contractor's Right to Stop Work or Terminate Contract.-If the work should be stopped under an order of any court or other public authority for a period of ninety (90) days through no act or fault of the Contractor or by anyone employed by him, or if the Architect should fail to issue any certificate for payment within fourteen days after it is due, or if the Owner should fail to pay to the Contractor within fourteen days of its maturity and presentation any sum certified by the Architect, then the Contractor may, upon seven days' written notice to the Owner and the Architect, stop work or terminate this contract and recover from the Owner payment for all work executed and any loss sustained upon any plant or material and reasonable profit and damages.

Article E-24. Application for Payments.-

(a) *Periodical Estimates and Receipts.*-The Contractor shall submit to the Architect in accordance with a form to be supplied by the Owner an application [sometimes herein designated "periodical estimate"] for each payment, and, if requested by the Owner or Architect, receipts or other vouchers, showing his payments for materials and labor, including payments to subcontractors as required by Article E-37. [See also articles E-32 and E-50]

(b) *Initial Breakdown and Periodical Payments.*-If payments are made on valuation of work done, such application shall be submitted at least fifteen days before each payment falls due, and the Contractor shall, before the first application, submit to the Architect a schedule of values of the various parts of the work, including quantities, aggregating to the total sum of the contract, divided in such manner as to facilitate payments to subcontractors in accordance with Article E-37, on a form (Form 37 as attached to these General Conditions) with a complete breakdown of the contract price so arranged and so itemized as to meet the approval of the Architect and, if requested, supported by such evidence as to its correctness as the Architect may direct. The schedule, designated herein the "initial breakdown" [specimen of which will be supplied to any bidder], when approved by the Architect shall be used as the basis for certificates of payment, unless it be found to be in error. In applying for payments, the Contractor shall submit a statement based upon this schedule on a periodical estimate form to be supplied by the Owner [specimen of which will be supplied to any bidder], and, if requested by the Architect or Owner, itemized in such form and supported by such evidence as the Architect or Owner may direct showing the Contractor's right to the payment claimed on the periodical estimate.

(c) *Materials Stored.*-If payments are made on account of materials delivered and suitably stored at the site but not incorporated in the work, they shall, if required by the Owner or the Architect, be conditional upon submission by the Contractor of bills of sales or such other procedure as will establish the Owner's title to such material or otherwise adequately protect the Owner's interest. [See also Articles E-28 and E-32] The Contractor is responsible for the existence, protection, and, if necessary, replacement of materials until execution of the final certificate of the Architect. [See also Articles E-12, E-25 and E-41] The Owner shall not pay for any material stored off site.

Article E-25. Certificates of Payment.-

(a) *Issuance.*— If the Contractor has made application for payment as provided under Article E-24, the Architect shall not later than the date when each payment falls due issue to the Contractor a certificate for each amount as he decides to be properly due or state in writing his reasons for withholding a certificate.

(b) *Effect.*-No certificate issued nor payment made to the Contractor nor partial of entire use or occupancy of the work by the Owner shall be an acceptance of any work or materials not in accordance with the contract documents. [See also Article E-20]. The making of the final payment shall constitute a waiver of all claims by the Owner other than those arising from unsettled liens, from faulty work appearing after final payment, or from requirements of the specifications or drawings. Acceptance of final payment shall operate as and shall be a release to the Owner from all claims of any kind or character under the contract except for such specific amount or amounts as may have been withheld to cover the fair value of any incomplete work which has been certified by the Architect under the provision of paragraph (d) of Article 5 of the form of agreement as incomplete through no fault on the part of the Contractor.

(c) *Date and Rate of Payment.*-Progress payments will be made by the Owner to the Contractor in accordance with article 4 of the Form of Agreement. Final payment will be made in accordance with Article 5 of the Form of Agreement. The date and rate of payment are subject to Article E-26. Sums retained pursuant to the present article are and remain the property of the Owner until such time as the Contractor shall have become entitled to receive payment of such retainage by (a) furnishing the remainder of the *quid pro quo* under the contract and (b) complying in full with the terms of the contract.

(d) *Interest.*-Should the Owner fail to pay the sum named in any certificate of the Architect upon demand when due, the Contractor shall receive, in addition to the sum named in the certificate, interest thereon at the legal rate in force at the place of building, PROVIDED: That the Contractor shall have given the Owner written notice of the date on which payment was properly due, and no interest shall be payable if the Owner makes payment within three days after receipt of the aforesaid notice from the Contractor. [See also Articles E-24, E-26 and E-46]

Article E-26. Payments Withheld.-The Architect may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any certificate to such extent as may be necessary to protect the Owner from loss on account of:

- (a) Defective work not remedied [See also Article E-19].
- (b) Claims filed or reasonable evidence indicating probable filing of claims.
- (c) Failure of the Contractor to make payments properly to subcontractors of for materials or labor. [See also articles E-9 and E-37]
- (d) A reasonable doubt that the contract can be completed for the balance then unpaid.
- (e) Damage to another Contractor or to some third party. [See also Article E-12]

- (f) Failure to maintain a rate of progress in accordance with the construction progress schedule. [See also Articles E-1(i), E-25(c), and E-46]
- (g) Failure to supply enough skilled workmen or proper materials. [See also Articles E-1 and E-19]

When the above grounds are removed, payment shall be made for amounts withheld because of them. At the option of the Owner adherence to the construction progress schedule shall be a condition precedent to the right of the contractor to demand payment of a periodical estimate. No omission on the part of the Owner to exercise the aforesaid option shall be construed to be a waiver of breach of the construction progress schedule or acquiescence therein, and the Owner may exercise its option from time to time as often as may be expedient.

Article E-27. Insurance and Hazards.-

(a) *Hazards.*—The Contractor shall be responsible from the time of his signing the form of agreement or from the time of the beginning of the first work, whichever shall be earlier, for all injury or damage of any kind resulting from the work to persons or property regardless of who may be the Owner of the property. [See also Article E-12] in addition to the liability imposed upon the Contractor on account of bodily injury (including death) or property damage suffered through the Contractor's negligence, which liability is not impaired or otherwise affected hereby, the Contractor assumes the obligation to save the Owner and the Architect harmless and to indemnify and defend same from every claim arising out of or through injury (including death) to any person or persons or damage to property (regardless of who may be the Owner of the property) arising out of or suffered through any act of omission of the Contractor or any subcontractor, or anyone either

- 1. directly or indirectly employed by or
- 2. under the supervision of any of them in the prosecution of the work included in this contract.

(b) *Insurance.*—Insurance shall be written on a per occurrence basis as opposed to a claim made basis. Proof of insurance coverage and furnishing of insurance policies shall be as shown hereinbelow.

(1) *Compliance with Workmen's Compensation Laws.*—The Contractor agrees to comply with the provisions of the workmen's compensation laws of the State of Georgia and to require all subcontractors likewise to comply. The Contractor agrees that, prior to beginning any work by the Contractor the Contractor will furnish the following to the Owner: Certificate from the insurance company showing issuance of workmen's compensation coverage for the State of Georgia or a certificate from Georgia Workmen's Compensation Board showing proof of ability to pay compensation directly. The Contractor agrees that the foregoing provisions respecting workmen's compensation is also applicable to subcontractors, except that subcontractors shall not be required to submit a certificate of insurance to the Owner. The general Contractor shall submit a certificate on the letterhead of the Contractor to the Owner in the following language:

This is to certify that all subcontractors performing work on this project are covered by their own worker's compensation insurance or are covered by the general Contractor's worker's compensation insurance.

(2) *Indorsement on Builder's Risk Policy.*—There shall be attached to and made a part of the insurance policy for BUILDER'S RISK an indorsement of the insurance company in accordance with the specimen set forth in Exhibit A.

(3) *Indorsement of Casualty Policies.*—There shall be attached to and made a part of every CASUALTY INSURANCE POLICY an indorsement of the insurance company in accordance with the specimen set forth in Exhibit B.

(4) *Ratification of Agent's Indorsement.*—In furnishing the insurance policy or in furnishing proof of coverage, as the case may be, the casualty insurance carrier shall upon request submit evidence satisfactory to the Owner that the agent of the carrier who executed an indorsement had the authority to make changes in the terms of the insurance policy which are binding on the insurance company.

(5) *Policies, Certificates, Limits and Disposition of Documents.*—The Contractor shall obtain at his expense insurance with limits as shown hereinbelow unless the Contractor desires to broaden the limits and obtain more protection.

[1] OWNER'S PROTECTIVE LIABILITY INSURANCE- Taken out in the name of the Owner as insured. [See Invitation to Bid for exact legal name of Owner.]

Bodily injury, including death and property damage as combined single limits in the amount of \$1,000,000.00.

DISPOSITION: ORIGINAL POLICY must be deposited with Owner prior to commencement of work.

- [2] CONTRACTOR'S PROTECTIVE LIABILITY INSURANCE—Taken out in the name of the Contractor.

Bodily injury, including death and property damage written as combined single limit in the amount of \$1,000,000.00.

DISPOSITION: Certificate of insurance must be sent to Owner prior to commencement of work.

- [3] CONTRACTOR'S PUBLIC LIABILITY INSURANCE—Taken out in the name of the Contractor.

Bodily injury, including death and property damage written as combined single limits in the amount of \$1,000,000.00.

DISPOSITION: Certificate of insurance must be sent to Owner prior to commencement of work.

- [4] CONTRACTOR'S AUTOMOBILE LIABILITY INSURANCE- Taken out in the name of the Contractor.

Bodily injury, including death and property damage written as a combined single limit in the amount of \$1,000,000.00 for any auto, either owned or non-owned.

DISPOSITION: Certificate of insurance must be sent to Owner prior to commencement of work.

- [5] BUILDER'S RISK INSURANCE- payable to the Contractor and Owner, as their interests may appear, for the amount of the contract including all materials in or adjacent to the building which are to be made a part of building covering fire, extended coverage, vandalism and malicious mischief.

DISPOSITION: ORIGINAL POLICY must be deposited with Owner prior to commencement of work.

(6) *Acceptability of Insurers to Owner.*—No insurance will be acceptable unless written by a company licensed by the State Insurance Commissioner to do business in Georgia at the time the policy is issued, and the company must in addition be acceptable to the Owner. To avoid inconvenience, any general Contractor or subcontractor must get in touch with the Owner to determine whether the insurance company or companies he expects to use is or are acceptable to the Owner. All policies and certificates must be signed or countersigned, as the case may be, by resident Georgia agents.

(c) *Termination of Obligation to Insure.*—Unless otherwise expressly provided to the contrary, the obligation to insure as prescribed herein shall not terminate until the Architect shall have executed the final certificate. [See also Articles E-20, E-24, E-29, and E-71 of general conditions and Article 5 of Form of Agreement Between Contractor and Owner].

(d) *Competence of Insurers.*—The Contractor is responsible for any delay resulting from the failure (1) of his insurance carriers and (2) of insurance carriers of his subcontractors to furnish proof of proper coverage in (1) the prescribed form, (2) the prescribed manner, and (3) in good season.

(e) *Blasting.*-If the specifications expressly permit blasting, the Contractor's protective liability insurance, Contractor's public liability insurance and Owner's protective liability policy shall have an endorsement ("X" coverage) which specifically provides coverage for blasting.

Article E-28. Affidavits.-Before receiving any portion of the retainage [See also Articles E-24 and E-32] the Contractor will be required to furnish non-influence affidavit and statutory affidavit in the exact form as set forth in Exhibit C and Exhibit D.

Article E-29. Bonds on Roofs and Walls.-

(a) *Five-Year Bond.*--Prior to demand for payment of retainage, the Contractor shall furnish to the Owner a five-year bond written by a surety authorized to do business in the State of Georgia in accordance with Form No. 299 set forth in Exhibit E and in the penal sum of not less than the amount shown as the cost of the roof and roof deck in the approved initial breakdown.

(b) *Manufacturer's Roofing Bond or Manufacturer's Full Service Guarantee.*--In addition to the five-year bond, the Contractor shall furnish to the Owner a manufacturer's roofing bond or manufacturer's full service guarantee covering materials and workmanship in the form and style of the roofing manufacturer whose materials were used, the period covered by the bond or guarantee and the terms of which are detailed in the specifications section under which the roofing system or systems is specified.

Article E-30. Performance Bond and Payment Bond.--The Contractor shall furnish both a performance bond and a payment bond (Form 160) as set forth Exhibit f and Exhibit G. The surety must be one which is licensed to do business in the State of Georgia, and the surety must in addition be acceptable to the Owner. [NOTE: To avoid inconvenience, the Contractor should get in touch with the Owner to determine whether the surety he expects to use is acceptable to the Owner]

Article E-31. Omitted.

Article E-32. Liens.--Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the Owner a complete release of all liens or claims arising out of this contract, or receipts in full in place thereof and, if required in either case, an affidavit that so far as he has knowledge or information the releases and receipts include all labor and materials for which a lien or claim could be filed; but the Contractor may, if any subcontractor or claimant refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Owner to indemnify the Owner against any lien or claim. If any lien or claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien or claim, including all costs and a reasonable attorney's fee. [See also articles E-24, E-25, and E-28]

Article E-33. Assignment.--Neither party to the contract shall assign the contract or sublet it as a whole nor shall the Contractor assign any moneys due or to become due to him hereunder.

Article E-34. Mutual Responsibility of Contractors.--Should the Contractor cause damage to any separate Contractor on the work the Contractor agrees, upon due notice, to settle with such Contractor by agreement if he will so settle. If such separate Contractor sues the Owner on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor who shall defend such proceedings at his own expense, and if any judgement against the Owner shall arise therefrom, the Contractor shall pay or satisfy it and pay all costs incurred by the Owner.

Article E-35. Separate Contracts.-

(a) *Duty of Contractor to Cooperate with Other Contractors.*--The Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly regulate, schedule, connect, and coordinate his work with theirs.

(b) *Duty of Contractor to Report Defects.*--If any part of the Contractor's work depends upon the proper execution or results upon the work of any other Contractor, the Contractor shall inspect and promptly report to the Architect any defects in such work that render it unsuitable for such proper execution and results. The Contractor's failure to inspect and report shall constitute an acceptance of the other Contractor's work as fit and proper for the reception of the Contractor's work, except as to defects which may develop in the other Contractor's work after the execution of the Contractor's work.

(c) *Duty of Contractor to Report Conflicts.*--To insure the proper execution of his subsequent work the Contractor shall measure work already in place and shall at once report to the Architect any discrepancy between the executed work and the drawings or specifications. [See also Article E-40]

(d) *Equipment.*--Article E-35 applies to installation of loose equipment and fixtures by the Owner or a lessee of the Owner, PROVIDED: That the Architect shall have rendered a decision in writing that no inconvenience to the Contractor will result. [See also Article E-34]

Article E-36. Subcontractors, Materialmen, Suppliers and Employees.-

(a) *Submission of list.*--As soon as possible after notice of award of the contract and in any event not later than three days prior to the time fixed in the contract for delivery of the executed form of agreement to the Owner, the Contractor shall submit in

writing to the Architect a list of the names of subcontractors the Contractor will employ on the work. The list of subcontractors is not submitted for approval but is for the purpose of establishing...

- (1) What trades and portions of the work are to be performed under subcontract, and
- (2) The names of the parties selected by the Contractor to perform work by subcontract, the aforesaid selection being a matter lying solely within the discretion of the Contractor.

(b) *No approval of subcontractors.*-Neither the Owner nor the Architect undertakes to pass upon or approve any subcontractor; however, if a fire protection sprinkler system is required, the general Contractor shall submit to the Architect the certificate of competency of the fire protection system subcontractor as required by the State of Georgia Fire Protection and Safety code Section 25-11-4. The certificate of competency shall be provide to the Architect prior to any work being performed on the fire protection sprinkler system.

(c) *Warranty of Contractor.*-The Contractor warrants that the subcontractors selected by him are reputable, skilled, reliable, competent, qualified in the trade or field in which they are to perform on the project, and thoroughly familiar with applicable codes.

(d) *Certification on account of.*-The Architect shall, on request furnish to any subcontractor, wherever practicable, evidence of the amounts certified on his account.

(e) *Contractor Responsible for Acts and Omissions of Subcontractors, Materialmen, Suppliers and Employees.*-The Contractor agrees that he is as fully responsible for the acts and omissions of his subcontractors, materialmen, suppliers, and employees and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him. The failure of a subcontractor, materialman, supplier or employee to perform shall not be asserted by the Contractor as an excuse for any omission from or noncompliance with requirements of the contract; nor shall the Contractor be entitled to an extension of time because of failure of a subcontractor, materialman, supplier, or employee to perform unless said failure was a direct result of some delay to the subcontractor, materialman, supplier or employee of the kind and character described under Article E-18 for which the Contractor shall have requested and received an extension of time under the terms of Article E-18 of the general conditions. [See also Article E-37(a)(3)] The subcontracting of work does not relieve the Contractor of the full responsibility for the execution of the work and for compliance with all requirements of the contract documents. The Contractor may not assert negligence, inefficiency, insolvency, bankruptcy, or incompetence of any subcontractor, materialman, supplier or employee as an excuse for the existence of any noncompliance with or omission to fulfill any obligation under the contract either as to timely performance or as to compliance with methods or materials designated in the contract documents; nor shall the Contractor assert nonperformance (unless an extension of time shall have been granted pursuant to Article E-18 as referred to hereinabove) of a subcontractor, materialman, supplier or employee as excuse of the existence of any noncompliance with or omission to fulfill any obligation under the contract either as timely performance or as to compliance with methods and materials designated in the contract documents. As to subcontractors, materialmen, suppliers and employees of the Contractor, the doctrine that a principal is liable for the acts and omissions of his agent shall be binding on the Contractor in his relationship to the Owner, and the Contractor may not reverse the aforesaid doctrine by serving as a conduit or agent for his own agent. [See also Article E-16 and condition of payment bond, Article E-30] Any provision in any contract between the Contractor and any subcontractor pursuant to which the Contractor is obliged to present to the Owner any claim of any subcontractor shall be invalid. [See also Article E-37(1)]

(f) *No Contract Between Owner and any Subcontractor, Materialman, Supplier or Employee.*-Nothing contained in the contract documents shall create any contractual relation between the Owner and any subcontractor or between the Owner and any materialman, supplier or employee of the Contractor or his subcontractors. [See also Articles E-2, E-37, E-45 and E-60]

Article E-37. Relationship of Contractor and Subcontractors.-

(a) *Obligations of Each.*-The Contractor agrees to bind every subcontractor and every subcontractor agrees to be bound by the terms of the contract documents insofar as they are applicable to his work, including the following provisions of this article:

THE SUBCONTRACTOR AGREES

- (1) To be bound to the Contractor by the terms of the contract documents and to assume toward the Contractor all the obligations and responsibilities that the Contractor by the aforesaid documents assumes toward the Owner.

- (2) To submit to the Contractor applications for payment in such reasonable time as to enable the Contractor to apply for payment under Article E-24 of the general conditions.
- (3) To make all claims for extras, for extensions of time [See Articles E-18 and E-36] or for damages to the Contractor in the manner provided in the general conditions for like claims by the Contractor upon the Owner, except that the time for making claims for extra expense is one week.

THE CONTRACTOR AGREES

- (1) To be bound to the subcontractor by all the obligations that the Owner assumes to the Contractor under the contract documents.
- (2) To pay the subcontractor upon the payment of certificates issued under the schedule of values described in Article E-24 of the general conditions the amount allowed to the Contractor on account of the subcontractor's work to the extent of the subcontractor's interest therein; provided, however, that retainage shall be paid to the subcontractor as provided in the statutory affidavit specified under Article E-28.
- (3) To pay the subcontractor upon the payment of certificates issued otherwise than as in Subparagraph E-37(a)(5) above in such manner that at all times the subcontractor's total payments should be as large in proportion to the value of the work done by the subcontractor as the total amount certified to the Contractor is to the value of the work done by the subcontractor.
- (4) To pay the subcontractor to such extent as may be provided by the contract documents or the subcontract, if either of these provides for earlier or larger payments than the above.
- (5) To pay the subcontractor on demand for his work or materials as far as executed and fixed in place, less the retained percentage, at the time the certificate should issue, even though the Architect fails to issue it for any cause not the fault of the subcontractor.
- (6) To pay the subcontractor a just share of any fire insurance money received by the Contractor.
- (7) To make no demand for liquidated damages or penalty for delay in any sum in excess of such amount as may be specifically named in the subcontract.
- (8) That no claim for services rendered or materials furnished by the Contractor to the subcontractor shall be valid unless written notice thereof is given by the Contractor to the subcontractor during the first ten days of the calendar month following that in which the claim originated.
- (9) To give the subcontractor an opportunity to be present and to submit evidence in any dispute involving rights of the subcontractor. [See also Article E-36(e)]

(b) *Owner Not Obligated to any Subcontractor.*-There is no obligation on the part of the Owner to pay to or to see to the payment of any sums to any (1) subcontractor, (2) materialman, (3) supplier, (4) laborer, (5) employee, or (6) claimant as defined in the payment bond. [See also Article E-36(d)]

(c) *Incorporation of Terms in Subcontracts.*-The Contractor agrees that failure on his part to incorporate in all subcontracts an express provision in accordance with Article E-37(1), above, shall be deemed to be and is a breach of an essential covenant and that in the event of such breach the Contractor shall, within five days after demand of the Owner, furnish proof in writing that the deficiency has been remedied to the end that (1) the Contractor may not maintain that it is beyond his competence to require performance of terms of the contract by a subcontractor and (2) no subcontractor may maintain that he has not assumed toward the Contractor all the obligations and responsibilities that the Contractor has assumed toward the Owner. Failure on the part of a Contractor to effect remedy as above within five (5) days after receipt of written demand of the Owner shall be *ipso facto* ground for issuance of a declaration of default by the Owner. [See also Articles E-15, E-34 and E-36]

Article E-38. Architect.-

(a) *Supervision.*-The Architect shall have general supervision and direction of the work except in respect to safety as stated under Article E-12 and except as qualified by Articles E-13 and E-60 of the general conditions. He is the agent of the Owner only when in special instances he is authorized in writing by the Owner so to act, and in such instances he shall, upon request, show the

Contractor written authority. He has authority to stop the work whenever such stoppage may be necessary to insure the proper execution of the contract.

(b) *Interpreter and Impartial Judge.*-As the Architect is, in the first instance, the interpreter of the conditions of the contract and the judge of its performance, he shall side neither with the Owner nor with the Contractor but shall use his powers under the contract to enforce its faithful performance by both.

(c) *Succession.*-In case of the termination of the employment of the Architect, the Owner shall appoint a capable and reputable Architect against whom the Contractor makes no reasonable objection and whose status under the contract shall be that of the former Architect.

Article E-39. Architect's Decisions.-

(a) *Promptness.*-The Architect shall make decisions with reasonable promptness after presentation of evidence on (1) any claim of the Owner or Contractor, (2) a demand of the Owner or Contractor for a decision on any matter relating to the execution or progress of the work, or (3) a demand of the Contractor or Owner for interpretation of or additional instructions with respect to the contract documents. [See also Articles E-3 and E-16]

(b) *On artistic effect.*-The Architect's decisions in matters relating to artistic effect shall be final if within the terms of the contract documents.

(c) *Claims for alleged procrastination.*-No claim for delay to the Contractor or for additional expense to the Contractor shall be allowed on account of failure of the Architect to render decisions, make interpretations, or furnish additional instructions until ten days after receipt of written claim for additional compensation, damages, or extension of time served upon the Architect and the Owner and not then unless such claim be reasonable. [See also Articles E-3, E-15, and E-16]

Article E-40. Measurements and Dimensions.-Before ordering material or doing work which is dependent upon coordination with building conditions, the Contractor shall verify all dimensions, elevations, grades and pitch by taking measurements at the building and shall be responsible for the correctness of same. No consideration will be given to any claim based on differences between the actual dimensions and those indicated on the drawings. Any discrepancies between the drawings and/or the specifications and the existing conditions shall be referred to the Architect for additional instructions before any work affected thereby is begun. [See also Articles E-14, E-35(c), and E-40]

Article E-41. Notice of Readiness for Final Inspection.-When the Contractor is ready for a final inspection, he shall give notice to the Architect in accordance with Article 5 of the form of agreement with a copy to the Owner in the following words:

The work on the contract for the [show name of improvement or project as it appears in the form of agreement] having been fully completed except as stipulated hereinbelow, it is requested that a final inspection be made promptly by the Architect in accordance with Article 5 of the form of agreement. The following work is incomplete through no fault of the Contractor [list any work which the Contractor regards as a proper exception under Subparagraph (d) of Article 5 of the form of agreement] [See Article E-71 for specimen of form of agreement].

No final inspection shall be made until such time as the Architect has received a letter in the exact form indicated above and a copy thereof has been received by the Owner. In the event the Contractor shall have issued the "Notice of Readiness for Final Inspection" prematurely [hereinafter referred to as "false start"] he shall be liable for the damage resulting from the aforesaid false start including but not limited to the salaries, professional fees, and travel and living expenses of the persons or parties inconvenienced by the aforesaid false start. [See also Article E-16] The Contractor acknowledges and agrees that he has an indivisible, indelegable, and intransferable contractual obligation to the Owner to make his own inspections of his own work at all stages of construction; and he shall supervise and superintend performance of the contract in such manner as to enable him to confirm and corroborate at all times that all work has been executed strictly, literally, rigidly, and inflexibly in accordance with the methods and materials designated in the contract documents so that (a) his certifications on periodical estimates shall be true and correct and (b) his notice of readiness for final inspection shall be true and correct. [See also Articles E-13, E-14, E-24, E-26 and E-46] Accordingly, the Contractor agrees that he may not defend or excuse any deviation from the contract documents on the ground (a) that the deviation was not brought to his attention by another person or party or other persons or parties or (b) that a subcontractor is or subcontractors are at fault.

No final inspection shall be requested by the Contractor until such time as the Contractor has provided to the Architect a copy of the initial test and balance report on heating, ventilating and air conditioning system.

Article E-42. Use of Premises.-The Contractor shall confine his plant, his apparatus, the staging and storage of materials, the operations of his forces, and the work to limits indicated by law, ordinances, permits, or the contract documents and shall not unreasonably encumber the premises with his materials. The Contractor shall not load or permit any part of the work to be loaded with weight that will endanger its safety. The Contractor shall enforce the Architect's instructions regarding signs, advertisements, fires and smoking. [See also Article E-11]

Article E-43. Cutting, Patching, and Fitting.-The Contractor shall do all cutting, fitting or patching of his work that may be required to make its several parts come together properly and fit. [See also Articles E-03, E-40, and E-53]

Article E-44. Cleaning Up.-The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his employees or work. At the completion of the work he shall remove all his rubbish from and about the building and all his tools, scaffolding, and surplus materials and shall leave his work "broom-clean" or its equivalent, unless more exactly specified. In case of dispute the Owner may remove the rubbish and charge the cost to the Contractor as the Architect shall determine to be just. [See also Articles E-12 and E-27]

Article E-45. Specification Arrangement.-The specifications are separated into numbered and titled divisions for convenience of reference. Neither the Owner nor the Architect assumes any responsibility for defining the limits of any subcontractors on account of the arrangement of the specifications. Notwithstanding the appearance of such language in the various divisions of the specifications as, "The Plumbing Contractor", "The Electrical Contractor", "The Roofing Contractor", etc., the general Contractor is responsible to the Owner for the entire contract and the execution of all of the work referred to in the contract documents. No partial sets of bidding documents shall be issued by the Architect. [See also Articles C-03, E-2, E-36 and E-37]

Article E-46. Commencement, Prosecution and Completion.-The Contractor will be required (a) to commence work under this contract within ten days after date of written notice from the Owner to proceed [See Article E-1(j)], (b) to prosecute the work with faithfulness and energy (c) to install the various parts of the work with equal steps shown on the construction progress schedule and at the same rate shown on the construction progress schedule to be furnished pursuant to Article E-50, and (d) to complete the work within the time stipulated in the proposal form as adjusted by any extensions of time provided for under Articles E-15 and E-18. Commencement of work shall mean actual physical work on the site. [See also Articles E-1(f) and E-1(i)] In the event the Contractor shall be delinquent in respect to compliance with the time limits established in the construction progress schedule, he shall, within seven days after receipt of written demand of the Owner, commence working not less than a twelve-hour day and not less than six days a week until such time as he shall have brought the amount of work in place into compliance with the construction progress schedule. Fulfillment of this requirement as to overtime work (hereinafter referred to as "recovery of lost time required of the Contractor for his breach of the covenant as to time") shall not relieve the Contractor from liability for breach of the covenant as to time [Article E-1(f) of general conditions.] For account of recovery of lost time required of the Contractor for his breach of the covenant as to time the Contractor shall be entitled to no claim against the Owner for any payment, repayment, reimbursement, remittance, remuneration, compensation, profit, cost, overhead, expense, loss expenditure, allowance, charge, demand, hire, wages, salary, tax, cash, assessment, price, money, bill, statement, dues, recovery, restitution, benefit, recoupment, exaction, injury or damages. [See also Articles E-25 and E-26]

Article E-47. Alternates.-Unless otherwise stipulated all alternate bids are deductive. No alternate bids will be taken unless the base bid exceeds the amount of money budgeted for the project prior to the opening of bids, and any alternate, or alternates, if taken, will be in numerical sequence to the extent necessary to reduce the cost to a sum which is not in excess of the amount budgeted if possible. [See also Article C-04(d)]

Article E-48. Public Employees Hazardous Chemical Protection and Right to Know Act of 1988.-The Contractor acknowledges that he is fully aware of the contents and requirements of Chapter 22 of Title 45 of the Official Code of Georgia. The Contractor upon submission of a proposal in connection with this chapter does hereby certify that it and its subcontractors are in compliance with the aforesaid code section.

Article E-49. Conflicts.-The following principles shall govern the settlement of disputes which may arise over conflicts in the contract documents: (a) as between figures given on drawings and the scaled measurements, the figures shall govern; (b) as between large-scale drawings and small-scale drawings, the larger scale shall govern; (c) as between drawings and specifications, the requirements of the specifications shall govern; and (d) as between the form of agreement and the specifications, the requirements of the form of agreement shall govern. Conflicts noted shall be reported to the Architect. The principles set forth herein shall not alter provisions of Article E-2 of the general conditions. Schedules, lists, indexes, tables, inventories, written

instructions, written descriptions, summaries, statements, classifications, specifications, written selections, or written designations although appearing on the drawings are deemed to be and are "specifications" within the meaning of Article E-49.

Article E-50. Progress Reports.-Within such reasonable space of time as the Owner shall designate in writing, the Contractor shall submit to the Owner such schedule of quantities and costs, construction progress schedules, payrolls, bills, vouchers, Correct copies of all subcontracts, statements, reports, correct copies of all agreements, correspondence, and written transactions with the surety on the performance bond which have any relevance to the work, estimates, records, and other data as the Owner may request concerning work performed or to be performed under this contract. When requested by the Owner, the Contractor shall give the Owner access to accounts relating to the foregoing. The above reports shall include but are not limited to (a) written notice of dates by which specified work will have been completed, (b) written notice of dates by which condemned work shall have been made good, (c) written notice that condemned work has been made good, (d) written notice as to the date or dates by which work which has not been performed with equal steps and at the same rate required by the construction progress schedule shall have been brought into conformity with the construction progress schedule, (e) date by which any undisputed claim of a subcontractor, materialman, or laborer shall have been paid, (f) written advice regarding the nature and amount of any disputed claim of a subcontractor, materialman or laborer, and (g) information regarding work performed under Case (b) or Case (c) of Article 15 upon demand of the Owner pursuant to Article E-15(k). Prior to submitting the first periodical estimate [See Article E-24], the Contractor shall have furnished a construction progress schedule (based on work in place only) in accordance with the style and format of a specimen to be furnished by the Owner [copies of which specimen will be furnished to any bidder on request]. [See also Articles E-1(i), E-19, E-20, E-26 and E-46]

Article E-51. Office for Resident Engineer Inspector.-The Contractor shall provide as his expense a temporary office at the site of the work for the use of the resident engineer inspector. The office shall be water-tight and shall be provided with heat, electric lights, telephone extension, and adequate windows. The Contractor shall also provide plan table and rack, chair, legal-size fiber transfer file with fifty (50) manila folders for the permanent records, and use of such business machines as may be necessary for the resident engineer inspector duties.

Article E-52. Trading with the State Statute.-In submitting a proposal, the bidder certifies that the provision of the act entitled "State Employees and Officials - Trading with the State", Georgia Laws 1956, pp. 60 *et seq.*, has been complied with.

Article E-53. Manufacturer's Recommendations.-In the event the contract shall require that given work or materials shall be installed in accordance with the manufacturer's recommendations or requirements, the Contractor shall obtain for his use at the site in executing the work copies of the bulletin, circular, catalogue, or other publication of the manufacturer bearing the title, number, edition, date, *etc.*, [hereinafter referred to as the "doctrine"] designated in the contract. In the event no such designation appears in the contract documents, the Contractor shall not proceed with the installation of the work or materials until (1) he shall have requested from the Architect in writing (with copy of the request to the Owner) additional instructions pursuant to Article E-3 of the general conditions as to title, number, edition, date, *etc.*, of the bulletin, circular, catalogue or other publication of the manufacturer which contains the manufacturer's published recommendations or requirements for installation and use of the product and (2) until he shall have received the aforesaid additional instructions. Prior to proceeding with the installation of the said work or materials, the Contractor shall obtain for his use at the site in executing the work the "doctrine" designated in the said additional instructions to the Architect. The plans and specifications shall be adhered to in all cases where they call for quality of materials, quality of workmanship, or quality of construction which is equal to or in excess of the quality called for in the manufacturer's recommendations or requirements. There may be no deviations from the plans and specifications except to the extent that the said deviations shall be necessary in order to comply with the manufacturer's express recommendations or express requirements. Any changes necessary to comply with the manufacturer's express recommendations or express requirements shall be made at no additional expense to the Owner. [See also Articles E-5, E-43, E-55 and E-67]

Article E-54. Keys.-Keys with tags indicating number and/or description of door or room each key is intended to fit attached to each key shall be delivered to the Owner. Contractor shall prepare and furnish with the keys an itemized key schedule in quintuplicate listing the door or room number and/or description, serial number of key, and number of keys being delivered for each door or lock.

Article E-55. Operation and Maintenance Data and Instructions.-Prior to making request for final inspection, the Contractor shall put all mechanical systems and equipment in operation and shall make all tests and adjustments. The Contractor shall furnish proper instructions to the lessee of the Owner in the presence of the Architect concerning operation and maintenance of all mechanical and electrical equipment. The Contractor shall give notice in writing to the Architect with copy to the Owner at least fifteen days prior to the date on which it is proposed to give instructions to the lessee. The aforesaid notice shall state the date and hour the giving of instructions will commence. The aforesaid notice shall not (repeat NOT) be given to the using agency. For all items of mechanical and electrical equipment or apparatus installed which require operation or maintenance after occupancy, the Contractor shall furnish and deliver to the Owner [not (repeat NOT) to the lessee] complete brochures and data as

prepared and published by the manufacturers covering details of operation and maintenance. [See also Articles E-53, E-62 and E-67]

Article E-56. Space Conditions.-All pipes passing through floors, walls and ceiling shall be installed with sufficient space between them to permit installation of pipe insulation and floor, wall and ceiling plates without cutting of insulation or plates. Roughing dimensions shall be prepared by the Contractor to accomplish this requirement. The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. This provision includes but is not limited to valves, traps, cleanouts, motors, controllers, switchgear, drain points, and fire dampers. If space, dimensions or other design conditions do not permit compliance with the present article, the Contractor shall file a demand in writing with the Architect for additional instructions pursuant to Article E-3, furnishing a copy of the aforesaid demand to the Owner. [See also Articles E-3 and E-40]

Article E-57. Cash Allowances.-The Contractor shall include in the contract sum all allowances named in the contract documents and shall cause the work thus covered to be done by such Contractors and for such sums as the Architect may direct, the contract sum being adjusted in conformity therewith. The Contractor declares that the contract sum includes such sums for overhead and profit on account of cash allowances as he deems proper. No demand for overhead and profit other than those included in the contract sum shall be allowed. The Contractor shall not be required to employ for any such work persons against whom he has a reasonable objection.

Article E-58. Testing Services.-Laboratories for testing services shall be selected by, engaged by, and responsible to the Architect, Provided: That, in the case of test (a) prescribed in the Contract Documents or any part thereof, including Article E-13 of the general conditions or (b) requested by the Architect the Contractor shall give notice to the Architect in writing stating the date and the hour when he will be ready for the test to be made and in the event the test fails or the Contractor is not ready for the test, the expense of the service of the testing laboratory shall be applied against the contract fees by a credit adjustment to the Owner effected by the furnishing of notice to the Contractor by the Owner accompanied by a copy of the statement for the testing services for the test which failed or for which the Contractor was not ready. This Article does not apply to verification of design mix on concrete. [See also Articles E-13 and E-65]

Article E-59. Drilling Samples and Log of Drilling Wells.-In the event the work includes a drilled well, the Contractor shall forward drilling samples to "Georgia Geological Survey, Room 400, 19 Martin Luther King Jr., Drive, S. W. Atlanta, Georgia 30334". Notice by Contractor (NOT BY SUBCONTRACTOR) concerning shipment must be forwarded to the Ground Water Division setting forth the name and number of the job, and a copy of the notice must be furnished to the resident engineer inspector, Architect and Owner. Samples of material drilled through shall be taken at every ten feet of additional depth and at every change of formation. Samples shall be placed in glass jars of one pint size. The jars shall be tightly covered and shall be labeled in ink to show the date and depth at which the samples were taken and the number of the job. At every change of formation the depth and date at which the change occurred and any unusual circumstances during the progress of the work shall be accurately recorded in the log book. The log book shall be delivered to the Owner at the completion of the work. Satisfactory evidence that samples have been delivered to the Ground Water Division and receipt of the log book shall be conditions precedent to certification of the work for payment.

Article E-60. Contractor's Warranty as to Performance.-The Contractor warrants that he is familiar with the codes applicable to the work and that he has the skill, knowledge, competence, organization and plant to execute the work promptly and efficiently in compliance with the requirements of the contract documents. The Contractor having the obligation to keep a competent superintendent on the work during its progress, to employ only skilled mechanics, and to enforce strict discipline and good order among his employees, the Contractor, himself, is responsible for seeing that the work is installed in accordance with the contract documents. Failure or omission on the part of the Owner, representatives of the Owner, agents of the Owner, resident engineer inspector, clerk-of-the-works, engineers employed by the Architect, representatives of the Architect, or the Architect either to discover or to bring to the attention of the Contractor any deviation from, omission from, or noncompliance with the contract documents shall not be set up by the Contractor as a defense for failure on his part to install the work in accordance with the contract documents or for any other neglect to fulfill requirements of the contract; nor shall the presence of any one, or all, or any of the foregoing at the site or the fact that any one, or all, or any of the foregoing may have examined the work or any part of it be set up as a defense by the Contractor against a claim for failure on his part to install the work in accordance with the contract documents or for any neglect to fulfill requirements of the contract; nor shall the presence of any one, or all, or any of the foregoing at the site or the fact that any one, or all or any of the foregoing may have examined the work or any part of it be set up as a defense by the Contractor against a claim for failure on his part to install the work in accordance with the Contract Documents or for any neglect to fulfill requirements of the contract. No requirement of this contract may be altered or waived except in pursuance of a written order of the Owner and in strict accordance with the provisions in the contract for changes in the work. [See also Articles E-9, E-13, E-14, E-15, E-20, E-36, E-37, E-38 and E-39]

Article E-61. Omitted.

Article E-62. Mechanical Systems, Retainage Pending Balance of.-If the work includes a heating system, there shall be withheld from the retainage of the Contractor as an exception under Article 5(d) of the form of agreement [work which is incomplete through no fault on the part of the Contractor] one-half of one percent of the amount shown on the breakdown of the Contractor for the heating system until such time as the Architect shall have certified that the heating system has been balanced under reasonable weather conditions, Provided: That the amount withheld shall in no event be less than \$1,000.00; and if the work includes an air conditioning system, the same provision shall apply to the said air conditioning system. PROVIDED FURTHER, However, That prior to asking for a final inspection the initial test and balance reports shall have been submitted to the Architect for review. [See also Article E-55] [See also Article E-71 for specimen of form of agreement]

Article E-63. Water Heaters.-No plastic dip tubes may be installed in any hot water heater. The dip tube or filler tube for any hot water heater shall be of galvanized steel, brass, copper, or stainless steel pipe. Temperature relief valves or combined temperature and pressure relief valves for any hot water heaters shall be of such design that the water in the hot water tank will not exceed 210 degrees Fahrenheit maximum. Temperature relief valves or combined temperature and pressure relief valves for any water heaters shall be set at a pressure not exceeding the rated working pressure of the hot water tank or heater, but in no case in excess of 150 pounds per square inch. If the Architect shall have designed work not in compliance with this article, there shall be a change order with an adjustment in the contract as provided in the contract for changes in the work.

Article E-64. Effect of Addenda, Amendments, Bulletins, Deletions, Omissions, and Change Orders.-No special implication, interpretation, construction, connotation, denotation, import, or meaning shall be assigned to any provision of the contract documents because of changes created by the issuance of any (1) addendum, (2) amendment, (3) bulletin, (4) notice of deletion, (5) notice of omission, or (6) change order other than the precise meaning that the contract documents would have had if the provision thus created had read originally as it reads subsequently to the (1) addendum, (2) amendment, (3) bulletin, (4) notice of detention, (5) notice of omission, or (6) change order by which it was created.

Article E-65. Concrete Specifications.-"Standard Minimum Concrete Specifications", October 1963, revised May 1976, revisions approved jointly by Georgia Branch, The Associated General Contractors of America, and Georgia Concrete and Products Association, Inc., successors to Georgia Ready-Mix Concrete Association are adopted as a minimum requirement, but in the event any other provision of the contract documents provides for materials, conditions, or services which exceed in quality the materials, conditions, or services required under the aforesaid "Standard Minimum Concrete Specifications", October 1963, revised May 1976, the higher quality of materials, conditions, or services shall govern. Copies of the above-mentioned "Standard Minimum Concrete Specifications" may be obtained from Georgia Branch, Associated General Contractors of America; 163 Harris Street, N.W.; Atlanta, Georgia, without cost. Paragraph 3.3(d) of the aforesaid revised "Standard Minimum Concrete Specifications" is hereby amended by deleting the eighth line in its entirety and substituting in place thereof the following:

"... with Article E-17 of the general Conditions. Load tests shall be made and ..."

Paragraph 4.1(b) of the aforesaid revised "Standard Minimum Concrete Specifications" is deleted in its entirety and the following is inserted therefor:

- (b) Prior to commencement of concrete work, the laboratory shall provide physical and written instructions in the performance of these sampling and testing duties for one or more employees designated by the Contractor.

The last paragraph in Article 4.2 of the above-mentioned revised concrete specifications is corrected to read "(c)" instead of "(b)" in order to maintain sequence. In regard to the first and second sentences of Article 4.2(b) of the revised concrete specifications, it is hereby expressly agreed by the Owner and the Contractor that as a requirement of the project the Contractor shall sample, mold, initially cure and transport to the laboratory the acceptance test specimens required by Section 3.3 of the aforesaid revised concrete specifications.

Article E-66. House Bill No. 210.-House Bill No. 210 [Act No. 443] of the General Assembly of Georgia having been signed into law on April 12, 1963, the same is hereby incorporated into the general conditions of the contract as follows:

SECTION 1

No contract for the construction of, addition to, or repair of any facility, the cost of which is borne by the State, or any department, agency, commission, authority, or political subdivision thereof shall be let, unless said contract contains a stipulation therein providing that the Contractor or subcontractor shall use exclusively Georgia forest products in

construction thereof, when forest products are to be used in such construction, addition or repair, and if Georgia forest products are available.

SECTION 2

The provisions of this Act shall not apply when in conflict with Federal rules and regulations concerning construction.

Article E-67. Certificates of Manufacturers for Major Components.-For elevators, moving walks, dumbwaiters, escalators, lifts, major components of air conditioning systems [i.e., cooling towers, compressors, condensers, absorption units, chiller units, fan coil units, air handling units, boilers, base mounted pumps, and temperature controls]; major components of heating systems [i.e., boilers, base mounted pumps, air handling units, unit ventilators, fan coil units, temperature controls, and boiler chemical feed systems]; major components of plumbing systems [i.e., boilers, base mounted pumps, sewage pumps and water treatment systems]; and incinerator systems; start-up, testing, and placing into operation shall be performed by the field representative(s) of the manufacturer(s), and certificate(s) of the manufacturer(s) shall be filed with the Owner on the letterhead(s) of the manufacturer(s) in which the manufacturer(s) certifies or certify that "the equipment has been installed in strict compliance with the recommendations of the manufacturer(s) and is operating properly". [See specimen of certificate, Form No. 290 attached hereto] The manufacturer(s) shall list in the certificate the item or items furnished to the job. The date, name, or other positive means of identifying the exact document or documents containing the recommendations of the manufacturer(s) shall be set forth in the certificate. A copy of each of the aforesaid documents shall be attached to the certificate. A specimen of the certificate will be furnished by the Owner and shall be adhered to by the manufacturer(s) in preparing the certificate. The Contractor expressly agrees that the aforesaid manufacturer(s) is (are) solely the agent(s) of the Contractor. The Contractor shall coordinate the performance of the aforesaid service and shall, in all cases where the equipment of two or more manufacturers ties in and functions together, require the field representatives to perform simultaneously the initial start-up, the testing, and the placing of their equipment into operation. "Start-up" is defined as putting the equipment into action. "Testing" is defined as performing such testing as is stipulated in the contract documents to be performed. "Placing into operation" is defined as operating the equipment for a sufficient period of time for the determination to be made that it is performing properly. [See also Articles E-53 and E-55] See Exhibit H, Form No. 290 (less enclosure thereto)—Specimen Certificate of Manufacturer.

Article E-68. Valuable Material, Geological Specimens.-If during the execution of the work, the Contractor, any subcontractor, or any servant, employee, or agent of either should uncover any valuable material or materials such as, but not limited to, treasure, geological specimens, archival material or materials, or ore, the Contractor acknowledges that title to the foregoing is vested in the Owner. The Contractor shall notify the Owner upon discovery of any of the foregoing, shall guard it, and shall deliver it promptly to the Owner. The Contractor agrees that the Geologic and Water Resources Division of the Georgia Department of Natural Resources may inspect the work at reasonable times consistent with the convenience of the Contractor.

Article E-69. Copies of Notices to Owner.-Wherever the general conditions provide that a copy of any notice, request, or demand filed with the Architect by the Contractor shall be furnished to the Owner, such notice, request or demand shall not become effective until the Owner's copy shall have been received by the Owner. No notice in writing or orally to the Architect or to the resident engineer inspector is notice to the Owner unless copy of the aforesaid notice in writing shall have been properly served upon the Owner at the address shown in the Invitation to Bid.

-[See also Articles E-1(d), E-3, E-15, E-16, E-18, and E-39(c)]

Article E-70. Utilities.-Pending the extension and connection of permanent water, permanent gas, permanent sewer taps, and permanent electric power, the Contractor shall obtain temporary water, temporary gas, temporary electric power, and provide sewage disposal at his own expense. In the absence of provisions to the contrary, the Contractor shall pay for all utilities services until the final certificate has been executed or until the work is occupied, whichever is the earlier. [See also Article E-9]

(a) *Toilets.*-Contractor shall also provide his own temporary, portable type toilet facilities. These facilities shall be maintained and serviced in a sanitary condition during the course of the work in accordance with local health codes/ordinance. Location of toilet facilities shall be coordinated with Owner and Architect.

(b) *Telephone.*-Contractor shall provide his on the job telephone.

Article E-71. Form of Agreement.-The form of agreement shall be executed on Form No. 418, specimen of which is attached hereto. [See also Article E-1]

See Exhibit I: Form No. 418, "FORM OF AGREEMENT BETWEEN CONTRACTOR AND OWNER"

EXHIBITS FOLLOW

EXHIBIT A

INDORSEMENT—BUILDER'S RISK

Attached to and forming part of Policy No. _____ of the
(Number of Policy)
_____ Insurance Company, issued at
(Name of Insurance Company)
its _____ Agency. Date of Indorsement _____
(City) (State)
No. of (Improvement) (Project) _____.

In consideration of the premium for which the policy is written and proper rate adjustment when applicable, the insurance company agrees as follows:

- Item (1)* Furniture and equipment may be delivered to the insured premises and installed in place for use, and said delivery and installation of furniture and equipment shall in no way diminish, change, alter, or otherwise affect the coverage and protection afforded the insured under said policy.
- Item (2)* Occupancy shall in no way diminish, change, alter, or otherwise affect the coverage and protection afforded the insured under said policy. The insured shall give notice to insurance company of any occupancy or partial occupancy.
- Item (3)* The insurance company recognizes the right of the Owner of the insured premises to perform other work in connection with construction operations insured under this policy and agrees that performance of other work by the said Owner, by agents of the said Owner, by the lessee of the Owner, by Contractors employed by the said Owner, or by Contractors employed by the lessee of the said Owner shall in no way diminish, change, alter, or otherwise affect protection afforded under the said policy.
- Item (4)* This policy shall not be cancelled, changed, allowed to lapse or allowed to expire until thirty (30) days after the Owner and Architect have received written notice thereof as evidenced by return receipt of registered letter. It is also agreed that the said notice shall be valid only as to such improvements or projects as shall have been designated by number in such notice and that as to any improvement or project not designated by number in the said notice coverage shall be continued in full force and effect.
- Item (5)* In the event the notice referred to hereinabove in Item No. (4) is never issued coverage under this policy shall automatically terminate thirty-six months from the date shown below.

The foregoing insurance provisions have been incorporated into by reference and are hereby made a part of insurance policy No. _____ this _____ day of _____, 19_____.

(Name of Company)

(Signature of Authorized Representative)

EXHIBIT B

INDORSEMENT—CASUALTY

Attached to and forming part of Policy No. _____ of the
(Number of Policy)

_____ Insurance Company, issued at

Its _____, _____ Agency.
(City) (State)

Date of Indorsement _____

Project No. _____

In consideration of the premium for which the policy is written and proper rate adjustment when applicable, the insurance company agrees as follows:

Item (1) This policy shall not be cancelled, allowed to lapse or allowed to expire until thirty (30) days after the Owner and Architect have received written notice thereof as evidenced by return receipt of registered letter or until such time as other valid and effective insurance coverage acceptable in every respect to the Owner and providing equal protection called for in the policy shown below shall have been received, accepted, and acknowledged by the Owner. It is also agreed that the said notice shall be valid only as to such improvements or projects as shall have been designated by number in said notice and that as to any improvement or project not designated by number in the said notice, coverage shall be continued in full force and effect.

Item (2) If the notice referred to above in Item No. (1) is never issued, coverage under this policy shall automatically terminate thirty-six months from the date shown below.

The foregoing insurance provisions have been incorporated into by reference and are hereby made a part of insurance policy No. _____, this _____ day of _____, 19_____.

(Name of Company)

(Signature of Authorized Representative)

EXHIBIT C

NON-INFLUENCE AFFIDAVIT

COUNTY OF _____

STATE OF _____

I do solemnly swear on my oath that as to the contract dated _____, 19____,
between _____ and the _____
Name of Contractor Name of Owner

I have no knowledge of the exertion of any influence or the attempted exertion of any influence on the firm on behalf of which this affidavit is made in any way, manner, or form in the purchase of materials, equipment, or other items involved in construction, manufacture, or employment of labor under the aforesaid contract by any

employee, officer, or agent of _____ or any person connected with the State
Name of Owner
Government of Georgia in any way whatsoever.

This _____ day of _____, 19_____.

Signature (L.S.)

Title

Firm

COUNTY OF _____

STATE OF _____

Personally before me, the undersigned authority, appeared _____,
Name of Person Signing Affidavit

who is known to me to be an official of the firm of _____, who, after being duly
General Contractor
sworn, stated on his oath that he has read the above statement and that the same is true and correct.

Notary Public

My commission expires _____

This _____ day of _____, 19_____.

EXHIBIT D

STATUTORY AFFIDAVIT

COUNTY OF _____

STATE OF _____

FROM: _____
(Contractor)

TO: _____, Owner

RE: Contract entered into the _____ day of _____, 19_____, between
the above-mentioned parties for the construction of Project No. _____
located at _____.

KNOW ALL MEN BY THESE PRESENTS:

1. The undersigned hereby certifies that all work required under the above contract has been performed in accordance with the terms thereof, that all materialmen, subcontractors, mechanics, and laborers have been paid and satisfied in full, and that there are no outstanding claims of any character [included disputed claims or any claims to which the Contractor has or will assert any defense] arising out of the performance of the contract which have not been paid and satisfied in full except as listed below:.....

[Instructions-ENTER THE WORD "NONE" OR LIST THE NAMES OF THE CLAIMANTS AND THE AMOUNT CLAIMED BY EACH]

2. The undersigned further certifies that to the best of his knowledge and belief there are no unsatisfied claims for damages resulting in injury or death to any employees, subcontractors, or the public at large arising out of the performance of the contract, or any suits or claims for any other damage of any kind, nature, or description which might constitute a lien upon the property of the Owner.

3. The undersigned makes this affidavit for the purpose of receiving final payment in full settlement of all claims against the Owner arising under or by virtue of the contract, and acceptance of such payment is acknowledged as a release of the Owner from any and all claims arising under or by virtue of the contract.

This _____ day of _____, 19_____.

_____(L.S.)
Signature

Title

Firm

COUNTY OF _____

STATE OF _____

Personally before me, the undersigned authority, appeared _____,
Name of Person Signing Affidavit

who is known to me to be an official of the firm of _____, who, after being
Name of General Contractor

duly sworn, stated on his oath that he had read the above statement and that the same is true and correct.

Notary Public

My commission expires _____

This _____ day of _____, 19_____

EXHIBIT E

FIVE-YEAR BOND ON ROOFS AND WALLS

STATE OF GEORGIA

COUNTY OF _____

1. Know all men by these presents, that we _____ as Principal, and
General Contractor

_____, as Surety are held and firmly bound unto _____
Name of Surety Name of Owner

in the sum of _____ Dollars (\$ _____)
for the payment of which well and truly to be made and done, we bind ourselves, our executors and administrators, our successors
and assigns, jointly and severally, by these presents.

2. The condition of the above obligation is such that WHEREAS _____
General Contractor

has entered into a contract with _____ dated _____
Name of Owner Date of Contract

for construction of Project No. _____

3. WHEREAS, the said _____ warrants with respect to the said work that
General Contractor

for a period of five years from the date of the execution of the final certificate of the Architect, the roofs and the walls of the
building (or buildings) and roofs of covered passages, including but not limited to roof decking, deck sheathing, material used as a
roof base or insulation over which roof is applied, roofing materials, promenade decks or any other work on the surface of the roof,
flashing, base flashing, counterflashing, metal work, gravel stops, roof expansion joints, or wall expansion joints shall be
absolutely watertight and free from all leaks, At no expense to the Owner, the Contractor will make repairs to any defects which
may develop in the work including but not limited to: blisters, exposed felts, ridges, wrinkles, splits, warped insulation and loose
flashing, in a manner compatible to the system and acceptable under industry standards and in accordance with the construction
specifications. The Contractor also warrants that for the same five-year period the walls of the building (or buildings) including
but not limited to: vertical and/or horizontal expansion joints, below and/or above grade waterproofing, below and/or above grade
dampproofing, thru-wall flashing, damp course flashing or waterproofing of joints at openings in walls including but not limited to
door perimeters, window perimeters, vent and pipe openings shall be absolutely watertight and free from all leaks, seepage or
dampness, and that he shall, at no expense to the Owner make repairs to any defects which may develop in the work in a manner
compatible to the system and acceptable under industry standards and in accordance with the construction specifications, Provided,
however: That the following are excluded from this warranty:

- (a) Defects or failures resulting from abuse by the Owner.
- (b) Defects in the design which the said _____, shall have brought to the attention
General Contractor

of the _____ in writing prior to installation of the work except, however, that the
Name of Owner

_____ shall not be responsible, insofar as liability under this bond is concerned,
General Contractor

for bringing to the attention of the _____ defects in design involving failure of:
Name of Owner

- (1) Structural frame
- (2) Load bearing walls
- (3) Foundations

nor shall the _____ be responsible for correction of leaks resulting from said
General Contractor
failure.

- (c) Damage caused by fire, tornado, hail, hurricane, acts of God, wars, riots, or civil commotion.

(d) The Contractor is not an insurer nor is he a guarantor of the suitability or adequacy of design. Any other provisions of this bond to the contrary notwithstanding, the Contractor shall not be required to remedy any unsuitable or inadequate design.

4. WHEREAS the said _____ agrees that should any leaks occur in the roofs or
General Contractor

walls of said _____ the said
Name and Number of Project

_____ will promptly remedy the said leaks or defects and pay for any
General Contractor
damage to other work of said improvement or project resulting therefrom, except, however, that when this instrument is executed by a subcontractor this agreement shall, insofar as the subcontractor is concerned, extend only to the work executed by said subcontractor.

5. NOW, THEREFORE, the condition of this obligation is such that if the _____
General Contractor
shall in all things promptly and faithfully perform and comply with the terms and conditions hereinbefore set forth, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed this
_____ day of _____, 19____.

Principal

WITNESS

By _____

TITLE _____

Surety

WITNESS

By _____

TITLE _____

(*) Attach Power of Attorney

Instructions for execution by General Contractor

- (a) If the firm is a partnership, all members of the partnership must execute.
- (b) If the firm is a corporation, the president must sign, the secretary must attest, and the seal of the corporation must be affixed.
- (c) If the firm operates as a sole proprietorship, the proprietor must execute.

EXHIBIT F

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That _____ as Principal (hereinafter referred
Legal Title and Address of Contractor
to as "Contractor"), and _____ as Surety (hereinafter
Legal Title and Address of Surety
referred to as "Surety"), are held and firmly bound unto _____
Legal Title and Address of Owner
as Obligee (hereinafter referred to as "Owner"), in amount of _____
Contract Price

_____ Dollars (\$ _____), to which payment Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above bounden Principal has entered into a contract with Owner bearing date of _____
_____ for Project No. _____
Date of Project Number and Name of Project

in accordance with drawings and specifications prepared by _____
Full Name and Title of Architect
which said contract is incorporated herein by reference and made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Contractor shall promptly and faithfully perform and comply with the terms and conditions of said contract; and shall indemnify and save harmless the Owner against and from all costs, expenses, damages, injury or loss to which said Owner may be subjected by reason of any wrongdoing, including patent infringement, misconduct, want of care or skill, default or failure of performance on the part of said Principal, his agents, subcontractors or employees, in the execution or performance of said contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

1. The said Surety to this bond, for value received, hereby stipulates and agrees that no change or changes, extension of time or extensions of time, alteration or alterations, addition or additions to the terms of the contract or the work to be performed thereunder, or the specifications or drawings accompanying same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change or changes, extension of time or extensions of time, alteration or alterations, or addition or additions to the terms of the contract or to the work or to the specifications or drawings.

2. If pursuant to the contract documents the Contractor shall be declared in default by the Owner under the aforesaid Contract, the Surety shall promptly remedy the default or defaults or shall promptly perform the Contract in accordance with its terms and conditions. It shall be the duty of the Surety to give an unequivocal notice in writing to the Owner within twenty-five (25) days after receipt of a declaration of default of the Surety's election either to remedy the default or defaults promptly or to perform the contract promptly, time being of the essence. In said notice of election, the Surety shall indicate the date on which the remedy or performance will commence, and it shall then be the duty of the Surety to give prompt notice in writing to the Owner immediately upon completion of (a) the remedy and/or correction of each default, (b) the remedy and/or correction of each item of condemned work, (c) the furnishing of each omitted item of work and (d) the performance of the contract. The Surety shall not assert solvency of its Principal as justification for its failure to give notice of election or for its failure to promptly remedy the default or defaults or perform the contract.

3. Supplementary to and in addition to the foregoing, whenever the Owner shall notify the Surety that the Owner has notice that the Contractor has failed to pay any subcontractor, materialmen, or laborer for labor or materials certified by the Contractor as having been paid for by the Contractor, the Surety shall, within 30 days of receipt of such notice, cause to be paid any unpaid amount for such labor and materials.

4. It is expressly agreed by the Principal and the Surety that the Owner, if he desires to do so, is at liberty to make inquiries at any time of subcontractors, laborers, materialmen, or other parties concerning the status of payments for labor, materials or services furnished in the prosecution of the work.

5. The Surety agrees that other than is provided in this bond it may not demand of the Owner that the Owner shall (a) perform any thing of act, (b) give any notice, (c) furnish any clerical assistance, (d) render any service, (e) furnish any papers or documents, or (f) take any other action of any nature or description which is not required of the Owner to be done under the contract documents.

6. No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the legal successors of the Owner.

Signed and sealed this _____ day of _____ A.D. 19 _____

IN THE PRESENCE OF:

Principal

Title

Surety

Title

(SEAL)

EXHIBIT G

PAYMENT BOND

THIS BOND IS EXECUTED TOGETHER WITH ANOTHER BOND IN FAVOR OF THE OWNER AS OBLIGEE CONDITIONED UPON PERFORMANCE OF THE CONTRACT

KNOW ALL MEN BY THESE PRESENTS:

That _____ as Principal (hereinafter referred
Legal Title and Address of Contractor
to as "Contractor"), and _____ as Surety (hereinafter
Legal Title and Address of Surety
referred to as "Surety"), are held and firmly bound unto _____
Legal Title and Address of Owner
as Obligee (hereinafter referred to as "Owner"), in amount of _____
Contract Price

_____ Dollars (\$ _____), to which payment Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above bounden Principal has entered into a contract with Owner bearing dated _____
_____ for Project No. _____
Date of Project Number and Name of Project

in accordance with drawings and specifications prepared by _____
Full Name and Title of Architect
which said contract is incorporated herein by reference and made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and materials supplied in the prosecution of the work provided for in said contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. The said Surety to this bond, for value received, hereby stipulates and agrees that no change or changes, extension of time or extensions of time, alteration or alterations, addition or additions to the terms of the contract or the work to be performed thereunder, or the specifications or drawings accompanying same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change or changes, extension of time or extensions of time, alteration or alterations, or addition or additions to the terms of the contract or to the work or to the specifications or drawings.
2. A claimant is defined as any subcontractor and any person supplying labor, materials, machinery, or equipment in the prosecution of the work provided for in said contract.
3. Every person entitled to the protection hereunder and who has not been paid in full for labor or materials furnished in the prosecution of the work referred to in said bond before the expiration of a period of ninety days after the day on which the last of the labor was done or performed by him, or materials or equipment or machinery was furnished or supplied by him for which such claim is made, or when he has completed his subcontract for which claims made, shall have the right to sue on such payment bond for the amount, or the balance thereof, unpaid at the time of the commencement of such action and to prosecute such action to final execution and judgement for the sum or sums due him; provided, however, that any person having direct contractual relationship with a subcontractor, but no contractual relationship express or implied with the Contractor furnishing said payment bond shall have the right of action upon said payment bond upon giving written notice to said Contractor within ninety days from the day on which such person did or performed the last of the labor, or furnished the last of the materials or machinery or equipment for which such claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished or supplied or for whom the labor was performed or done; provided further that nothing contained herein shall limit the right of action to said 90-day period. Notice may be served by depositing a notice, registered mail, postage prepaid, duly addressed to the Contractor at any place he maintains an office or conducts his business, or his residence, in any post office or branch post office or any letter box under the control of the Post Office Department or, notice may be served in any manner in which the sheriffs of Georgia are authorized by law to serve summons or process. Every suit instituted under this section shall be brought in the name of the claimant without the Owner being made a party thereto. The official who has the custody of said bond is authorized and directed to furnish, to any person making application therefor who submits an affidavit that he has supplied labor or materials for such work and payment therefor has not been made, or that he is being sued on any such bond, a copy of such bond and the contract for which it was given, certified by the official who has custody of said bond; this copy shall be primary

evidence of said bond and contract and shall be admitted in evidence without further proof. Applicants shall pay for such certified copies and such certified statements such fees as the official fixes to cover the cost of preparation thereof, but in no case shall the fee exceed the fees which the clerks of the superior courts are permitted to charge for similar copies.

4. No action can be instituted on this bond after one year from the date of the final certificate of the Architect.

5. Further, this bond shall be considered the same as a bond furnished under Section 13-10-1 *et seq.*, of the Code of Georgia, as amended, and all provisions of law pertaining to bonds furnished under said Section shall pertain hereto.

Signed and sealed this _____ day of _____ A.D. 19_____

IN THE PRESENCE OF:

Principal

Title

Surety

Title

(SEAL)

EXHIBIT H

CERTIFICATE OF MANUFACTURER

[INSTRUCTIONS FOR PREPARATION OF CERTIFICATE: To be acceptable, the certificate must be prepared in the form indicated by this specimen on the official letterhead of the manufacturer. No portions of the certificate may be omitted. Attached is a copy of the contract provision under which the certificate is required. The Owner needs only one copy of the certificate. If equipment of a manufacturer is not installed in strict compliance with the recommendations of the manufacturer or if in the design of the work the equipment is not installed in strict compliance with the recommendations of the manufacturer, a letter from the manufacturer should be forwarded to the Contractor [with copies to the Architect and the Owner] setting forth a list of the deviations from the recommendations of the manufacturer and stating what remains to be done in order to bring the work into strict compliance with the recommendations of the manufacturer. [See "Definitions" set forth on the last page of this specimen.] Prior to calling upon the representative of the manufacturer for performance of the services necessary to enable him to execute a certificate in accordance with this specimen, it is the obligation of the Contractor to have installed the work in strict compliance with the recommendations of the manufacturer. [See Article E-53 of the General Conditions], and it is likewise the obligation of the Contractor to have put the equipment in good operating condition in absolute and final readiness for the "start-up", "testing", and "placing into operation" as defined hereinbelow by the representative of the manufacturer.]

Name of Owner _____ Date: _____
Address _____
City State Zip _____

Re: Certificate of _____ that equipment or
Legal Name of Manufacturer
components furnished by it has [or have, as the case may be] been installed in strict compliance with its
recommendations and is [or are, as the case may be] operating properly at Project No. _____
Number and Name of Project _____

Gentlemen:

1. We certify through our duly authorized and acting agent that the following item [or items, as the case may be] furnished by us to the project or improvement named in the caption was [or were, as the case may be] started up, tested, and placed in operation by our authorized field representative on [enter date on which the field representative performed the start-up, test, and placing into operation] and is [or are, as the case may be] operating properly:

[List the item or items furnished to the job. Show catalogue number or numbers.]

2. We certify further that the aforesaid equipment was installed in strict compliance with our recommendations as published by us in the following document [or documents, as the case may be]:

[Insert the date, name, or other positive means of identifying the exact document or documents in which the recommendations for installation and use of the item or items are published.] (*)

3. A copy of the aforesaid document(s) is (are) attached hereto.

This _____ day of _____, 19____.

By _____
Legal Name of Manufacturer
Authorized Representative

(*) The date must be shown

(Form No. 290)
(9-3-69)
[Attachment—Copy of contract provision—(Article E-67)]

DEFINITIONS:

- 1. "Start-up" is defined as putting the equipment into action.
2. "Testing" is defined as performing such testing as is stipulated in the contract documents to be performed.
3. "Placing into operation" is defined as operating the equipment for a sufficient period of time for the determination to be made that it is performing properly

EXHIBIT I

FORM OF AGREEMENT BETWEEN CONTRACTOR AND OWNER

THIS AGREEMENT made the _____ day of _____ in the year Nineteen
Hundred and _ by and between _____

_____ hereinafter called the Contractor, and _____

_____ hereinafter called the Owner,

WITNESSETH, That the Contractor and the Owner for the consideration hereinafter named agree as follows:

1. SCOPE OF THE WORK--The Contractor shall furnish all of the materials and perform all of work shown on the drawings or described in the specifications entitled _____ prepared by James W. Buckley & Associates, Inc. acting as and in these contract documents entitled the Architect; and shall do everything required by this agreement, the general conditions of the contract, the specifications or the drawings.

2. TIME OF COMPLETION.--The work to be performed under this contract shall be commenced within ten (10) days of Notice to Proceed and shall be completed no later than _____.

3. THE CONTRACT SUM--The Owner shall pay the Contractor for the performance of the contract, subject to additions and deductions provided therein, in current funds as follows:

4. PROGRESS PAYMENTS--The Owner shall make progress payments on account of the contract as follows: On or about the 15th day of each month 90 per cent of the value, based on the contract prices, of labor and materials incorporated in the work and of materials suitably stored at the site thereof up to the 1st day of that month, as estimated by the Architect, less the aggregate of previous payments, until one-half of the contract sum is due. At any time after one-half of the contract sum, including change orders, becomes due and the work is

- (a) On or ahead of the construction progress schedule; and
- (b) There are no breaches of orders of condemnation; and
- (c) There is no delinquency in the filing of the final breakdown and accounting, together with vouchers, on force account work as referred to in Subparagraphs (k) and (n) of Article E-15 of the general conditions, if the Contractor requests and the Architect approves, the sum being withheld as retainage will be converted to a lump sum and held by the Owner until final completion. No further retainage will be withheld by the Owner from payments to the Contractor unless ...

- Event (a) The percentage of work complete as set forth in Column (8), Line D, of Form 36-3 falls behind the percentage required by the construction progress schedule by as much as 15 per cent; or
- Event (b) The Contractor breaches an order of condemnation; or
- Event (c) The Contractor becomes delinquent in regard to the filing of the final breakdown and accounting, together with vouchers, on force account work as referred to in Subparagraphs (k) and (n) of Article E-15 of the general conditions.

in which event or events the Owner shall reinstate the 10 per cent retainage on all periodical estimates due to be paid while one or more of the events continues to exist. The Contractor will be given written notice of the reinstatement of the retainage. If the Contractor.....

- (a) Recovers all lost time and puts the work back on schedule; and
- (b) Remedies all breaches of orders of condemnation; and
- (c) Supplies a proper breakdown and accounting on force account work the sums withheld while either or all of the events existed will be converted to an additional lump sum and held by the Owner until final completion, and no further retainage will be withheld unless.....

(1)Event (a) recurs, or

(2)Event (b) recurs, or

(3)Event (c) recurs

in which event or events the Owner shall reinstate the 10 percent retainage on all subsequent periodical estimates. At the discretion of the Owner, the retainage of each subcontractor may be released separately as he completes his work. An application for release of a subcontractor's retainage shall bear the original certificate of the subcontractor, the Contractor, and the Architect that the subcontractor's work has been fully performed and that the sum for which payment is requested is due by the Contractor to the subcontractor. Checks releasing a subcontractor's retainage shall be made payable to the Contractor, the Contractor's surety, and the subcontractor and should be mailed to the Contractor's surety. This article does not create any contractual relationship between the Owner and the subcontractor or any duty of the Owner to any subcontractor. All warranties shall run from the date of the final certificate of the Architect unless otherwise expressly provided in the contract. Payments pursuant to this article shall in no way diminish, change, alter or affect the right of the Owner under the contract documents.

5. FINAL PAYMENT--(a)-Final payment shall be due 30 days after execution of the final certificate by the Architect, provided that all other requirements of the contract shall have been met in full. Final payment shall be made by a check payable to Contractor and surety and shall be mailed to the surety.

(b)-Upon receipt of written notice from the Contractor pursuant to Article E-41 of the general conditions that the work is ready for final inspection, the Architect shall promptly make such inspection, and when he finds the work complies with the contract and when the contract shall have been fully performed he shall promptly issue a final certificate, over his own signature, stating that the work provided for in this contract has been completed under the terms and conditions thereof, and that the entire balance found to be due the Contractor, and noted in said final certificate, is due and payable.

(c)-Before issuance of final certificate, the Contractor shall submit evidence satisfactory to the Architect that all payrolls, material bills, and other indebtedness connected with the work have been paid.

(d)-If full completion of the work is materially delayed through no fault of the Contractor, and the Architect so certifies, the Owner shall, upon certificate of the Architect, and without terminating the contract, make payment of the balance due for that portion of the work fully completed. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of payment for incomplete work.

6. THE CONTRACT DOCUMENTS--The general conditions of the contract, the specifications, the drawings, the signed proposal form, and the notice of acceptance of the said proposal together with this agreement form the contract, and they are as fully a part of the contract as if hereto attached or herein repeated. The drawings and specifications shall be identified by the Architect pursuant to the general conditions.

7. BONDS--The Contractor shall furnish both a performance bond and a payment bond and shall pay the premium thereon. The performance bond shall guarantee the full performance of the contract.

8. Indemnity by the Contractor: The Contractor agrees to indemnify and hold harmless the Owner and the Architect from any liabilities, damages and costs (including reasonable attorney's fees) to the extent caused by the negligent acts, errors or omissions of the Contractor, its subcontractors, or anyone for whom Contractor is legally responsible.

IN WITNESS WHEREOF the parties hereto have executed this agreement the day and year first written above.

OWNER

CONTRACTOR

BY: Superintendent

BY: Contractor

Secretary

Seal if a Corporation

Georgia Department of Education
Facilities Services Unit

Certificate of the Contractor or His Duly Authorized Representative

Reimbursement Request Number _____ Project Number(s) _____
Project Name _____

To the best of my knowledge and belief, I certify that all items, units, quantities, and prices of work and material shown on this Reimbursement Request Number _____ are correct and that all work has been performed and materials supplied in full accordance with the terms and conditions of the contract documents between the _____ (Owner) and _____ (Contractor); dated: _____ and all authorized changes thereto; and that the following is a true and correct statement of the contract account up to and including the last day of the period covered by this estimate and that no part of the "amount due this estimate" has been received.

I. Original Contract Sum	\$0.00
2. Net change by Change Orders	\$0.00
3. Contract Sum to Date(1 + 2).....	\$0.00
a. Total amount earned for work in place (original contract).....	\$0.00
b. Total amount earned for work in place (change orders).....	\$0.00
c. Value of materials stored at site	\$0.00
d. Total amount earned (a plus b plus c).....	\$0.00
e. Amount retained (10%).....	\$0.00
f. Total earned less retained percentage (d minus e)	\$0.00
g. Total previously approved	\$0.00
h. Total due this request for contractor (f minus g).....	\$0.00
i. Amount due this request for architect	\$0.00
j. Total amount requested (h plus i).....	\$0.00

I further certify that all claims outstanding against the undersigned contractor for labor, materials and expendable equipment employed in the performance of said contract have been paid in full in accordance with the requirements of said contract, except such outstanding claims as are listed below or on the attached sheet, which statement contains all claims against the contractor which are not yet paid, including all disputed claims and any claims to which the contractor has or will assert any defense.

I further certify that all the materials indicated on this Reimbursement Request as being stored on the site, but not yet incorporated into the building have been purchased, delivered and are now stored on the site for future incorporation into the building, and until so incorporated the title to same is, upon payment of this statement, vested in the owner Furthermore, the undersigned contractor assumes full responsibility for the existence, protection, and, if necessary replacement of the above mentioned materials until the completion of this contract.

Contractor/Construction Mgr. _____ Date _____

By _____ (Signature) Title _____

Certificate of the Supervising Architect

I certify that I have verified this Reimbursement Request and that to the best of my knowledge and belief it is a true and correct statement of work performed and materials supplied by the contractor and that the contractor's certified statement of this account and the amount due him is correct and just and that all work and materials in this Reimbursement Request have been performed in full accordance with the terms and conditions of the contract documents and authorized changes thereto.

Name _____ (Signature) Architect. Date _____

EXHIBIT K

SUMMARY OF MATERIALS STORED

In support of Reimbursement Request No. _____

(Project Improvement No.) _____ Period Ending: _____

Contractor: _____

ITEM NO.	NAME (Contractor or Subcontractor)	TYPE OF MATERIAL	QUANTITY	AMOUNT (Dollars)
		TOTALS		

Prepared by _____ for _____
(Contractor)

Date __, and certified by him to be a true and accurate statement.

Checked and concurred in:

By: _____
Resident Engineer Inspector or Architect

Date: _____

EXHIBIT L

SCHEDULE OF CHANGE ORDERS

In support of Reimbursement Request No. _____

Project Improvement No _____ Period Ending: _____

Contractor: _____

CHANGE ORDERS		ADDITIONS			DEDUCTIONS
Number (1)	Date (2)	Authorized Amount (3)	Amount This Period (4)	Completed Previous Periods (5)	Authorized Deductions (6)

EXHIBIT M

SCHEDULE OF VALUES

APPLICATION NUMBER:

PROJECT NAME:

CAPITAL OUTLAY PROJECT NUMBER(s):

A	B	C	D	E	F	G		H	I
			WORK COMPLETED						
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION (D+E)	THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G/C) #DIV/0!	BALANCE TO FINISH (C-G)	RETAINAGE (IF VARIABLE RATE)
						\$0.00		\$0.00	\$0.00
	TOTAL	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	#DIV/0!	\$0.00	#DIV/0!

EXHIBIT N

DETAILED BREAKDOWN SUMMARY

Sheet 1 of 8 Sheets

NAME OF IMPROVEMENT _____

NO. OF IMPROVEMENT _____ CONTRACT PRICE _____

SCHOOL SYSTEM _____ LOCATION _____

CONTRACTOR'S NAME AND ADDRESS _____

Spec. Div. No. (1)	Description Of Division (2)	No. & Kind Of Units (3)	Labor Costs (\$) (4)	Material Costs (\$) (5)	Other Costs (\$) (6)	Total Costs (\$) (7)
1	General Requirements		126,455	3,100	211,030	340,585
2	Sitework		184,319	90,176	21,625	296,120
3	Concrete		218,900	242,106	0	461,006
4	Masonry		877,741	592,149	1,300	1,471,190
5	Metals		134,262	489,573	6,700	630,535
6	Wood & Plastics		49,446	81,619	0	131,065
7	Thermal & Moisture Protection		145,868	233,507	0	379,075
8	Door & Windows		84,384	169,191	0	253,575
9	Finishes		294,447	502,728	5,440	802,615
10	Specialties		13,705	91,130	0	104,835
11	Equipment		400	12,915	0	13,315
12	Furnishings		0	0	0	0
13	Special Const.		44,979	213,041	0	258,020
14	Conveying Systems		0	0	0	0
15	Mechanical		0	0	1,859,075	1,859,075
16	Electrical		0	0	1,013,145	1,013,145
	TOTALS		\$2,174,906	\$2,721,235	\$3,118,315	\$8,014,456

Submitted By: _____

Approved By: _____

Contractor _____

Architect _____

Date _____

Date _____

(INSTRUCTIONS: The sums shown on the breakdown on the)
 (General Contractor for "Plumbing", "Heating", "Electrical,)
 ("Airconditioning", etc., must agree in amount with the)
 ("Total Contract Price" shown on breakdown for these trades.)

SUPPLEMENTAL DETAILED BREAKDOWN

Sheet 2 of 8 Sheets

NAME OF IMPROVEMENT _____

NO. OF IMPROVEMENT _____ CONTRACT PRICE _____

SCHOOL SYSTEM _____ LOCATION _____

CONTRACTOR'S NAME AND ADDRESS _____

Spec. Div. No. (1)	Description Of Division (2)	Number & Kind Of Units (3)	Labor Costs Dollars (4)	Material Costs Dollars (5)	Other Costs Dollars (6)	Total Costs Dollars (7)
1	General Requirements					
	a. Insurance & Bonds	LS			118,485	118,485
	b. Permits	LS			6,470	6,470
	c. Mobilization	1 Mo.	10,030	3,100	7,000	20,130
	d. Testing/Eng.	4 Mo.			17,920	17,920
	e. Supervision	65 Wk.	74,230			74,230
	f. Temp. Utilities	15 Mo.			30,285	30,285
	g. Field Office	15 Mo.			30,870	30,870
	h. Security	15 Mo.	6,285			6,285
	i. Clean-Up	15 Mo.	35,910			35,910
2	Sitework:					
	a. Site Utilities:					
	Water	3280 LF	14,432	19,358		33,790
	Sanitary	1790 LF	31,859	20,871		52,730
	Road Crossing	1 EA	9,240			9,240
	Storm	5280 LF	61,565	39,755		101,320
	b. Fnd. Excavation	3100 LF	19,220		12,240	31,460
	c. Canopy Walkway	4120 LF	4,223	5,562		9,785
	d. Fine Grade	148,000 SF	29,600		6,385	35,985
	e. Termite Treatment	148,000 SF	5,180	1,230		6,410
	f. Temp. Grassing	4 Acres	9,000	3,400	3,000	15,400
3	Concrete:					
	a. Bldg. Foundation	1035 CY	50,625	36,225		86,850
	b. Slab-on-grade	148,000 SF	111,000	82,285		193,285
	c. Trench Drains	7 EA	35,000	32,116		67,116
	d. Equipment Pads	1825 SF	5,475	1,835		7,310
	e. Elevated Slabs	16,000 SF	16,800	7,215		24,015
	f. Reinf. (Material)	170 T		82,430		82,430
4	Masonry:					
	a. Brick	420 M	184,680	50,400		235,080
	b. 4" CMU	7 M	10,890	4,200		15,090
	c. 6" CMU	58 M	97,620	35,800		133,420
	d. 8" CMU	209 M	369,435	128,535		497,970
	e. 12" CMU	17 M	39,400	10,880		50,280
	f. 8" CMU (Rated)	20 M	44,500	13,000		57,500
	g. 12" CMU (Rated)	7 M	90,840	9,800		100,640
	h. Mortar	14,400 EA		66,130		66,130
	i. Sand	2100 CY		29,570		29,570
TOTALS			\$	\$	\$	\$

Submitted By: _____

Approved By: _____

Contractor _____

Architect _____

SUPPLEMENTAL DETAILED BREAKDOWN

Sheet 3 of 8 Sheets

NAME OF IMPROVEMENT _____

NO. OF IMPROVEMENT _____ CONTRACT PRICE _____

SCHOOL SYSTEM _____ LOCATION _____

CONTRACTOR'S NAME AND ADDRESS _____

Spec. Div. No. (1)	Description Of Division (2)	Number & Kind Of Units (3)	Labor Costs Dollars (4)	Material Costs Dollars (5)	Other Costs Dollars (6)	Total Costs Dollars (7)
4	Masonry (Cont.)					
	j. Reinforcing	150,000 LF		23,100		23,100
	k. Ties and Anchors	10,000 EA		13,350		13,350
	l. Cavity Insulation	50,000 SF		26,700		26,700
	m. Dampproofing	50,000 SF	8,000	4,830		12,830
	n. Concrete Fill	1100 CY		124,260		124,260
	o. Flashing	5000 LF		2,970		2,970
	p. Brick Cleaning	63,000 SF	7,762	2,588		10,350
	q. Block Cleaning	329,000 SF	12,675	4,225		16,900
	r. Cast Stone	760 LF	5,946	17,839		23,785
	s. Concrete Columns	14 EA	5,993	23,972	1,300	31,265
5	Metals:					
	a. Structural Steel	319 T	79,603	282,227	3,800	365,630
	b. Joists	175 T	31,753	112,577	2,200	146,530
	c. Metal Deck	1426 SQ	21,668	76,822	700	99,190
	d. Misc. Metal	8 T		15,980		15,980
	e. Floor Sleeves	4 EA	500	595		1,095
	f. Aluminum Reveal	760 LF	738	1,372		2,110
6	Carpentry:					
	a. Rough Carpentry	36,150 LF	17,108	27,912		45,020
	b. Finish Carpentry	4200 LF	6,480	11,520		18,000
	c. Millwork:					
	Base	66 LF	2,377	3,878		6,255
	Wall	37 LF	1,150	1,875		3,025
	Shelving	378 LF	16,673	27,202		43,875
	Stain/Finish	471 LF	5,658	9,232		14,890
7	Moisture Protection:					
	a. Roofing:					
	Insulation	1208 SQ	33,588	62,377		95,965
	Membrane	1208 SQ	67,084	124,586		191,670
	Metal Flashing	4132 LF	8,180	14,335		22,515
	b. Spray Fireprfg.					
	Beams	2417 LF	3,164	1,356		4,520
	Deck	45,848 SF	10,015	4,290		14,305
	Joists	8623 LF	14,851	6,364		21,215
	c. Waterproofing	1180 SF	1,260	540		1,800
	d. Caulk & Sealant	2080 LF	1,280	320		1,600
	e. Ceil. Ins. @ Gym.	12880 SF	6,446	19,339		25,785
TOTALS			\$	\$	\$	\$

Submitted By: _____

Approved By: _____

Contractor _____

Architect _____

SUPPLEMENTAL DETAILED BREAKDOWN

Sheet 4 of 8 Sheets

NAME OF IMPROVEMENT _____

NO. OF IMPROVEMENT _____ CONTRACT PRICE _____

SCHOOL SYSTEM _____ LOCATION _____

CONTRACTOR'S NAME AND ADDRESS _____

Spec. Div. No. (1)	Description Of Division (2)	Number & Kind Of Units (3)	Labor Costs Dollars (4)	Material Costs Dollars (5)	Other Costs Dollars (6)	Total Costs Dollars (7)
8	Doors and Windows:					
	a. Hollow Metal	372 EA	29,760	40,815		70,575
	b. Finish Hardware	630 EA	27,090	65,440		92,530
	c. Wood Doors	258 EA	11,352	25,958		37,310
	d. Roll-Up Doors	7 EA	1,407	7,143		8,550
	e. Windows	58 EA	8,700	11,510		20,210
	f. Alum. Storefront	3 EA	2,439	9,301		11,740
	g. Glass & Glazing	3636 SF	3,636	9,024		12,660
9	Finishes:					
	a. Plaster	398 SY	12,710	11,940		24,650
	b. Drywall	31,500 SF	45,600	106,400		152,000
	c. Acoustical Ceil.	113,335 SF	25,925	77,775		103,700
	d. Acou. Wall Trmt.	767 SF	1,580	6,320		7,900
	e. Drywall Sub-Bond	LS			5,440	5,440
	f. Hard Tile					
	Ceramic Floor	3550 SF	5,135	15,405		20,540
	Ceramic Walls	8900 SF	13,146	27,934		41,080
	Marble Thresh.	40 EA	200	310		510
	Quarry Floor	8300 SF	18,734	30,566		49,300
	Quarry Base	1600 LF	2,147	3,503		5,650
	g. Terrazzo	23,800 SF	104,306	81,954		186,260
	h. Stage Floor	1980 SF	3,745	7,605		11,350
	i. Gym Floor	11,225 SF	25,045	50,850		75,895
	j. Painting					
	Walls	225,000 SF	21,255	43,155		64,410
	Epoxy	47,000 SF	5,751	10,679		16,430
	Structural	13,500 SF	2,704	5,251		7,955
	Doors/Frames	355 EA	4,078	21,412		25,490
	Ext. Spec. Coat	950 SF	322	653		975
	Graphics.	2000 LF	2,064	1,016		3,080
10	Specialties:					
	a. Chalk/Tackboard	145 EA	3,171	28,539		31,710
	b. Toilet Ptns.	61 EA	3,700	33,225		36,925
	c. Flagpole	1 EA	275	1,505		1,780
	d. Signage	359 EA	2,198	3,297		5,495
	e. Fire Ext. & Cab.	78 EA	1,296	7,349		8,645
	f. Tlt. Accessories	251 EA	1,845	11,725		13,570
	g. Canopies	8 EA	970	3,820		4,790
	h. Folding Partition	1 EA	250	1,670		1,920
TOTALS						

Submitted By: _____

Approved By: _____

Contractor _____

Architect _____

SUPPLEMENTAL DETAILED BREAKDOWN

Sheet 5 of 8 Sheets

NAME OF IMPROVEMENT _____

NO. OF IMPROVEMENT _____ CONTRACT PRICE _____

SCHOOL SYSTEM _____ LOCATION _____

Contractor's NAME AND ADDRESS _____

Spec. Div. No. (1)	Description Of Division (2)	Number & Kind Of Units (3)	Labor Costs Dollars (4)	Material Costs Dollars (5)	Other Costs Dollars (6)	Total Costs Dollars (7)
11	Equipment: a. Kitchen Equipment: Item #10 Item #13 Item #43	1 EA 1 EA 1 EA	100 100 200	2,320 4,340 6,255		2,420 4,440 6,455
12	Furnishings: Not Applicable					
13	Special Construction: a. Pre-Eng. Building b. Insulation	40,000 SF 46,400 SF	42,404 2,575	207,031 6,010		249,435 8,585
14	Conveying Systems: Not Applicable					
15	Mechanical: a: Plumbing b: Fire Protection c: HVAC				460,470 143,130 1,255,475	460,470 143,130 1,255,475
16	Electrical:				1,013,145	1,013,145
NOTES: NO LUMP SUMS ALLOWED EXCEPT AS EVIDENCED BY ATTACHED BREAKDOWNS. ALL WORK, INCLUDING SUBCONTRACTS, SHALL BE BROKEN DOWN IN UNIT COSTS.						
TOTALS			\$2,174,906	\$2,721,235	\$3,118,315	\$8,014,456

Submitted By _____

Approved By: _____

Contractor _____

Architect _____

SUPPLEMENTAL BREAKDOWN OF "PLUMBING"

Date _____

PERIODICAL ESTIMATE NO. _____

Item	Total Material Quantity	Unit Price Material Stored	Unit Price Material Installed	Total Material Installed	Material Installed to Date		Material Stored on Site	
					Quantity	Total	Quantity	Total
Water Meter								
Water Service Line								
Soil Pipe								
Soil Pipe Fittings								
Steel Pipe								
Steel Pipe Fittings								
Concrete Pipe & Fittings								
Valves								
Drains								
Down Spout								
Boots								
Insulation								
Fixtures								
Grease Traps								
Hot Water Boiler & Trim								
Hot Water Storage Tanks								
Breeching								
NOTES: NO LUMP SUMS ALLOWED. ALL WORK, INCLUDING SUBCONTRACTS, SHALL BE BROKEN DOWN IN UNIT COSTS.								
TOTAL CONTRACT PRICE								

Total Material Installed \$ _____
Material Stored on Site \$ _____
Total Amount Earned \$ _____
Less 10% retained \$ _____
Total earned less retained percentage \$ _____
Less Previous payments \$ _____
 AMOUNT DUE THIS ESTIMATE \$ _____

(INSTRUCTIONS: The total contract price on this supplemental)
 (breakdown must agree in amount with the sum shown for plumbing)
 (on the initial breakdown of the Contractor.)

SUPPLEMENTAL BREAKDOWN OF "HEATING"

Date _____

PERIODICAL ESTIMATE NO. _____

Item	Total Material Quantity	Unit Price Material Stored	Unit Price Material Installed	Total Material Installed	Material Installed to Date		Material Stored on Site	
					Quantity	Total	Quantity	Total
Boiler								
Breeching								
Condensate Pump								
Gas Burner								
Convector								
Heating Controls								
Exhaust Fans								
Radiator Traps & Valves								
Gate Valves								
Pipe Fittings								
Steel & W.I. Pipe								
Insulation								
Outside Gas Line								
Pipe Hangers								
NOTES: NO LUMP SUMS ALLOWED. ALL WORK, INCLUDING SUBCONTRACTS, SHALL BE BROKEN DOWN IN UNIT COSTS.								
TOTAL CONTRACT PRICE								

Total Material Installed \$ _____
Material Stored on Site \$ _____
Total Amount Earned \$ _____
Less 10% retained \$ _____
Total earned less retained percentage \$ _____
Less Previous payments \$ _____
 AMOUNT DUE THIS ESTIMATE \$ _____

(INSTRUCTIONS: The total contract price on this supplemental)
 (breakdown must agree in amount with the sum shown for heating)
 (on the initial breakdown of the Contractor.)

SUPPLEMENTAL BREAKDOWN OF "ELECTRICAL"

Date _____

PERIODICAL ESTIMATE NO. _____

Item	Total Material Quantity	Unit Price Material Stored	Unit Price Material Installed	Total Material Installed	Material Installed to Date		Material Stored on Site	
					Quantity	Total	Quantity	Total
Conduit	17940 ft	.15	41.00	7,355.40				
Conduit Fittings, Condulets, etc.	47	2.18	2.75	129.25				
Conduit Locknuts & Bushings	2175	.03	.06	130.50				
Junction Boxes & Tele. Cabinets	4	5.20	20.00	80.00				
Bare & Insulated Wire & Cable	47775 ft	.04	.12	5,733.00				
Switches, Receptacles, Plates & Devices	499	.50	.70	349.30				
Outlet Boxes & Plaster Rings	590	.35	.45	265.50				
Lighting & Power Panels	8	259.84	395.00	3,160.00				
Breakers	3	222.67	320.00	960.00				
Lighting Fixtures	241	35.90	40.00	9,640.00				
Fire Alarm Equipment	26	12.47	21.00	546.00				
Clocks, Bells, Speakers, etc.	59	36.13	40.00	2,360.00				
Fuses	19	.06	.15	2.85				
Devices furnished by others	35		2.00	70.00				
Excavation & Backfill	970 ft	.06	.06	58.20				
Concrete	8 CY	20.00	20.00	160.00				

NOTES: NO LUMP SUMS ALLOWED.

ALL WORK, INCLUDING SUBCONTRACTS, SHALL BE BROKEN DOWN IN UNIT COSTS.

				31,000.00				

Total Material Installed \$ _____

Material Stored on Site \$ _____

Total Amount Earned \$ _____

Less 10% retained \$ _____

Total earned less retained percentage \$ _____

Less Previous payments \$ _____

AMOUNT DUE THIS ESTIMATE \$ _____

(INSTRUCTIONS: The total contract price on this supplemental)
 (breakdown must agree in amount with the sum shown for electrical)
 (on the initial breakdown of the Contractor.)

**SECTION 01040
PROJECT COORDINATION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. General: Contractor responsible for coordination and verification of all elements of Work with requirements of Contract Documents.
 - 1. Contractor required to coordinate information provided in construction documents with Surveyor, layout work, Suppliers, Subcontractors, his own forces, Architect, and others as required to assure proper interface of the various components of Work.
- B. Discrepancies: Prior to proceeding with purchasing or installing any element of Work, Contractor notify Architect, in writing, of any discrepancies in Contract Document requirements.
 - 1. Contractor obtain written clarification from Architect resolving those discrepancies in every case.
 - 2. Minimum administrative and supervisory requirements necessary for coordination of Work on Project include but not necessarily limited to following:
 - a. Coordination and meetings.
 - b. Administrative and supervisory personnel.
 - c. Surveys and records or reports.
 - d. Limitations for use of site.
 - e. Special reports.
 - f. General installation provisions.
 - g. Cleaning and protection.
 - h. Conservation and salvage.

1.03 COORDINATION AND MEETINGS

- A. General:
 - 1. Prepare written memorandum on required coordination activities.
 - 2. Include such items as required notices, reports and attendance at meetings.
 - 3. Distribute this memorandum to each entity performing work at project site.
 - 4. Prepare similar memorandum for separate contractors where interfacing of their work required.
- B. Coordination Drawings:
 - 1. Prepare coordination drawings where work by separate entities requires fabrication off-site of products and materials which must accurately interface.
 - 2. Indicate on coordination drawings how work shown by separate shop drawings will interface, and indicate sequence for installation.
 - 3. Comply with all requirements of "submittals" section.
- C. Monthly Coordination Meetings: Hold monthly general project coordination meetings at regularly scheduled times convenient for all parties involved.
 - 1. These meetings in addition to specific meetings held for other purposes, such as regular project meetings and special preinstallation meetings.
 - 2. Request representation at each meeting by every party currently involved in coordination or planning for Work of entire project.
 - 3. Conduct meetings in manner which will resolve coordination problems.
 - 4. Record results of meeting and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
 - 5. At Contractor's option, monthly coordination meetings can be held integrally with monthly progress meetings as specified in section "Schedules, Reports, Payments".

1.04 PRE-CONSTRUCTION CONFERENCE

- A. Prior to starting construction, a pre-construction conference will be held to discuss procedural requirements of the contract.
 - 1. The Architect shall submit to the contractor a letter of intent to award a contract. This letter shall describe information and documents required for pre-construction meeting.
 - 2. The following people shall be in attendance: The Owner, Architect, General Contractor's project superintendent, plumbing sub-contractor, mechanical sub-contractor, and electrical sub-contract.
 - 3. The contractor shall provide to the architect, at the time of the pre-construction conference, the following:
 - a. CPM Project Schedule; min. 4 copies.
 - b. One original and two copies of the payment and performance bonds with power of attorney. Bonds shall include bond number and a letter from the bonding company stating their A.M. Best rating and size for each bond.
 - c. One original and two copies of the performance bonds for major sub-contractors with power of attorney. Bonds shall include bond number and a letter from the bonding company stating their A.M. Best rating and size for each bond.
 - d. Three copies of the Labor and Material Bond.
 - e. One original and two copies of Certificates of insurance.
 - f. Three copies of list of sub-contractors with contact persons and 24-hour telephone numbers. Include with the list the name and phone numbers for the General Contractor's project manager and project superintendent.

1.05 MONTHLY MEETINGS

- A. When request by the Owner and/or Architect, normally on a monthly basis for duration of project, the Contractor and certain sub-contractors shall attend progress and coordination meetings held in the Owner's offices. The following people shall attend the monthly meetings:
 - 1. Contractor's superintendent
 - 2. Contractor's project manager or principal of the contractor.
 - 3. Sub-contractors when requested by the Owner or Architect.
 - 4. Representative of the Owner
 - 5. Representative of the Architect

1.06 SURVEYS AND RECORDS/REPORTS

- A. General:
 - 1. Working from lines and levels established by property survey, establish and maintain bench marks and other dependable markers.
 - 2. Establish bench marks and markers to set lines and levels for work at each level of construction and elsewhere as needed to properly locate each element of Project.
 - 3. Calculate and measure required dimensions shown within recognized tolerances.
 - 4. Do not scale drawings to determine dimensions.
 - 5. Advise entities performing work, of marked lines and levels provided for their use.
- B. Surveyor: Engage Land Surveyor or Professional Engineer experienced and specializing in land survey work, registered in State where Project located, to perform those services specified in this article.
 - 1. Survey Procedures:
 - a. Before proceeding with layout of actual work, verify layout information shown on drawings, in relation to property survey and existing benchmarks.
 - b. Maintain surveyor's log or record book of such checks; make this log or record book available for Architect or Engineer's reference.
 - c. Record deviations from required lines and levels, and advise Architect or Engineer promptly upon detection of deviations that exceed indicated or recognized tolerances.
 - d. Record deviations which are accepted, and not corrected, on record drawings.

2. Minimum Survey Requirements: As a minimum the contractor shall have licensed surveyor perform the following:
 - a. Layout drives, roads, paving, parking, walks, and other site improvements.
 - b. Layout underground utility distribution lines; including water, storm, sewer, gas, and electrical.
 - c. Establish building location and orientation.
 - d. Layout building.
 - e. As work proceeds, check every major building element, including building utilities for line, level, elevation and plumb.
3. Final Property Survey:
 - a. Before Final Acceptance, prepare final property survey showing significant features (real property) resulting from construction of Project.
 - b. Include on survey a certification, signed by Surveyor, to effect that principle lines and levels of project are accurately positioned as shown on survey.
 - c. Submit 10 blue-line copies of final property survey.

1.07 COMMUNICATIONS

- A. Form of Communications: All communications to the architect, whether in the form of letters, memos, requests for information, transmittals, or other forms of communication shall be in type written, hard copy form unless otherwise agreed by the architect in writing.
 1. If the architect permits other forms of communications, such approval may be revoked by the architect at any time.
 2. If the architect agrees to accept forms of communication other than 'hard copy', such other forms of communication shall be in addition to the hard copy.
- B. Electronic Communications:
 1. The architect will not accept, from the contractor, electronically generated and/or transmitted forms, correspondence, requests for information, change orders or other forms of communication.
- C. Computer Generated Correspondence:
 1. The architect will not accept, from the contractor, forms of communication which have been automatically generated by computer.
- D. Delivery of Communications: Letters, shop drawings, responses to requests for information and other forms of communications will be transmitted to the contractor by the most economical method available.
 1. The architect will not intend to transmit project documentation, paperwork, or correspondence using Overnight type delivery or other premium type delivery services.
 2. If the contractor requests that communications be delivered using methods other than the type normally used by the architect, the contractor shall pay for the cost of such delivery method.

1.08 LIMITATIONS ON USE OF THE SITE

- A. General:
 1. Limitations on site usage as well as specific requirements that impact site utilization are indicated on drawings and by other contract documents.
 2. In addition to these limitations and requirements administer allocation of available space equitably among entities needing both access and space to produce best overall efficiency in performance of total Work of Project.
 3. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

1.09 SPECIAL REPORTS

- A. General:
 1. Submit special reports directly to Owner within one day of occurrence.
 2. Submit copy of report to Architect/Engineer and other entities affected by occurrence.

- B. Reporting Unusual Events:
 - 1. When event of unusual and significant nature occurs at site, prepare and submit special report.
 - 2. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects and similar pertinent information.
 - 3. Advise Owner in advance when such events known or predictable.
- C. Reporting Accidents:
 - 1. Prepare and submit reports of significant accidents, at site and anywhere else Work in progress.
 - 2. Record and document data and actions.
 - 3. For this purpose, significant accident defined to include events where personal injury sustained, or property loss of substance sustained, or where event posed significant threat of loss or personal injury.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION PROVISIONS

- A. Pre-Installation Conferences:
 - 1. Hold a pre-installation meeting at project site well before installation of each unit of work which requires coordination with other work.
 - 2. Installer and representatives of manufacturers and fabricators involved in or affected by that unit of work, and with its coordination or integration with other work that has preceded or will follow attend this meeting.
 - 3. Advise Architect/Engineer of scheduled meeting dates.
 - 4. At each meeting review progress of other work and preparations for particular work under consideration including specific requirements for following:
 - a. Contract documents.
 - b. Options.
 - c. Related change orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Shop drawings, product data and quality control samples.
 - g. Possible conflicts and compatibility problems.
 - h. Time schedules.
 - i. Weather limitations.
 - j. Manufacturer's recommendations.
 - k. Compatibility of materials.
 - l. Acceptability of substrates.
 - m. Temporary facilities.
 - n. Space and access limitations.
 - o. Governing regulations.
 - p. Safety.
 - q. Inspection and testing requirements.
 - r. Required performance results.
 - s. Recording requirements.
 - t. Protection.
 - 5. Record significant discussions of each conference, and record agreements and disagreements, along with final plan of action.
 - 6. Distribute record of meeting promptly to everyone concerned, including Owner and Architect/Engineer.
 - 7. Do not proceed with work if pre-installation conference cannot be successfully concluded.
 - a. Initiate whatever actions necessary to resolve impediments to performance of Work and reconvene pre-installation at earliest feasible date.

- B. Installer's Inspection of Conditions:
 - 1. Require Installer of each major unit of work to inspect substrate to receive work and conditions under which work performed.
 - 2. Installer report all unsatisfactory conditions in writing to Contractor.
 - 3. Do not proceed with work until unsatisfactory conditions corrected in manner acceptable to Installer.
 - 4. Installation of product shall be construed as acceptance of conditions as being acceptable for proper installation and performance of product.
 - C. Manufacturer's Instructions:
 - 1. Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation, to extent that these instructions and recommendations more explicit or more stringent than requirements indicated in Contract Documents.
 - D. Inspect each item of materials or equipment immediately prior to installation.
 - 1. Reject damaged and defective items.
 - E. Provide attachment and connection devices and methods for securing work.
 - 1. Secure work true to line and level, and within recognized industry tolerances.
 - 2. Allow expansion and building movement.
 - 3. Provide uniform joint width in exposed work.
 - 4. Arrange joints in exposed work to obtain best visual effect.
 - 5. Refer questionable visual-effect choices to Architect/Engineer for final decision.
 - F. Recheck measurements and dimensions of Work, as integral step of starting each installation.
 - G. Install each unit-of-work during weather conditions and project status which ensure best possible results in coordination with entire Work.
 - 1. Isolate each unit of work from incompatible work as necessary to prevent deterioration.
 - H. Coordinate enclosure of Work with required inspections and tests, to minimize necessity of uncovering work for that purpose.
 - I. Mounting Heights:
 - 1. Where mounting heights not indicated, mount individual units of work at industry recognized standard mounting heights for particular application indicated.
 - 2. Refer questionable mounting height choices to Architect/Engineer for final decision.
- 3.02 CLEANING AND PROTECTION
- A. General: During handling and installation of work at project site, clean and protect work in progress and adjoining work at basis of continuous maintenance.
 - 1. Apply protective covering on installed work where required to ensure freedom from damage or deterioration at time of Final Acceptance.
 - 2. Clean and perform maintenance on installed work frequently as necessary through remainder of construction period.
 - a. Adjust and lubricate operable components to ensure operability without damaging effects.
 - B. Limiting Exposures of Work:
 - 1. To extent possible through reasonable control and protection methods, supervise performance of Work in such manner and by such means which ensures that none of work, whether completed or in progress, subjected to harmful, dangerous, damaging or otherwise deleterious exposure during construction period.
 - 2. Such exposures include, where applicable, but not by way of limitation following:
 - a. Excessive static or dynamic loading.
 - b. Excessive internal or external pressures.
 - c. Excessively high or low temperatures.
 - d. Excessively high or low humidity.
 - e. Water or ice.
 - f. Solvents.
 - g. Chemicals.

- h. Light.
- i. Radiation.
- j. Puncture.
- k. Abrasion.
- l. Heavy traffic.
- m. Soiling.
- n. Bacteria.
- o. Rodent and Insect infestation.
- p. Combustion.
- q. Electrical current.
- r. High speed operation, improper lubrication, unusual wear or other misuse.
- s. Incompatible interface.
- t. Destructive testing.
- u. Misalignment.
- v. Excessive weathering.
- w. Unprotected storage.
- x. Improper shipping or handling.
- y. Theft.
- z. Vandalism.

3.03 CONSERVATION AND SALVAGE

A. General:

1. It is requirement for supervision and administration of Work that construction operations carried out with max. possible consideration given to conservation of energy, water and materials.
2. In addition give maximum consideration to salvaging materials and equipment involved in performance of Work but not incorporated therein.
3. Refer to other sections for required disposition of salvage materials which are Owner's property.

END OF SECTION 01040

SECTION 01110
SUMMARY OF THE WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification section, apply to work of this Section.

1.02 SUMMARY OF WORK

- A. Project Description:
 - 1. Project Name: **Dalton Middle School Addition**
 - 2. Project Location: **Dalton, Georgia**
 - 3. Owner: **Dalton, Public Schools**
 - 4. Drawing and Project Manual Date: **September 1, 2013**
 - 5. Architect: James W. Buckley & Associates, Inc, Albany, Georgia
- B. Contract Documents: Indicate work of Contract and related requirements and conditions that have impact on Project; related requirements and conditions indicated on Contract Documents include, but are not necessarily limited to the following:
 - 1. Existing site conditions and restrictions on use of site.
 - 2. Work performed prior to work under this Contract.
 - 3. Alterations and coordination with existing work.
 - 4. Work performed concurrently by Owner.
 - 5. Work performed concurrently by separate contractors.
 - 6. Work to be performed subsequent to work under this Contract.
 - 7. Alternates.
 - 8. Pre-negotiated equipment/material orders assigned as work of this Contract.
 - 9. Pre-purchased material/equipment for Contract, with purchase price included Contract Sum.
 - 10. Pre-purchased subcontracts for Contract, with subcontract amounts included in Contract Sum.
 - 11. Owner Furnished materials for use and incorporation into project.
 - 12. Requirements for partial Owner occupancy prior to Final Acceptance of Contract Work.
- C. Summary by References: Work of Contract summarized by references to Contract, General Conditions, Supplementary Conditions, Specification Sections, Drawings, addenda and modifications to Contract Documents issued subsequent to initial printing of Project Manual and including but not necessarily limited to printed material referenced by any of these.
 - 1. It is recognized that work of Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions and other forces outside Contract Documents.

1.03 SCHEDULE OF WORK

- A. Maintain work in such manner and method to complete Project on or before specified date.
- B. Contractor prepare and submit construction progress schedule indicating starting and completion dates of all major divisions and key sub-divisions of work.
 - 1. Schedule shall be organized so that the completion date for various aspects of the project occurs on or before dates indicated on the Proposal Form (Section B).
 - 2. Progress schedule shall be submitted prior to the first request for payment. Payment will not be issued until and acceptable schedule is received and approved by the Architect.

- C. The project shall be considered substantially complete only when each of the following conditions have been met.
 - 1. A final inspection has been requested by the contractor and performed by the Architect and a letter of substantial completion issued.
 - 2. A final inspection has been requested by the contractor and performed by the state Local Building Inspector and State Fire Marshall's office and an Occupancy Permit Issued.

1.04 PHASING AND SEQUENCING OF WORK

- A. General: Phasing and sequencing of work to be scheduled and performed in a manner so as to minimize disruptions to school functions.
- B. Operation of Existing Building: Work shall be phased and sequenced in a manner necessary to ensure that existing building services (waster, sewer, gas, electrical, and other similar and related services) remain in full operation at all times that the building is occupied.
 - 1. Transfer and interruption of facilities shall only take place when building is not occupied.
 - 2. Notify Owner of dates and times of pending interruptions in utilities.
- C. It is the intent of the contract documents that renovations and modifications of the existing building be performed during the time when the building is not occupied. Work in the existing building may be performed during the following time periods:
 - 1. Between 4:30 PM and Midnight Monday through Friday.
 - 2. On weekends from 4:30 PM Friday until 7:00 AM on Monday
 - 3. Summer, fall, winter and/or spring breaks.
- D. School Functions: The contractor is advised that during the school year a number of school functions will take place which will require the contractor to discontinue work or perform work at times other than normally scheduled work hours in order to avoid disruption of these school functions. These school functions include, but are not limited to, sporting events, community events, after school activities and other related and similar functions.
 - 1. The contractor shall coordinate with the Owner to determine what activities, if any, may be performed while these functions are underway.
 - 2. If necessary to accommodate function the contractor shall either discontinue work for period necessary or adjust work hours so as to avoid conflicts.
- E. Student Testing: At certain times during the year, mandatory student achievement tests are conducted. Disruption of the students during these testing periods will not be permitted. The listed days and times for mandatory student testing are to be discussed with the Owner's Representative 2-3 weeks prior to the first date listed for clarification and possible modification. Tentative testing dates are as follows:
 - 1. Iowa Test of Basic Skills (ITBS)- September 16-24- NO WORK- 7:30a- 2:45p daily
 - 2. Georgia Writing Exam- January 22 and 23- NO WORK- 7:30a- 10:30a both days
 - 3. Criterion Referenced Competency Test (CRCT)- April 21-29- NO WORK- 7:30a- 2:45p daily

1.05 COORDINATION

- A. Work of Contract includes coordination of entire work of project, including preparation of general coordination drawings, diagrams and schedules, and control of site utilization, from beginning of construction activity through project close-out and warranty periods.
- B. Responsibility of all parties providing material and/or labor (work) to this Contract to coordinate their work with other surrounding work to avoid conflicts in routing paths and improper installation that will not work with adjoining and surrounding constructed or to-be-constructed conditions; Correct such conflicts at the Contractor's expense.
- C. Construction Observations: The contractor responsible for coordinating required visits to allow for the observation of in place construction in accordance with the requirements contained herein, in technical specifications sections, by local, state and federal agencies:
 - 1. Unless otherwise noted or required by agencies having jurisdiction the Architect (or engineer), Testing Laboratory and Local Authorities shall be allowed to observe work prior to concealing of such work.

2. Prior to the covering of any concealed or underground utilities or building components the contractor shall advise the appropriate parties of the date on which the work will be ready for viewing. The contractor's request for observation shall be issued a minimum of 72 hours prior to the date on which the observation is requested.
3. No work shall be covered until the local authorities and architect have viewed the work and determined that the work in place complies with the provisions of the contract.

1.06 SEPARATE CONTRACTS

- A. Separate contracts will be let by Owner during construction of this project; refer to Article E-35 of General Conditions.
- B. Contractor coordinate and work closely with separate contracts in receiving, storage and protecting materials provided by separate contracts.
- C. Responsibility for their own insurance and security lies with the separate contracts.

1.07 CONTRACTOR'S DUTIES

- A. Except as specifically noted the contractor shall provide and pay for:
 1. Labor, material and equipment required or necessary.
 2. Tools, Construction equipment and machinery.
 3. Temporary Utilities, Including water.
 4. Other Facilities and Services necessary for proper execution and completion of work.
- B. Contractor to pay:
 1. Applicable sales, consumer and use taxes.
 2. Other applicable taxes.
- C. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids:
 1. Required Permits.
 2. Government Fees.
 3. License Fees.
 4. Inspection fees.
- D. Give Required Notices.
- E. Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities which apply.
- F. Promptly submit written notice to Architect of observed variance of Contract Documents from Legal Requirements.
- G. Enforce strict discipline and good order among employees. Do not employ on this project:
 1. Unfit Persons.
 2. Persons not skilled in assigned tasks.

1.08 GRADES AND LINES

- A. The Owner's Surveyor shall be responsible for the following:
 1. Furnish Bench mark(s).
- B. The Contractor Shall be responsible for the following:
 1. Providing survey base line.
 2. Required layout and staking of buildings, walks, drives, roads, parking areas and other site improvements.
 3. Layout and staking to be performed under the direct supervision of a Georgia Licensed land Surveyor.

1.09 UNSUITABLE SOILS

- A. For the purposes of this contract, the term ‘unsuitable soils’ shall be defined as being **existing** undisturbed soils which are determined by the testing laboratory to be unsuitable for use as structural fill for reasons other than moisture or water content.
 - 1. Water saturated soils, regardless of whether water is from above or below ground, shall not be considered as unsuitable. Contractor responsible for dewatering or drying out of water saturated soils to the extent necessary to satisfy the requirements for structural fill.
- B. Fill Material: Fill material placed on site from contractor, regardless of whether fill is on-site or off-site borrow, cannot, by its nature, be classified as unsuitable soils. Only structural, suitable soils to be used for fill.
 - 1. Materials placed as structural fill shall not be classified as unsuitable soils regardless of conditions encountered.
- C. Water Saturated Soils: Should soils become saturated the contractor shall, as part of the scope of this contract, perform activities necessary to mediate and/or replace water saturated soils as required to obtain suitable structural fill as required by the testing laboratory.

1.10 CONTRACTOR USE OF PREMISES

- A. General: During the construction period Contractor has exclusive use of premises for construction operations, including full use of site.
- B. General: Contractor limit use of premises to work indicated, so as to allow for Owner occupancy and use by public.
- C. Use of the Site:
 - 1. Confine operations at site to areas permitted under Contract.
 - 2. Portions of site beyond areas on which work indicated not to be disturbed.
 - 3. Conform to site rules and regulations affecting work while engaged in project construction.
 - 4. Carefully place and watch work tools, ladders, hot tar kettles, and other similar equipment to prevent injury to students and teachers from these items.
 - 5. Keep existing driveways and entrances serving premises clear and available to Owner and employees at all times; do not use these areas for parking or storage of materials.
 - a. Minimize disturbance to vehicular traffic.
 - b. Provide adequate means of access to all private and public properties during all stages of construction.
 - 6. Do not unreasonably encumber site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated; if additional storage necessary, obtain and pay for storage off site.
 - a. Assume full responsibility for protection and safekeeping of products stored on and off site.
 - b. Move any materials which interfere with operations of separate contracts or operations of owner.
 - 7. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use; do not leave vehicles or equipment unattended with motor running or ignition key in place.
- D. Contractor's Use of the Existing Building:
 - 1. Should work be underway at times when building is occupied, the Contractor shall limit use of premises, so as to allow for Owner occupancy and use by public.
 - 2. The Contractor shall, when deemed necessary, adjust work schedule as necessary to avoid conflicts with operation of facility.
 - a. The Principal (or Administrator if no principal exists) shall be the party responsible for determining what activities and operations conflict with the School's operation.
 - b. If requested by Principal all work performed, when not within construction period, shall be performed prior to 7:30 A.M., After 3:30 P.M. or on Holidays and weekends.
 - 3. Maintain existing building in safe and weathertight condition throughout construction period.
 - a. Repair damage caused by construction operations.
 - b. Take all precautions necessary to protect building and occupants during construction period.

4. Keep public areas such as hallways, stairs, elevator lobbies and toilet rooms free from accumulation of waste material, rubbish or construction debris.
 5. Smoking or open fires not permitted within building enclosure or on premises.
- E. Security of New and Existing Building(s):
1. The contractor is advised that the building(s) has an operating security system. Coordinate with owner for access to building.
 2. The contractor shall be responsible for the security of the building for the duration of the construction project.
 3. Contractor responsible to make secure all building areas affected by work under this Contract at end of each day.
 - a. Insure that all doors, windows and other openings locked with their own existing locking device.
 - b. If locking devices do not exist, Contractor provide locking device.
 4. The contractor shall verify that the building is secure at the end of each day.
 5. All openings in the building envelope shall be sealed at the end of each day or when required by weather conditions. Seal shall prevent unauthorized passage, protect interior of building from construction material, and protect building components from water damage.
 6. The contractor is responsible for equipment and material losses or damages resulting due to inadequate implementation of security and weathertight security systems.
- F. Solid Construction Barriers: Where required or where indicated construct solid temporary construction barriers to separate work area from occupied portions of building.
1. Provide interior solid construction barriers between existing and new construction to prevent construction noise, debris, dust, etc. from disrupting school operations.
 2. Barriers to be constructed of 6 mil polyethylene (taped) over 3/4" plywood on 2 x 4 studs at 24" on center.
 3. Where required by Fire Marshal, barriers shall be constructed to allow exiting from existing building as required for emergencies only.
- G. Employee Behavior: The contractor, subcontractors and suppliers are advised that students will be in the vicinity of the construction activities. In order to protect the students the following are prohibited:
1. Loose and vulgar language.
 2. Wearing of inappropriate or inadequate clothing, including partial disrobing prohibited.
 3. Smoking or use of tobacco products.
 4. Possession or consumption of alcohol
 5. Possession or use of controlled substances
 6. Possession or use of weapons, including guns, knives or other items prohibited by Board Policy and/or State Law. No items which appear to be or may be used as a weapon permitted on site.
 7. Workers shall not interact with students or staff.
 8. Construction vehicles to be parked in designated areas only
- H. Identification of Companies, Personnel and Staff:
1. Workers to be easily distinguishable from students and staff either with a shirt with company logo, distinctively colored clothing or hard hats, or distinctive and easily visible name tags.
 2. Vehicles to be marked with company logo or a placard (8.5" x 11" white paper is acceptable) to be placed on the dash board of each vehicle.. Placard to list name of general contractor, name of contractor, and project name.
- 1.11 OWNER OCCUPANCY
- A. Full Owner Occupancy: Owner will occupy site and existing building during period, other than summer months, of construction.
1. Cooperate fully with Owner or his representative during construction operations to minimize conflicts and to facilitate Owner usage.
 2. Perform Work so not to interfere with Owner's operation.

- B. Partial Owner Occupancy: Owner reserves right to place and install equipment as necessary in completed areas of building and occupy such completed areas prior to Final Acceptance, provided that such occupancy does not substantially interfere with completion of Work.
 - 1. Such placing of equipment and partial occupancy does not constitute acceptance of Work or any part of Work.

1.12 OWNER'S RIGHT TO OCCUPY INCOMPLETE WORK

- A. Should the Project, or any portion thereof, be incomplete for Substantial Completion or final completion at the scheduled date or dates, the Owner shall have the right to occupy, and/or complete any portion of the Project. In such an event, the Contractor shall not be entitled to any extra compensation on account of said occupancy by the Owner's normal full use of the project, nor shall the Contractor interfere in any way with said normal full use of the project. Further, the contractor shall not be relieved of any responsibilities of the Contractor, including the required times of completion. Such occupancy by the Owner does not, in itself, constitute Substantial Completion nor Final Completion.

1.13 EXISTING CONDITIONS

- A. Existing conditions shown in Contract Documents are, to best of Architect's knowledge, accurate.
 - 1. Under requirements of Contract Documents, Bidder visit jobsite prior to bid date, verify and review existing conditions, and insure that he has accounted for, in his bid, all costs to accomplish Work.
 - 2. If actual field conditions and/or dimensions found different than indicated by Contract Documents, Bidders, prior to bid date, promptly report to Architect all discrepancies and request clarification in accordance with General Conditions.
- B. Prior to bid, any on-site inspection of facility, contractors make call or visit facility administrator and identify himself and purpose of visit.
 - 1. Permission to inspect the facility granted only by administrator before any on-site activity accomplished.
 - 2. Contractors check conditions affecting work and notify Architect of any discrepancies between drawings and existing conditions that may affect work adversely, including list of structural defects or existing damages to building.
- C. Contractor take photographs (35 mm) throughout interior and exterior of buildings to document existing conditions prior to starting of construction; keep photographs on file at jobsite.
 - 1. This requirement included to protect Contractor's interest, and filing of such list will preclude possibility of damages being assigned Contractor for repairs.
 - 2. Contractor does not have responsibility of repairing any damages not result of his own negligence.
- D. When Contractor moves on site and starts construction, it is be construed as his complete acceptance of existing site conditions.

1.14 DIMENSIONS

- A. Contractor verify dimensions shown on Contract Documents relative to interfacing new work to existing on jobsite.
 - 1. Dimension and construct work to fit, blend, and conform to actual constructed conditions.
- B. Field verify dimensions, sizes and locations of items that depend on actual constructed conditions (new and existing), prior to fabrication or erection of each item.
- C. Dimensions indicated on drawings relative to existing construction are approximate and shall be field verified by the contractor prior to bidding. No changes to the contract amount will be made due to contractor's failure to verify dimensions.

1.15 HAZARDOUS MATERIALS

- A. Hazardous Materials: It shall be a requirement that neither the Contractor, nor his material suppliers, nor his Subcontractors install or otherwise incorporate any materials containing asbestos, PCB or other hazardous materials within the boundaries of the Project.
 - 1. No soil found on site, or transported to the site from remote locations which is contaminated with material containing asbestos, PCB, Radon, gasoline, fuel oil, diesel fuel or other similar fossil fuels shall be used for fill, backfill or landscape topsoil.
 - 2. The Contractor shall require that each of his Subcontractors and material suppliers warrants to Owner and Architect that all materials, products and assemblies incorporated, or submitted for incorporation into this Project, are totally free of asbestos, PCB, or other such hazardous materials.
 - 3. If the Contractor or his Subcontractors or material suppliers have knowledge that, or believe that an item, component, material or accessory within a product or assembly may contain asbestos, PCB or other such hazardous material, it is the Contractor's sole responsibility to secure a written certification from the manufacturer of any suspected material stating this material is totally free of asbestos, PCB or other hazardous materials. A copy of the written certification shall be submitted to the Owner and Architect.
- B. Asbestos: All materials provided and installed by contractor shall be 100% free of asbestos containing materials.
 - 1. The manufacturer of each construction material shall certify that products utilized in construction of this facility are 100% free from asbestos.
 - a. Individual product certifications required.
 - b. General product certifications not acceptable. Certification must address project by name.
 - 2. The general contractor shall certify that all materials utilized in the construction of this facility are 100% free from asbestos.
- C. Lead: No lead materials shall be utilized in the domestic water system components and plumbing fixtures.
 - 1. No lead shall be utilized in paint.
 - 2. The plumbing contractor shall certify that no lead was utilized in the plumbing system.
 - 3. The paint manufacturer shall certify that no lead was contained in paint utilized.
 - 4. The manufacturer of the plumbing fixtures shall certify that no lead was utilized in any plumbing fixture.

1.16 COLORS

- A. Unless otherwise specified in other sections, colors selected after contract awarded, and during shop drawing submittal stage.
 - 1. Colors selected from samples submitted by Contractor, therefore not longer than thirty (30) days after date of "Notice to Proceed", submit to Architect, appropriate color samples of all materials requiring color selections.
 - 2. Submit **ONLY** those colors from which selections are to be made.
 - 3. Color selections will be made after all required color samples have been submitted. NO partial color selections will be made.

1.17 MISCELLANEOUS PROVISIONS

- A. Mechanical/Electrical Requirements of General Work:
 - 1. Except as otherwise indicated, comply with applicable requirements of Division-15 sections for mechanical provisions within units of general (Division 2-14) Work.
 - 2. Except as otherwise indicated, comply with applicable requirements of Division-16 sections for electrical provisions within units of general (Division 2-14) Work.
- B. Service Connections:
 - 1. Refer to Division-15 and Division-16 sections for characteristics of mechanical and electrical services connected to units of general work.
 - 2. Provide units manufactured or fabricated for proper connection to and utilization of available services, as indicated.
 - 3. Except as otherwise indicated, final connection of mechanical services to general work defined as mechanical work, and final connection of electrical services to general work is defined as electrical work.

- C. Electrical Requirements:
 - 1. Except as otherwise indicated, comply with applicable provisions of National Electrical Code (NEC) and standards by National Electrical Manufacturer's Association (NEMA), for electrical components of general work.
 - 2. Provide Underwriters Laboratories listed and labeled products where applicable.

PART 2 - PRODUCTS (Not applicable).

PART 3 - EXECUTION

3.01 REMOVAL OF EXISTING CONSTRUCTION

- A. Where required for installation of new materials, the contractor shall remove existing construction.
 - 1. Existing materials shall be repaired and refinished in accordance with provisions stated below.
- B. Where new finishes are specified to be installed, the contractor shall, unless noted otherwise, remove the existing finish completely.
 - 1. Where new floor covering is specified to be installed the contractor shall remove the existing flooring, adhesive, leveling compound, patching compound and setting bed completely.
 - 2. Where new base is specified to be installed the contractor shall remove existing base and adhesive completely.
 - 3. Where new ceiling is specified to be installed the contractor shall remove the existing ceiling tile(s), grid(s) and suspension system(s) completely.

3.02 DEMOLITION AND PATCHING

- A. Perform all demolition and patching required to accomplish the work called for under this contract.
- B. All material shown to be removed, unless noted otherwise, shall become the property of the contractor and shall be removed from the site and disposed of in a legal manner.
- C. Repair and patch all damaged materials (finishes, systems, etc.) resulting from work performed under this contract. The "patched" work shall match the existing material, finish, and color of adjacent surrounding materials.

3.03 MINOR ADJUSTMENTS

- A. Minor adjustments permitted in measurements shown on drawings that cover new work, so that all revised and new work properly fit, join, unite and connect onto present work, all in acceptable and satisfactory manner.
 - 1. If minor adjustments in the measurements required, do not change design, general arrangements, nor fabrication of Work.

3.04 STRUCTURAL MEMBERS

- A. Do not cut structural members and framing under any circumstances except where expressly and particularly indicated on drawings and within specifications.
 - 1. If cutting, demolition, etc., required for Work creates change in conditions differing from those indicated on drawings and in specifications, which cause serious weakening or possible damage to any part of present structure, request instructions for continuing Work.

3.05 OVERLOADING STRUCTURES

- A. Do not overload roofs; Contractor repair damage to buildings or interior of buildings, caused by overloading, to satisfaction of Architect and Owner.
- B. Repair any damages to building or interior of buildings, caused by overloading, to the satisfaction of the Architect and Owner.

3.06 CLEAN UP

- A. Waste Materials: Contractor maintain construction premises and jobsite in reasonably neat and orderly condition and free from accumulations of waste material and rubbish during construction period.
 - 1. Remove all crates, and other flammable waste material or trash from work areas at end of each working day.
- B. Contractor remove all rubbish, crates, flammable waste material, trash and debris promptly from buildings and premises at end of each working day; do not permit rubbish and debris to accumulate in excessive amounts that will become hazardous.
 - 1. Comprehensive project cleanup to be performed, as an absolute minimum, once a month.
- C. Finishing: Clean all areas of building throughout just prior to the start of painting and finishing; maintain these areas in satisfactory condition during painting and finishing, then clean and restore any finished surfaces defaced in any way by mechanics and workmen and restore to their original condition.
 - 1. Clean and restore new and existing finished surfaces defaced in any way by mechanics and workmen, as result of work under this Contract, in their original condition.
- D. Final: Upon completion of the work, Contractor remove all temporary construction facilities, including buildings, fences, scaffolding, unused materials provided for the work and rubbish of any kind, leaving building, site, and/or adjacent property in neat and clean condition acceptable to Architect and Owner.

3.07 REPAIRING AND REFINISHING

- A. Damaged Materials: Repair or replaced all construction, materials, equipment and furnishings damaged as a result of work performed under this contract.
 - 1. Where damage is to equipment and or furniture, and repair of items to pre-construction condition is not possible or feasible, the contractor shall replace with new equipment or furniture of like quality at no cost to the Owner.
 - 2. Where damage is to new or existing construction the contractor shall, if possible, patch work to pre-damage conditions. If an patch is not of acceptable quality, damaged material or finish shall be replaced with new.
- B. Patch all damaged areas resulting from work under this Contract.
- C. Refinish patched work, to satisfaction of the Architect, to produce surfaces which match existing finish or adjoining surfaces or adjacent similar surfaces or refinished adjoining or adjacent surfaces; if suitable match cannot be obtained refinish (paint) entire surface.
 - 1. Where existing or new surfaces are to be painted due to repair or refinishing activities, extend painting to nearest perpendicular intersection, both directions.
- D. Where existing concrete or asphalt paving is defaced, damaged or destroyed due to work performed under this contract, the contractor shall repair or replace existing using materials, methods and finishing techniques to match existing.

3.08 TRASH BURNING / BURYING

- A. On Site Burning:
 - 1. On site burning of materials not permitted.
- B. On Site Burying of Materials:
 - 1. Burying of material on site not permitted.

3.09 SHRUBBERY

- A. Protect existing shrubbery from damage.
 - 1. Keep ditches far enough from shrubbery to not damage or interfere with roots.
 - 2. Contractor replace damaged shrubbery at no expense to Owner.

3.10 EXISTING UTILITIES

- A. The contractor is advised that a substantial number of underground utilities exist in the construction area.
- B. Contractors shall check with local utility companies and Owner for locations of underground utilities and piping.
 - 1. Flag all identified utilities.
 - 2. Contractor repair lines ruptured due to the performance of work associated with this contract at no expense to Owner.

3.11 INTERRUPTION OF UTILITIES:

- A. Utility services (electricity, water, sewer, Gas and storm) shall not be interrupted while the existing facilities area in use.
- B. Transfer of utility services shall occur after school hours, on weekends or scheduled holidays.
- C. Under No circumstances shall utility services to existing buildings be interrupted when the facility is in use.
- D. The contractor shall provide 72 hours written notice to the architect prior to interruption of electrical services.

3.12 MECHANICAL SYSTEMS:

- A. Equipment not shown to be replaced with new shall be reused. Protect for duration of project and render operational upon completion of work.
- B. Contractor shall remove all abandoned mechanical systems.
- C. Abandoned Equipment: Unless noted otherwise, remove the following where systems are to be replaced with new:
 - 1. Existing central HVAC system components, boiler, chiller, fans, motors, ductwork, grilles, etc..
 - 2. Existing window type HVAC units, where new units are shown to be installed.
 - 3. Roof top exhaust fans and associated ductwork.
 - 4. Roof top HVAC Units, Ductwork, support frames and associated materials.
 - 5. Miscellaneous equipment including:
 - a. HVAC Support frames.
 - b. Pitch Pockets.

3.13 ELECTRICAL SYSTEM:

- A. Equipment not shown to be replaced with new shall be reused. Protect for duration of project and render operational upon completion of work.
- B. Unless shown to be replaced with new or indicated to be removed, all electrical devices which were operational (functional) prior to commencement of renovation shall be operational upon completion.
- C. Unless noted otherwise all abandoned electrical conduit, cable, electrical wiring, communications wiring devices shall be removed from project site and disposed of by contractor.
- D. The new electrical conduit shown on the electrical drawings is in schematic form only. All conduit shall be run on solid backing as directed by architect.
 - 1. The routing of electrical conduit may vary from methods shown on electrical drawings in order to obtain proper routing paths. Such rerouting shall be at no added cost to the contract.

- E. All new conduit shall be run concealed where installed at location of new construction. Exposed conduit not permissible except at existing building construction where not possible to conceal.
 - 1. Where conduit is run exposed the conduit shall be painted in accordance with provisions of Section 09900.
 - 2. Where existing or new walls contain a cavity or cell larger than 2" the contractor shall "fish" flex down in cavity of wall to maintain a fully concealed application.
- F. Unless noted otherwise all abandoned electrical conduit, cable, electrical wiring, communications wiring devices shall be removed from project site and disposed of by contractor.

3.14 CERTIFICATION OF LINES AND LEVELS

- A. Contractor shall check all grades, lines, levels and dimensions as shown on the drawings and shall promptly report to the architect in writing any discrepancies for clarification before commencing work.

END OF SECTION 01110

**SECTION 01210
ALLOWANCES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Reminder: General Conditions of the Contract include following subparagraph pertaining to "Allowances":
 - 1. 'Article E-57 Cash Allowances.-The Contractor shall include in the contract sum all allowances named in the contract documents and shall cause the work thus covered to be done by such Contractors and for such sums as the Architect may direct, the contract sum being adjusted in conformity therewith. The Contractor declares that the contract sum includes such sums for overhead and profit on account of cash allowances as he deems proper. No demand for overhead and profit other than those included in the contract sum shall be allowed. The Contractor shall not be required to employ for any such work persons against whom he has a reasonable objection.'
- C. Coordinate allowance work with related work to ensure that each selection is completely integrated and interfaced with related work.

1.02 DESCRIPTION OF REQUIREMENTS

- A. Definitions and Explanations:
 - 1. Certain requirements of work related to each allowance are shown and specified in Contract Documents.
 - 2. Allowance established in lieu of additional requirements for that work, and further requirements thereof (if any) issued by change order.
- B. Types of allowances scheduled herein for work include following:
 - 1. Lump sum allowances.
 - 2. Unit-cost allowances.
 - 3. Contingency allowance.
- C. Selection and Purchase:
 - 1. At earliest feasible date after award of Contract, advise Architect/Engineer of scheduled date when final selection and purchase of each product or system described by allowance must be accomplished to avoid delays in performance of work.
 - 2. As requested by Architect/Engineer, obtain and submit proposals for work of each allowance for use in making final selections; include recommendations for selection relevant to proper performance of work.
 - 3. Purchase products and systems as specifically selected (in writing) by Architect/Engineer.
 - 4. Submit proposals and recommendations, for purchase of products or systems of allowances, in form specified for change orders.
- D. Change Order Data:
 - 1. Where applicable, include in each change order proposal both quantities of products being purchased and unit costs, along with total amount of purchases to be made.
 - 2. Where requested, furnish survey-of-requirements data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, and amounts of applicable trade discounts.
- E. For unit-cost type allowances, submit substantiated survey of quantities of materials, as shown in "Schedule of Values", revised where necessary, and corresponding with change order quantities.

- F. Unit-Cost Allowances:
1. **Documentation:** Prepare and submit substantiation of change in scope of work (if any) claimed in change orders related to unit-cost type allowances.
 2. **On-Site:** For the purposes of this allowance on-site shall be defined as the entire property/site on which the building(s) is/are located as defined by the site(s) property lines.
 - a. The site, for the purposes of this definition, is **not** limited to the area in which the work is being performed or any notations of the drawings regarding 'limits of work'
 3. **Survey of Quantities:** Unit costs to include the cost for surveys (before and after) for the purpose of determining the quantities of material (rock, unsuitable soils, ect) removed. Measurements to based on in place volumes as determined by surveys.
 - a. Contractor to include in the unit cost value the cost for performing necessary surveys for quantifying materials removed and replaced.
 - b. Owner reserves right to establish actual quantity of work-in-place by independent quantity survey, measure or count.
 4. **Value of Allowance:** The value of the allowance shall be determined by multiplying the allowance quantity by the unit costs contained in the contractor's bid proposal form.
 5. **Value of Change Order:** Each change order amount for unit-cost type allowance based solely on difference between actual unit purchase amount and unit allowance, multiplied by final measure or count of work-in-place.
- G. Change Order Mark-Up:
1. Except as otherwise indicated, comply with provisions of General Conditions.
 2. For each allowance, Contractor's claims for increased costs (for either purchase order amount or Contractor's handling, labor, installation, overhead, and profit), because of change in scope or nature of allowance work as described in Contract Documents, must be submitted within 30 days of initial change order authorizing work to proceed on that allowance; otherwise, such claims rejected.
 3. As a procedural restriction of General Conditions, include no mark-up (increase or decrease) in change order amount for Contractor's increase or decrease in handling, labor, installation, overhead or profit unless purchase order amount varies from allowances by 50% or more.
- H. Change Order Mark-Up:
1. Amount of each change order resulting from final selection of products and systems covered by allowance is the difference between purchase order amount and allowance, and does not include Contractor's mark-up (or subcontractor's mark-up) except to extent clearly demonstrated (by Contractor) that either scope of installation or nature of work required was changed from that which could have been foreseen from description of allowance and other information in Contract Documents.
 2. No mark-up permitted for selection of higher or lower priced materials or systems, of same scope and nature as originally indicated.
- I. Excess Materials:
1. Submit invoices or delivery slips to indicate actual quantities of materials delivered to site for use in fulfillment of each allowance.
 2. Where economically feasible, and when so requested by Architect/Engineer, return unused materials to manufacturer/supplier for credit to Owner, after installation completed and accepted.
 3. Where not economically feasible to return unused material for credit and when so requested by Architect/Engineer, prepare unused material for Owner's storage, and deliver to Owner's storage space as directed.
 4. Otherwise, disposal of excess material is Contractor's responsibility.
- J. Contingency Allowance:
1. Contingency allowance used only as directed for Owner's purposes, and only by change orders which designate amounts charged to contingency allowance.
 2. Contractor's related costs not included in Contract Sum (other than allowance itself) for work so ordered charged to contingency allowance.
 3. Change orders include costs and reasonable overhead/profit margins.
 4. At time of project closeout, unused amounts remaining in contingency allowance credited to Owner by change order.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 SCHEDULE OF ALLOWANCES

A. The following dollar amounts shall be included in the contractor's base bid proposal.

DESCRIPTION OF ALLOWANCE	Quantity
A. Rock Allowances	
1. Mass Rock Removal, off-site waste	250 CY
2. Trench Rock Removal, off-site waste	250 CY
B. Unsuitable Soils	
1. Remove Unsuitable soil; mass, off-site waste	500 CY
2. Replacement of above with structural fill; off-site borrow	600 CY
3. Remove Unsuitable soil; Trench, off-site waste	500 CY
4. Replacement of above with structural fill; off-site borrow	600 CY
C. Erosion Control	
1. Type 'C' Silt Fence	3600 LF
2. Erosion Control Mat (Mb)	24,000 SF
3. Temporary Const. Entrances (Co)	50 TNS
4. Filter Fabric (Sd2-F)	120 LF
5. Filter Fabric (Sd2-P)	160 LF
6. Rip Rap	32 TNS

END OF SECTION 01210

**SECTION 01230
ALTERNATES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF REQUIREMENTS

- A. Definition: An alternate is an amount proposed by Bidders and stated on Bid Form as added to or deducted from Base Bid amount if Owner decides to accept a corresponding change in either scope of work or in products, materials, equipment, systems or installation methods described in Contract Documents.
- B. Coordination: Coordinate related work and modify or adjust adjacent work as required to ensure that work affected by each accepted alternate is complete and fully integrated into the project.
- C. Notification: Immediately following award of Contract, prepare and distribute to each party involved, notification of status of each alternate.
 - 1. Indicate whether alternates have been accepted, rejected or deferred for consideration at later date.
 - 2. Include complete description of negotiated modifications to alternates, if any.
- D. Schedule: "Schedule of Alternates" included at end of this Section.
 - 1. Specification sections referenced in Schedule contain requirements for materials and methods necessary to achieve work described under each alternate.
 - 2. Include as part of each alternate, miscellaneous devices, appurtenances and similar items incidental to or required for complete installation whether or not mentioned as part of alternate.
- E. Bidding of Alternates:
 - 1. All Alternates must be bid. Failure to bid Alternates may subject bid to disqualification.
 - 2. Enter amounts of Alternates on Proposal form.

1.03 ACCEPTANCE OF ALTERNATES

- A. Additive Alternates:
 - 1. Additive Alternates, if accepted, will be exercised at the option of the owner.
- B. Deductive Alternates:
 - 1. Deductive Alternates will be, if accepted, accepted in the order listed.

1.04 AWARD OF CONTRACT

- A. Should the owner decide to award a contract, the contract will be awarded on the lowest responsive **Modified Base Bid**.
 - 1. The **Modified Base Bid** shall be the contractor's base bid less any deductive alternates accepted by the owner.
 - 2. Additive Alternates shall not be considered in the award of the Construction Contract.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.01 SCHEDULE OF ALTERNATES

- A. ALTERNATE NO. A-1 (ADDITIVE): Owner-Preferred Finished Hardware:
 - 1. Base Bid; Furnish hardware, Section 08710, from one of the prior approved manufacturer.
 - 2. Additive Alternate: If alternate is accepted furnish the Owner-preferred hardware. The Owner-preferred hardware is
 - a. Locksets: Schlage
 - b. Cylinders: Schlage; Everest Key System
 - c. Door Closers: LCN;
 - d. Panic Devices: Von Duprin

- B. ALTERNATE NO. A-2 (ADDITIVE): HVAC Equipment:
 - 1. Base Bid; Under the Contractor's Base Bid proposal provide Hvac equipment by one of the listed manufacturers.
 - 2. Additive Alternate: If this alternate is accepted provide Hvac equipment from the 'Owner-Preferred' manufacturer. Owner preferred equipment is:
 - a. Roof top hvac units with gas heat and heat pumps: Carrier or Trane.
 - b. Ductless Heat pumps: Mitsubishi

- C. ALTERNATE NO. A-3 (ADDITIVE): Hvac Controls:
 - 1. Base Bid; Under the Contractor's Base Bid proposal provide Hvac controls by one of the listed manufacturers.
 - 2. Additive Alternate: If this alternate is accepted provide Hvac controls from the 'Owner-Preferred' manufacturer. The Owner preferred manufacture is:
 - a. ALC

- D. ALTERNATE NO. A-3 (ADDITIVE): Owner-Preferred Kitchen Equipment:
 - 1. Base Bid; Under the Contractor's Base Bid proposal provide kitchen equipment by one of the listed manufacturers.
 - 2. Additive Alternate: If this alternate is accepted provide kitchen equipment from the 'Owner-Preferred' manufacturer. The Owner preferred manufactures are:
 - a. Serving Line, Items A2.1, A3.1, A4.1 and A5.1: Low Temp Industries
 - b. Pulper/Extractor, Items C1.1 and C2.2: Somat
 - c. Conveyor Pizza Oven; Item G8.1: Lincoln

- E. ALTERNATE NO. A-4 (ADDITIVE) Lighting-existing Corridor
 - 1. Additive Alternate: If this alternate is accepted provide and install new lighting in existing building corridors as indicated on the electrical drawings.

END OF SECTION 01230

**SECTION 01250
MODIFICATION PROCEDURES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to this Section.
- B. Section E; Article E-15; Changes in the Work apply.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections: Following sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Product Substitutions" for administrative procedures for handling requests for substitutions made after award of Contract.

1.03 MINOR CHANGES IN THE WORK

- A. Supplemental instructions authorizing minor changes in Work, not involving adjustment to Contract Sum or Contract Time, issued by Architect by appropriate written form.

1.04 CHANGE ORDER PROPOSAL REQUESTS

- A. Change Orders: Changes in the scope of the project which affect either Contract amount or time shall be incorporated into the contract through the issuance of a change order signed by the Owner and the contractor.
 - 1. No change to the contract amount or time shall be made without the execution of a change order.
- B. Owner-Initiated Proposal Requests: Proposed changes in Work that require adjustment to Contract Sum or Contract Time issued by Architect, with detailed description of proposed change and supplemental or revised Drawings and Specifications, if necessary.
 - 1. Proposal requests issued by Architect are for information only.
 - 2. Do not consider them instruction either to stop work in progress, or to execute proposed change.
 - 3. Unless otherwise indicated in the proposal request, within 7 days of receipt of proposal request, submit to Architect for Owner's review, estimate of cost necessary to execute proposed change.
 - 4. Include list of quantities of products to be purchased and unit costs, along with total amount of purchases to be made.
 - 5. Indicate applicable time and rates for labor.
 - 6. Where requested, furnish survey data to substantiate quantities.
 - 7. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 8. Indicate applicable overhead and profit as percentages and dollars.
 - 9. Include statement indicating effect proposed change in Work will have on Contract Time.
- C. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting request for change to Architect.
 - 1. Include statement outlining reasons for change and effect of change on Work.
 - 2. Provide complete description of proposed change.
 - 3. Indicate effect of proposed change on Contract Sum and Contract Time.
 - 4. Include list of quantities of products to be purchased and unit costs along with total amount of purchases to be made.
 - 5. Indicate applicable time and rates for labor.
 - 6. Where requested, furnish survey data to substantiate quantities.
 - 7. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 8. Indicate applicable overhead and profit as percentages and dollars.

9. Comply with requirements in Section "Product Substitutions" if proposed change in Work requires substitution of one product or system for product or system specified.
 - D. Allowable Costs: The contractor shall refer to Article E-15 of the Section E of the General Conditions to the specifications for a detailed description of allowable expenses as it relates to the development of change orders. Allowable costs shall only include those costs, including equipment costs, directly associated with proposed change.
 - E. Overhead and Profit: The contractor shall refer to Section D, Supplementary General Conditions and Article E-15 of Section E of the General Conditions of the Specifications for allowable percentages for overhead and profit. Percentages utilized in the development of change orders shall not exceed those listed.
 - F. Delays: The contractor understands that due to the nature of construction projects certain changes to the contract documents, during the construction are likely to occur and that such changes to the contract documents, whether initiated by the Architect, Owner or Contractor shall not be grounds for claims for delays or additional costs associated with the issuance of such changes.
 1. Extensions in time authorized only when the change order material changes the scope of the work or where, due to timing of the change order, the work cannot be performed in anticipated sequence as shown on the contractor's initial project schedule.
 - G. Proposal Request Form: Form of proposal to be as agreed upon between Architect and Contractor. Degree of detail required on form to be similar to the contractor's Detailed Cost Breakdown"
 - H. Change Order Review: The contractor shall submit requests for change orders, with all required back-up information in form indicated, allowing sufficient time for Architect, Engineers, and Owner to review proposal for accuracy and acceptability.
 1. Change order requests which do not have sufficient breakdown, back-up or supporting data, or which are found to have costs exceeding those contained in the contractor's initial detailed breakdown will be rejected and returned to the contractor for correction.
 2. Allow 21 calendar days for the Architect, Engineer and owner to review each proposal
 3. Allow and additional 21 days for the Architect, Engineer and Owner to review each revised proposals.
- 1.05 CHANGE ORDER PROCEDURES
- A. Upon receipt of request for proposals the contractor shall develop and submit to the architect a detailed cost breakdown of costs associated with the change order.
- 1.06 FORM OF SUBMISSION:
- A. The change order shall be submitted in accordance with the requirements of this section and the following:
 1. Each change order proposal shall be submitted and numbered separately. Change order proposal #1 shall be labeled as COP #1. Each subsequent proposal shall be numbered consecutively.
 2. The contractor shall provide a completed detailed narrative of scope of work included in change order proposal.
 3. Attach a copy of the architect's request for proposal, RFI (request for information) and other documentation necessary to clarify the scope of the proposal.
 4. Attach a copy of each supplemental drawing and/or sketch on which the proposal is based.
 5. Provide a statement of effect change order has on time.
- 1.07 REVIEW OF SUBMISSION:
- A. The architect will review the change order proposal for completeness, compliance with contract provisions and fairness of pricing.
 1. Incomplete or non compliant change order proposal will be returned to the contractor for revision and re-submission.
 2. The rejection of the change order proposal for failure to provide requested information or failure to comply with contract provisions shall not be grounds for claims for delays.

1.08 ISSUANCE OF CHANGE ORDER

- A. Upon Owner's approval of Change Order Proposal Request (Proposal), Architect will issue Change Order for signatures of Owner and Contractor, as provided in the Conditions of the Contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01250

CHANGE ORDER PROPOSAL (COP)

Project Name		Project Number		COP PROPOSAL NUMBER	
Owner's Name		Architect's Name	J.W. Buckley & Associates	COP DATE	
Contractor's Name				TIME EXTENSION REQUEST	
Description of COP					

DETAILED COST BREAKDOWN

Item Description	Equip Model	Labor Costs				Materials				Equipment				Totals
		Quantity	Units	Unit Cost	Cost	Quantity	Units	Unit Cost	Cost	Quantity	Units	Unit Cost	Cost	

Sub Totals														
Tax														
Sub Totals														
Bond Cost	Not allowed as a reimbursable expense per requirements of contract													

	Overhead and Profit...Work by GC using own forces and Work by Sub Contractors...15% maximum													
	General Contractor's overhead and profit on work performed by sub contractors...7.5% maximum													
	Total Cost of Work													

CONTRACTOR'S CERTIFICATION

I do solemnly swear, under penalty of a felony false statement subject to punishment by not less than one year nor more than twenty years of penal servitude, that the costs shown herein above do not exceed current costs for like services, materials and equipment and that the quantities shown do not exceed the actual requirements.

Required Attachments to Change Order Proposal	Contractor's Name and Signature	
1. Copy of architect's request for change order proposal where applicable.	Contractor...Company Name	
2. Supplemental drawings, instructions, responses to RFI's and other similar data	Contractor...Name....Printed	
3. Full narrative description of change required	Contractor's Signature	
4. Detailed cost breakdown for all subcontractors		
5. Justification for extension in time if time extension requested		

**SECTION 01330
SUBMITTALS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:
 - 1. Contractor's construction schedule.
 - 2. Submittal schedule.
 - 3. Daily construction reports.
 - 4. Shop Drawings.
 - 5. Product Data.
 - 6. Samples.
- B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
 - 1. Permits.
 - 2. Detailed cost breakdown
 - 3. Applications for payment.
 - 4. Performance and payment bonds.
 - 5. Insurance certificates.
 - 6. List of Subcontractors.
 - 7. Requests for information (RFI's)
- C. Inspection and test reports included in Section "Quality Control Services."

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor responsible for providing products and shop drawings of products in full and complete compliance with technical provisions of contract documents.
- B. The contractor shall develop and submit to the architect shop drawings of all items specified in the contract documents.
- C. No products shall be purchased by the contractor until the contractor has submitted the required shop drawings, allowed the architect time to review the shop drawings, and received the shop drawings back with a notation of 'Furnish as Corrected', 'Reviewed' or 'Reviewed as Noted'

1.04 SUPPLIER'S RESPONSIBILITIES

- A. As part of each submittal, product supplier shall certify, **in writing**, that the product(s) submitted comply/complies with **ALL** technical provisions of the specifications. If product submitted does not comply with all technical provisions, the supplier shall list each deviation from specifications.
 - 1. Failure to submit certification will result in the submittal being rejected and returned without review.

1.05 ARCHITECT'S REVIEW

- A. Architect shall perform a general review of shop drawings for verification of compliance with general design intent of contract documents. This review shall not be considered as an exhaustive and comprehensive review of submittals.
 - 1. During this review some errors will be detected, but others may be overlooked. The failure of the Architect to "discover" all errors in shop drawings does not grant the contractor the authority or permission to proceed in error.
 - 2. Regardless of any information contained in the shop drawings, the requirements of the Drawings and Specifications shall be followed and are not waived or superseded by the shop drawing review.
- B. Contractor shall note that it is not the Architect's responsibility to "discover" all deviations from the project specifications, and that the Architect's review of the submittal does not represent acceptance of deviations from the contract documents.

1.06 SUBMITTAL PROCEDURES

- A. General Contractor's responsibilities: Contractor shall develop or cause to be developed submittals (shop drawings) for all materials and products to be installed within the scope of this project.
 - 1. Contractor shall perform a detailed review of each submittal to verify compliance with contract documents.
 - 2. Contractor shall stamp and sign each submittal indicating his approval prior to submitting to Architect. Submittals not containing contractor's stamp of approval will be returned for correction.
 - 3. Submit only products and material complying with the technical requirements of the contract documents
- B. Coordination:
 - 1. Coordinate preparation and processing of submittals with performance of construction activities.
 - 2. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 3. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 - 4. Coordinate transmittal of different types of submittals for related elements of Work so processing not delayed by need to review submittals concurrently for coordination.
 - 5. Architect reserves right to withhold action on submittal requiring coordination with other submittals until related submittals received.
- C. Processing:
 - 1. Allow sufficient review time so installation not delayed as result of time required to process submittals, including time for resubmittals.
 - 2. Allow twenty days (20) for initial review; allow additional time if processing delayed to permit coordination with subsequent submittals.
 - 3. Architect will promptly advise Contractor when submittal being processed delayed for coordination.
 - 4. If intermediate submittal necessary, process same as initial submittal.
 - 5. Allow twenty days (20) for reprocessing each submittal.
 - 6. No extension of Contract Time authorized because of failure to transmit submittals to Architect sufficiently in advance of Work to permit processing.
- D. Submittal Preparation:
 - 1. Place permanent label or title block on each submittal for identification.
 - 2. Indicate name of entity that prepared each submittal on label or title block.
 - 3. Provide space approximately 4" x 5" on label or beside title block on Shop Drawings to record Contractor's review and approval markings and action taken.
 - 4. Include following information on label for processing and recording action taken.
 - a. Project name and Date.
 - b. Name and address of Architect.
 - c. Name and address of Contractor, subcontractor and supplier.
 - d. Name of manufacturer.
 - e. Number and title of appropriate Specification Section.
 - f. Drawing number and detail references, as appropriate.

5. If submittal not complete, Architect will not accept nor log in submittal and will return to Contractor for additional information.
 - a. Architect will state reason for non-acceptance in "Submittal Return Notification" accompanying returned, unreviewed submittal.
 - b. Delays encountered due to incomplete submittals not basis for extension of Contract time.
 - E. Submittal Transmittal:
 1. Package each submittal appropriately for transmittal and handling.
 2. Transmit each submittal from Contractor to Architect using transmittal form.
 3. Submittals received from sources other than Contractor returned without action.
 - F. Transmittal Form: Contractor use form acceptable to Architect; submit form for approval.
- 1.07 CONTRACTOR'S CONSTRUCTION SCHEDULE-CPM
- A. General:
 1. Prepare, maintain Critical Path Method (CPM) progress schedule network analysis system
 2. Begin preparations immediately following first notification of Contract award
 3. Pursue necessary steps of development, analysis so first full network diagram accepted, placed into unrestricted max. 30 days following Notice to Proceed.
 4. Conduct educational workshops to train, inform key project personnel, subcontractors' personnel, to provide data, utilize progress schedule information
 5. Establish regular procedures for monitoring, updating, reporting; coordinate with progress meeting dates, payment request dates
 - B. Standards:
 1. CPM in Construction - a Manual for General Contractors", Associated General Contractors of America, Inc.
 2. Other authorities acceptable to Architect
 - C. Minimum Procedures:
 1. Establish procedures, processing routines
 - a. Include data to consistent with complexity of Work
 - b. Achieve high degree of effectiveness, accuracy to develop "optimum" progress schedule
 2. Use "one day" as unit of time
 - D. Activities:
 1. Before producing network diagram
 - a. List every activity having possible bearing on time required to complete Work
 - b. List each activity's estimated time duration
 - c. Document each activity's interface, sequencing requirements in relation to others
 - d. Impart best logic foreseen for whole construction process
 - E. Organization: Sketch first skeleton network to help understand essence of probable critical path
 - F. Processing:
 1. Input prepared data to EDP program
 - a. Process to produce output data or computer-drawn network
 - b. Draw network by hand if equipment unable to produce
 2. Revise data, reorganize necessary sequences, reproduce as necessary to produce optimum arrangement within limitations of Contract Time
 3. Display full network on single (or pieced together) sheet
 - a. Mark, locate critical path near center of network
 - b. Locate paths with most float near edges
 - c. Sub-networks permissible on separate sheets for activities clearly off critical path

- G. Initial Issue:
 - 1. Prepare initial issue of network from listing of straight "early start-total float" sort
 - 2. For identified and described activity, show associated events;
 - a. Event
 - b. Duration
 - c. Float
 - d. Early start/finish dates
 - e. Late start/finish dates
 - 3. In listings, identify critical items
 - 4. List dollar-volumes of total work performed calculated to match projected payment request dates
- H. Submittal and Distribution:
 - 1. Submit initial issue for acceptance
 - 2. When authorized, distribute copies to:
 - a. Architect/Engineer (3 copies)
 - b. Owner
 - c. Separate contractors (if any)
 - d. Principal subcontractors
 - e. Suppliers or fabricators, other identified by Contractor with need-to-know schedule responsibility
 - 3. Post copies in project meeting rooms, temporary field offices
 - 4. When revisions made, distribute, post subsequent updated schedule to same entities
 - a. Delete distribution to entities when assigned work completed, no longer involved in scheduled work.
 - 5. Submit copies of each computer produced listing, in duplicate, to Architect/Engineer.
- I. Phasing: Provide notations on schedule to show how sequence of Work affected by requirements for phased completion to permit Work by separate Contractors and partial occupancy by Owner prior to Final Acceptance.
- J. Work Stages: Indicate important stages of construction for each major portion of Work, including testing and installation.
- K. Area Separations:
 - 1. Provide separate time bar to identify each major construction area for each major portion of Work.
 - 2. Indicate where each element in area sequenced or integrated with other activities.
- L. Cost Correlation:
 - 1. At the head of schedule, provide two item cost correlation line, indicating "precalculated" and "actual" costs.
 - 2. On line show dollar-volume of Work performed as of dates used for preparation of payment requests.
- M. Distribution:
 - 1. Following response to initial submittal, print and distribute copies to Architect, Owner, subcontractors, and other parties required to comply with scheduled dates.
 - 2. Post copies in Project meeting room and temporary field office.
 - 3. When revisions made, distribute to same parties and post in same locations.
 - 4. Delete parties from distribution when their assigned portion of Work completed and are no longer involved in construction activities.
- N. Schedule Updating:
 - 1. Update schedule monthly.
 - 2. Revise schedule after each meeting or activity, where revisions recognized or made.
 - 3. Issue updated schedule concurrently with monthly requests for payment.

1.08 SUBMITTAL SCHEDULE

- A. Time Periods for Submission of Submittals: The contractor shall submit all required submittals to the architect within a timely manner and as required to allow for specified review times, re-submission, ordering of materials and delivery of materials to the site without delaying the project. Unless otherwise indicated, submittals shall be delivered to the architect within the time frames (from the date of the contract) indicated below:
 - 1. Failure to comply with the time frames indicated may, at the Owner's Option, result in withholding of payments until such time as the required submittals have been submitted and found to comply with the provisions of the contract documents.
- B. The following submittals shall be submitted to the architect within 24 Hours of the execution of the Owner/Contractor contract:
 - 1. List of major sub contractors and suppliers, including Site Grading Contractor, Site Utilities Contractor, Site Paving Contractor, Concrete Finisher, Mason, Steel Building Erector, Metal Building Supplier and Erector, Plumbing Contractor, Sprinkler Contractor, Mechanical Contractor, Electrical Contractor, Electrical Low Voltage Systems Contractor.
- C. The following submittals shall be submitted to the architect within seven days of the execution of the Owner/Contractor contract:
 - 1. Performance Bond
 - 2. Payment Bond
 - 3. Insurance Certificates, endorsements and policies
 - 4. Notice of commencement
- D. The following submittals shall be submitted to the architect within thirty days of the execution of the Owner/Contractor contract:
 - 1. Detailed Cost Breakdown
 - 2. Base Line Construction Schedule
- E. After development and acceptance of Contractor's construction schedule, prepare complete schedule of submittals.
 - 1. Submit schedule within 10 days of date required for establishment of Contractor's construction schedule.
 - 2. All shop drawings shall be submitted, unless otherwise agreed upon by architect in writing, within **ninety calendar days** of the date of the notice to proceed.
- F. Coordinate submittal schedule with list of subcontracts, schedule of values and list of products as well as Contractor's construction schedule.
- G. Prepare schedule in chronological order; provide following information:
 - 1. Scheduled date for the first submittal.
 - 2. Related Section number.
 - 3. Submittal category.
 - 4. Name of subcontractor.
 - 5. Description of part of Work covered.
 - 6. Scheduled date for resubmittal.
 - 7. Scheduled date of Architect's final release or approval.
- H. Distribution:
 - 1. Following response to initial submittal, print and distribute copies to Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated.
 - 2. Post copies in Project meeting room and field office.
 - 3. When revisions made, distribute to same parties and post in same locations.
 - 4. Delete parties from distribution when their assigned portion of Work completed and no longer involved in construction activities.
- I. Schedule Updating:
 - 1. Revise schedule after each meeting or activity, where revisions recognized or made.
 - 2. Issue updated schedule concurrently with report of each meeting.

1.09 DAILY CONSTRUCTION REPORTS

- A. Prepare daily construction report, recording following information concerning events at site; and submit duplicate copies to Architect at weekly intervals:
 - 1. List of subcontractors at the site.
 - 2. Approximate count of personnel at the site.
 - 3. High and low temperatures, general weather conditions.
 - 4. Amount of precipitation recorded on site, each day and the effect this had on the work activities.
 - 5. Accidents and unusual events.
 - 6. Meetings and significant decisions.
 - 7. Stoppages, delays, shortages, losses.
 - 8. Meter readings and similar recordings.
 - 9. Emergency procedures.
 - 10. Orders and requests of governing authorities.
 - 11. Change Orders received, implemented.
 - 12. Services connected, disconnected.
 - 13. Equipment or system tests and start-ups.
 - 14. Partial Completions, occupancies.
 - 15. Final Acceptances authorized.

1.10 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale.
 - 1. Highlight, encircle, or otherwise indicate deviations from Contract Documents.
 - 2. Do not reproduce Contract Documents or copy standard information as basis of Shop Drawings.
 - 3. Standard information prepared without specific reference to Project not considered Shop Drawings.
- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings; include following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
- C. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets min. 8-1/2" x 11" but max. 24" x 36".
- D. Submittal:
 - 1. Submit one and min. of four blue- or black-line prints for Architect's review.
 - 2. Contractor retain one blueline print after marked by Architect, and maintain as "Record Document".
 - 3. Do not use Shop Drawings without appropriate final stamp indicating action taken in connection with construction.
- E. Coordination Drawings: Special type of Shop Drawing that show relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in space provided or function as intended.
 - 1. Preparation of coordination Drawings specified in section "Project Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.
 - 2. Submit coordination Drawings for integration of different construction elements.
 - 3. Show sequences and relationships of separate components to avoid conflicts in use of space.

1.11 PRODUCT DATA

- A. Collect Product Data into single submittal for each element of construction or system.
 - 1. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves.
 - 2. Where Product Data specially prepared because standard printed data not suitable for use, submit as "Shop Drawings."

- B. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which not required, mark copies to indicate applicable information.
 - 1. Include following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with recognized trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 - C. Do not submit Product Data until compliance with requirements of Contract Documents confirmed.
 - D. Submittals:
 - 1. Submit min. 6 copies (8 if to be part of maintenance manual) of each required submittal.
 - 2. Architect will retain 2, and return other marked with action taken and corrections or modifications required.
 - 3. Unless resubmittal required, retain 1 copy on file at site, 2 copies for maintenance manuals if applicable and one for Record Product Data file.
 - E. Unless noncompliance with Contract Document provisions observed, submittal may serve as final submittal.
 - F. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities.
 - 1. Show distribution on transmittal forms.
 - G. Do not proceed with installation until applicable copy of Product Data applicable is in installer's possession.
 - H. Do not permit use of unmarked copies of Product Data in connection with construction.
- 1.12 SAMPLES
- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with material or product proposed.
 - 1. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
 - 2. Mount, display, or package Samples in manner specified to facilitate review of qualities indicated.
 - 3. Prepare Samples to match Architect's Sample.
 - 4. Include following:
 - a. Generic description of the Sample.
 - b. Sample source.
 - c. Product name or name of manufacturer.
 - d. Compliance with recognized standards.
 - e. Availability and delivery time.
 - 5. Submit Samples for review of kind, color, pattern, and texture, for final check of these characteristics with other elements, and for comparison of characteristics between final submittal and actual component as delivered and installed.
 - 6. Where variation in color, pattern, texture or other characteristics are inherent in material or product represented, submit multiple units (not less than 3), that show approximate limits of variations.
 - B. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
 - C. Refer to other Sections for Samples returned to Contractor for incorporation in Work.
 - 1. Such Samples must be undamaged at time of use.
 - 2. On transmittal, indicate special requests regarding disposition of Sample submittals.
 - D. Preliminary submittals:
 - 1. Where Samples are for selection of color, pattern, texture or similar characteristics from range of standard choices, submit full set of choices for material or product.
 - 2. Preliminary submittals reviewed and returned with Architect's mark indicating selection and other action.

- E. Submittals:
1. Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one returned marked with action taken.
 2. Maintain sets of Samples, as returned, at Project site, for quality comparisons throughout course of construction.
 3. Unless noncompliance with Contract Document provisions is observed, submittal may serve as final submittal.
 4. Sample sets may be used to obtain final acceptance of construction associated with each set.
- F. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of Work.
1. Show distribution on transmittal forms.
- G. Field Samples specified in individual Sections are special types of Samples.
1. Field Samples: Full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish standard by which Work judged.
 2. Comply with submittal requirements to fullest extent possible.
 3. Process transmittal forms to provide record of activity.

1.13 COLORS

- A. Unless otherwise specified in other sections, colors selected after contract awarded, and during shop drawing submittal stage.
1. Colors selected from samples submitted by Contractor, therefore not longer than thirty (30) days after date of "Notice to Proceed", submit to Architect, appropriate color samples of all materials requiring color selections.
 2. Submit **only** those colors from which selections are to be made.
 3. Color selections will be made after all required color samples have been submitted. **No** partial color selections will be made.
- B. The contractor is advised that color selections will take approximately 90 days after receipt of all colors

1.14 ARCHITECT'S ACTION

- A. Except for submittals for record, information or similar purposes, where action and return required or requested, Architect will review each submittal, mark to indicate action taken, and return promptly.
1. Compliance with specified characteristics is Contractor's responsibility.
- B. Action Stamp:
1. Architect will stamp each submittal with uniform, self-explanatory action stamp.
 2. Stamp appropriately marked, as follows, to indicate action taken
 - a. Final Unrestricted Release: Where submittals marked "REVIEWED" and/or "NO EXCEPTIONS TAKEN", that part of Work covered by submittal may proceed provided it complies with requirements of Contract Documents; final acceptance depends upon that compliance.
 - b. Final-But-Restricted Release: When submittals marked "FURNISH AS CORRECTED" and/or "EXCEPTIONS NOTED", that part of Work covered by submittal may proceed provided it complies with notations or corrections on submittal and requirements of Contract Documents; final acceptance depends on that compliance.
 - c. Returned for Resubmittal: When submittal marked "REJECTED" or "REVISE AND RESUBMIT", do not proceed with that part of Work covered by submittal, including purchasing, fabrication, delivery, or other activity.
 - 1) Revise or prepare new submittal in accordance with notations; resubmit without delay.
 - 2) Repeat if necessary to obtain a different action mark.
 3. Do not permit use of submittals marked "Not Approved, or Revise and Resubmit" at Project site, or elsewhere where Work in progress.
- C. Other Action: Where submittal is primarily for information or record purposes, special processing or other activity, submittal returned, noted "Action Not Required".

1.15 ARCHITECT'S TIME

- A. Repeated failure of the contractor to adequately prepare or review submittals materials prior to forwarding to the Architect, which results in excessive or exhaustive efforts by the Architect (or consultants) to review the submittals, including RFI's, shall result in the Architect's notifying the Contractor in writing of that further review of submittals will be at the contractor's expense.
- B. Partial or incomplete submittals received from the Contractor in an effort to expedite the work or resulting from the Contractor's, subcontractors', or suppliers' lack of planning shall not constitute a rush situation on the part of the Architect.
- C. The Contractor shall not utilize the Architect or his Consultants as a "checking service" for review of submittals. Approval of submittals by the Architect or his Consultants shall, in no way be construed to relieve the Contractor of his responsibility to provide specified products and correctly perform the Work.
- D. Architect's invoice:
 - 1. The Architect will maintain records of time expended in processing such submittals.
 - 2. The Architect shall be paid by the contractor for such costs incurred upon submission of an invoice to the contractor.
 - 3. Failure to pay invoices within thirty (30) days of issuance may, at the Architect's Option, result in future payments to the contractor being held until payment is received.

1.16 ELECTRONIC DOCUMENTS:

- A. Electronically formatted plans may, at the architect's discretion, be made available to the contractor(s) for use in developing required shop drawings and other activities herein defined.
- B. Electronic Documents - Pre Bid: Documents in .pdf format may, at the architect's sole discretion, be provided to bidders, prior to the bid date, for use in the development of bids.
 - 1. No electronically formatted documents other than .pdf's will be provided to contractor's for bidding purposes.
- C. Electronic Documents - Post Bid: Provided that certain conditions are met, the architect may, provide electronic documents to successful bidders for use in site and building layout and in the development of shop drawings.
- D. Limitation of Use of Electronic Data: The use of the electronic drawings shall be limited to:
 - 1. Staking and Grading: When requested by contractor and in accordance with the conditions herein noted and defined in the contract for distribution of electronic data, the architect and/or engineers will provide certain civil drawings in electronic format for the purposes of staking and grading of the site.
 - a. Contractor(s) acknowledges that the civil drawings do not include all necessary data for building layout.
 - b. Contractor to refer to hard copies of contract documents for all required layout information.
 - c. Should a conflict exist between the electronic documents and hard copy documents the hard copied documents shall govern.
 - d. Should a conflict exist between the scaled civil drawings and dimensioned drawings the dimensioned drawings shall govern.
 - 2. Shop Drawings: The recipient is authorized to use electronic information in the development of shop drawings for the work of this project only.
 - a. Contractor may make any changes required to plans to correctly reflect the contract documents, including the incorporation of addenda, change orders, field directives and modifications. All costs for modifications to plans to be born by contractor.
 - 3. Use of drawings for purposes other than those defined herein and in the contract prohibited.
- E. Request for Electronic documents: Contractor to submit a written request for drawings on form to be provided by the Architect. This form shall represent a contract for the delivery, use and Ownership of the electronic data.
- F. Agreement to Conditions: The recipient agrees to bound to the requirements contained herein and in the form of agreement for the electronic transfer. The opening, distribution and/or use of the electronic documents shall be considered as an acceptance of these conditions regardless of whether a formal contract has been executed or not.

- G. Governing Documents: The hard copies (blue line or black line) of plans printed and distributed by the architect shall be considered to be the contract documents. Electronic versions of the documents shall not be considered as contract documents.
- H. The delivery of electronic documents to the contractor shall in no way be construed as changing the contract documents.
 - 1. If conflicts exist between the electronic documents and the hard copy of the contract documents, the hard copy shall govern.
 - 2. The recipients of electronic documents shall be responsible for identifying and notifying architect of conflicts between contract documents and electronic versions of documents and verifying that the electronic documents accurately represent the contract documents.
- I. Electronic data, if furnished, shall be provided to the contractor as a convenience to the contractor. Such delivery of electronic documents shall in no way eliminate or reduce the contractor's traditional and/or contractual responsibilities.
 - 1. The contractor shall retain customary duties and responsibilities for verifying materials and quantities, field measurements, and field construction criteria and for checking and coordinating information in submittals to verify compliance with contract documents.
- J. Waiver of Liability: The contractor agrees to hold the Owner, architect and engineers harmless for any claims resulting from the use of the electronic documents regardless of the nature of the claim or the use of the electronic data.
 - a. The opening, distribution or use of electronic documents, by contractor(s), subcontractor(s), supplier(s) or other parties (recipients) shall be construed as an agreement to hold the Owner, architect and engineers harmless for any issues, claims, delays, or damages resulting from the use of such documents.
 - b. The recipient shall waive all claims and/or damages against the Owner, architect and or engineers relating to corruption, degradation or disruption of data.
 - c. Recipient of electronic data shall defend and indemnify the Owner, architect and engineer(s) from any claim arising from any defect, error, omission or modifications not contained in the hardcopies of the contract documents.
- K. Copy Right of Documents: The delivery of electronic documents to parties shall not be construed as authorization to use, copy or distribute electronic documents for any other use than that which is indicated herein and as defined in the agreement for transfer of electronic documents.
 - a. The architect expressly retains ownership of documents and copyright of said documents.
- L. No Warranties on Accuracy of Electronic Documents: The architect and engineers do not in any way warrant that the plans and/or specifications are identical to the contract documents. If conflicts exist between the printed contract documents and the electronically formatted documents the printed documents shall govern
- M. No Warranty as to Fitness: The recipient agrees that the electronic documents are an 'instrument of service' and not a 'product'. The architect and engineers in no way warrant the merchantability or fitness of the electronic documents.
 - 1. The architect expressly disavows any and all warranties whether expressed or implied regarding the accuracy of the electronic documents or the fitness of the documents for the intended use by the recipients.
- N. Limitation of Documents to be Provided: The architect will only furnish electronic documents for floor plans. Sections, details, schedules, and other similar items will not be provided as electronic documents.
- O. Form of Documents to be Provided: The electronic documents will be modified to provide only that information necessary for the development of shop drawings.
 - 1. The architect's seal and signature will be removed from each sheet.
 - 2. Dimensions and text will be removed from the sheet.
- P. Electronic Format and Transfer Medium: The architect will deliver the electronic documents using the CAD system on which the drawings were developed. The architect and engineers will not attempt to translate the electronic documents to a format other than that on which the drawings were developed.

- Q. Electronic Shop Drawings: The contractor shall, upon development of shop drawings, transmit, at no cost to the Owner or Architect, an electronic copy of the shop drawings and revised floor plans in a format acceptable to the architect.
- R. Cost Reimbursement: The recipient agrees that the development and delivery of electronic documents requires monies to be expended by the architect and/or engineers.
1. The recipient of electronic documents agrees to reimburse the architect and engineers for the cost incurred by the architect and engineers to compile and deliver to the recipient the requested information.
 2. The amount reimbursement paid by the recipient shall in no way be interpreted as creating a contract between the architect and the recipient(s) or the architect and third party beneficiaries. The cost is a reimbursement for reproduction and delivery costs.
 3. The recipient shall reimburse the architect the following amounts:
 - a. Architectural Drawings: \$100.00 per sheet
 - b. Engineering Drawings: \$150.00 per sheet.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01330

SUPPLIER'S SUBMITTAL CERTIFICATION

PROJECT: _____

LOCATION: _____

PRODUCT: _____ SPEC. SECTION: _____

SUPPLIER: _____

ADDRESS: _____

PERSON: _____

TELEPHONE: _____ FAX NUMBER _____

TO: JAMES W. BUCKLEY & ASSOCIATES, INC; ARCHITECT

The undersigned understands that it is the contractor's and supplier's contractual responsibility to furnish products in strict conformance with the project technical specifications (project manual) and drawings. As part of this responsibility the undersigned does hereby certify that, except as specifically stated below, the products submitted herein, as stated above, are in full and complete compliance with the provisions of the contract documents, including provisions of Specifications Section _____.

The undersigned further certifies that products furnished under this section deviate from the contract documents, specifications and drawings, only in the following respects:

Respectfully Certified:

Signature

Printed Name / Title

Date

**SECTION 01410
REGULATORY REQUIREMENTS**

PART 1 - GENERAL

1.01 REGULATORY AGENCIES

- A. Contractor responsible for notifying following agencies as to date that construction activities scheduled to commence:
 - 1. Clerk of Superior Court in County in which project is to be constructed; "Notice of Commencement".
 - 2. City or County Building Inspectors
 - 3. EPA / EPD
 - 4. Department of Natural Resources
 - 5. Utility Companies
 - 6. E-Verify
- B. Contractor responsible for notifying following agencies as to date building is ready for preliminary and/or final inspection(s).
 - 1. Local Fire Marshal
 - 2. State Fire Marshal
 - 3. City or County Building Inspectors
- C. Inspection Reports:
 - 1. Contractor shall send two copies of required notifications transmitted to Architect.
 - 2. Contractor have all inspection reports sent directly to him with copies to Owner and Architect.
 - 3. In event of inspection by one of above listed agencies not required, Contractor notify Owner and Architect in writing which agency and why not required to inspect building.
- D. Forms:
 - 1. Form of "Notice of Commencement" included at end of this Section.
 - 2. Application for 80% preliminary and 100% final inspections by Fire Marshal included at end of this Section.
 - 3. Contractor Affidavit under O.C.G.A 13-10-91, E-Verify (b) (1) Contractor
 - 4. Contractor Affidavit under O.C.G.A 13-10-91, E-Verify (b) (3) Sub-Contractor
 - 5. Contractor Affidavit under O.C.G.A 13-10-91, E-Verify (b) (4) Sub-Sub-Contractor
 - 6. Contractor obtain necessary forms from agencies required by respective agency.
- E. Fees and Costs:
 - 1. Contractor pay all inspection fees required and performed by agencies having jurisdiction. Contractor responsible for fee payments until all contract related deficiencies corrected to satisfaction of inspecting agency. If non-contract related deficiencies exist, Contractor's responsibility not negated until all contract related deficiencies corrected.
 - 2. Contractor responsible for costs associated with initial inspection and follow-up inspections (reinspections), when required, until all documented deficient work corrected and Occupancy Permit issued by all authorities having jurisdiction.

1.02 PREREQUISITES TO FINAL INSPECTIONS BY AUTHORITIES

- A. General: Prior to requesting final inspections by the local and/or state authorities the contractor shall develop necessary documentation which adequately demonstrates that the building complies with applicable regulations and codes, permitted drawings and specifications and contract documents.
- B. Procedural: A minimum of sixty (60) days prior to the request for final inspection(s) the contractor shall develop and submit to the architect a minimum of four (4) each hardbound, three ring notebook type binders, tabbed, indexed and cross referenced adequately to ensure ease in locating necessary documentation.
 - 1. The architect shall review the note books for compliance with requirements described herein. The contractor shall be notified of revisions and or additions required to the documents.
 - 2. The contractor shall have on site two complete and corrected copies of the note books at the time of the Fire Marshals final inspection. One copy of this note book shall be furnished to the fire marshal.

- C. The note books shall contain, as a minimum the documentation described below.
1. Notices:
 - a. Notice of Readiness for Final Inspection (General Conditions, Article E-41)
 2. Inspection Reports:
 - a. Copy of Previous Inspection Reports with written responses to each item.
 3. Construction Permit:
 - a. Copy of Fire Marshal Construction Permit
 - b. Copy of Construction Permits (If Any) issued by local authorities
 - c. Copy of Building Permit
 4. Drawings and Specifications:
 - a. Original State Fire Marshal Reviewed plans and specifications with attached review comments.
 5. Product Data: Provide product data which clearly states the product's fire rated and burning characteristics, including fire ratings, flame spread, smoke developed and other related data for each of the following:
 - a. Floor coverings including vinyl tile floor, carpet and related materials
 - b. Walls including gypsum board, concrete block with applicable UL Design numbers
 - c. Wall coverings including paint, vinyl wall covering, acoustical wall panels.
 - d. Doors, Doors frames and Windows
 - e. Ceilings
 6. Fire Rated Penetrations: The contractor shall develop and have each trade contractor develop and submit a detailed description of each of systems utilized for sealing penetrations through fire rated and smoke rated construction. Provide as a minimum:
 - a. Description of condition, location and smoke or fire rating for which system is being used.
 - b. UL number of system being used with back up documentation showing UL Design
 7. Site Utilities Work
 - a. NFPA form, Underground utilities certifications
 - b. Letter from site utilities contractor certifying that the work has been installed in strict compliance with requirements of the contract documents and all applicable codes..
 - c. Contractor's name, firm, address, telephone number.
 - d. Contractor's license number
 8. Building Contractor:
 - a. Copy of Fire Marshal approved bleacher (where applicable) shop drawings
 9. Plumbing System
 - a. NFPA form, Underground utilities certifications
 - b. Letter from plumbing contractor certifying that the work has been installed in strict compliance with requirements of the contract documents and all applicable codes.
 - c. Copy of Department of Labor approval of boilers, and where water heaters classified as boilers of water heaters.
 - d. Contractor's name, firm, address, telephone number.
 - e. Contractor's license number
 10. Sprinkler System
 - a. Letter from plumbing contractor certifying that the work has been installed in strict compliance with requirements of the contract documents and all applicable codes.
 - b. Copy of Fire Marshall approved building sprinkler system shop drawings
 - c. Contractor's name, firm, address, telephone number.
 - d. Contractor's license number
 - e. Installer's certificate of competency and photo identification of installer.
 11. Mechanical System
 - a. Letter from plumbing contractor certifying that the work has been installed in strict compliance with requirements of the contract documents and all applicable codes.
 - b. Kitchen exhaust hood shop drawings
 - c. Contractor's name, firm, address, telephone number.
 - d. Contractor's license number

12. Electrical System
 - a. Letter from plumbing contractor certifying that the work has been installed in strict compliance with requirements of the contract documents and all applicable codes.
 - b. Certification of installation and proper operation of Fire Alarm System.
 - c. Copy of Fire Marshall approved Fire Alarm Shop Drawings
 - d. Documentation and certification of start up and proper operation of emergency generator.
 - e. Contractor's name, firm, address, telephone number.
 - f. Contractor's license number, including low voltage contractor

PART 2 - PRODUCTS (Not applicable).

PART 3 - EXECUTION

3.01 NOTICE OF COMMENCEMENT

- A. Within 7 Calendar Days of Commencement of Construction activities; contractor shall transmit to Clerk of the Superior Court in county in which project is located, form of "Notice of Commencement".
 1. Submit copy of fully executed 'Notice of Commencement' to the Owner and Architect.

3.02 REQUEST FOR INSPECTION(S)

- A. In appropriate and timely manner and using applicable forms, notify authorities having jurisdiction that Project ready for required inspections.
 1. Written notification required, indicating:
 - a. Type inspection required.
 - b. Stage of Project construction.
 - c. Proposed date of inspection.
 - d. Other requirements of specific agency or authority.
 2. Transmit copy to Architect.

3.03 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor assist inspecting authority in performance of inspection.
 1. Accompany inspector until inspection complete.
 2. Provide equipment required for inspections, including but not limited to:
 - a. Flashlights.
 - b. Mirrors.
 - c. Ladders.
 - d. Measuring devices.
 - e. Other items required by specific inspection agency.

3.04 SUBCONTRACTS:

- A. The contractor or subcontractor shall insert in any subcontracts the clauses for providing Contractor Affidavit for E-Verify form and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in in above and O.C.G.A. 13-10-91. Each company has to go on line, register and take knowledge test. Once this is done, you will receive company ID #<https://e-verify.uscis.gov/emp>

3.05 INSPECTION - FIRE MARSHALL

- A. Eighty (80%) Inspection:
1. Notify Fire Marshall and request inspection upon completion of 80% of Project, providing minimum of 21 days notice.
 2. 80% completion defined as having structural components in place and open for review of fire safety components such as:
 - a. Fire walls.
 - b. Vertical shafts.
 - c. Stairways.
 - d. Smoke stops.
 - e. Hazardous area separation.
 - f. Roof and ceiling assemblies.
 - g. Corridor and door width.
 - h. HVAC system.
 3. Do not install ceilings or other obstructing elements until 80% inspection complete and acceptable.
 4. Upon receipt of Fire Marshall's report, Contractor take following actions:
 - a. Type Fire Marshall's hand written report.
 - b. Review and respond in writing to each item in report indicating status of item, proposed method of resolution, and time resolution to finished.
 - c. Transmit copies of report and response to Architect.
 - d. Correct deficiencies indicated on report.
- B. One Hundred (100%) Inspection:
1. Notify Fire Marshall and request inspection upon completion of 100% of Project, providing minimum 21 days notice.
 2. 100% completion defined building ready to occupy and qualify for Certificate of Occupancy.
 3. Perform 100% inspection prior to occupancy of Project.
 4. Upon receipt of Fire Marshall's report, Contractor take following actions:
 - a. Type Fire Marshall's hand written report.
 - b. Review and respond in writing to each item in report indicating status of item, proposed method of resolution, and time resolution to finished.
 - c. Transmit copies of report and response to Architect.
 - d. Correct deficiencies indicated on report.
- C. Reinspection(s):
1. When documented deficiencies corrected, notify Fire Marshall Project ready for reinspection.
 2. Upon receipt of Fire Marshall's report, Contractor take following actions:
 - a. Type Fire Marshall's hand written report.
 - b. Review and respond in writing to each item in report indicating status of item, proposed method of resolution, and time resolution to finished.
 - c. Transmit copies of report and response to Architect.
 - d. Correct deficiencies indicated on report.
 3. Repeat procedure until all deficiencies corrected and Occupancy Permit obtained.

END OF SECTION 01410

OFFICE OF COMMISSIONER OF INSURANCE

JOHN W. OXENDINE
COMMISSIONER OF INSURANCE
SAFETY FIRE COMMISSIONER
INDUSTRIAL LOAN COMMISSIONER
COMPTROLLER GENERAL

APPLICATION FOR 80% INSPECTION

SEVENTH FLOOR, WEST TOWER
FLOYD BUILDING
2 MARTIN LUTHER KING JR., DRIVE
ATLANTA, GEORGIA 30334
(404) 656-2056 TDD# (404) 656-4031

DATE _____

Engineering/Inspection Section
Safety Fire Division
Floyd Building, 620 West Tower
2 Martin Luther King, Jr. Drive
Atlanta, Georgia 30334

Dear Sir:

Pursuant to the provisions and regulations of the Georgia Safety Fire Law, I, _____,
_____ Owner/Authorized Representative

hereby submit application and request a preliminary inspection of _____,
_____ Project Name

located at _____, _____,
_____ Facility Name _____ Street

_____, _____,
_____ City _____ County

The facility was approved under Construction Permit No. _____ dated _____

_____, _____, (_____) _____,
_____ Job Site Contract _____ Title _____ Phone Number

The facility will be ready to be occupied on _____.

Signature of Applicant

Telephone Number (required)

Mailing Address

City

State/Zip Code

(This application and request is to be submitted 21 days prior to the date of the requested inspection.)

FM 50 (Revised 2/95)

If you are an individual with a disability and wish to acquire this publication in an alternative format, please contact the ADA Coordinator, Safety Fire Division, Office of Commissioner of Insurance, 2 Martin Luther King Jr. Drive, Atlanta, Georgia 30334, 404 656 2056, TDD#404 656-4031.

THE OFFICE OF COMMISSIONER OF INSURANCE DOES NOT DISCRIMINATE ON THE BASIS OF RACE, COLOR, NATIONAL ORIGIN, SEX, RELIGION, AGE OR DISABILITY IN EMPLOYMENT OR THE PROVISION OF PROGRAMS OR SERVICES.



OFFICE OF COMMISSIONER OF INSURANCE

JOHN W. OXENDINE
COMMISSIONER OF INSURANCE
SAFETY FIRE COMMISSIONER
INDUSTRIAL LOAN COMMISSIONER
COMPTROLLER GENERAL

APPLICATION FOR 100% INSPECTION

SEVENTH FLOOR, WEST TOWER
FLOYD BUILDING
2 MARTIN LUTHER KING JR., DRIVE
ATLANTA, GEORGIA 30334
(404) 656-2056 TDD# (404) 656-4031

DATE

Engineering/Inspection Section
Safety Fire Division
Floyd Building, 620 West Tower
2 Martin Luther King, Jr. Drive
Atlanta, Georgia 30334

Dear Sir:

Pursuant to the provisions and regulations of the Georgia Safety Fire Law, I, _____,
Owner/Authorized Representative

hereby submit application and request a preliminary inspection of _____,
Project Name

located at _____,
Facility Name Street

City County

The facility was approved under Construction Permit No. _____ dated _____

_____, _____, (_____) _____
Job Site Contract Title Phone Number

The facility will be ready to be occupied on _____.

Signature of Applicant

Telephone Number (required)

Mailing Address City State/Zip Code

(This application and request is to be submitted 21 days prior to the date of the requested inspection.)

FM 50 (Revised 2/95)

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NOTICE OF COMMENCEMENT

TO THE CLERK OF THE SUPERIOR COURT OF _____ COUNTY, GEORGIA

Pursuant to O.C.G.A. 44-14-361.5(b), the undersigned hereby gives Notice of Commencement of improvements to property including the following information:

1. Name, Address, and Telephone number of Contractor:

2. Name and Location of Project:

A legal description of the property upon which the improvements are being made is attached hereto as Exhibit "A", which is incorporated herein by this reference.

3. Name and address of true owner of property:

1. Name and address of person, other than true owner, at whose instance the improvements to the property are being made:

2. Name and address of Surety for the Performance and Payment Bonds, if any:

6. Name and address of Construction lender, if any:

The Clerk of the County is requested to file, record and index, this Notice of Commencement, in the records and indices maintained for such notices.

(Owner, Agent of Owner, Or Contractor)

Date _____

Contractor Affidavit under O.C.G.A. § 13-10-91(b)(1)

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services on behalf of (name of public employer) has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned contractor will continue to use the federal work authorization program throughout the contract period and the undersigned contractor will contract for the physical performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the contractor with the information required by O.C.G.A. § 13-10-91(b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

Federal Work Authorization User Identification Number

Date of Authorization

Name of Contractor

Name of Project

Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, ____, 201__ in _____ (city), _____ (state).

Signature of Authorized Officer or Agent

Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____, 201__.

NOTARY PUBLIC

My Commission Expires:

Subcontractor Affidavit under O.C.G.A. § 13-10-91(b)(3)

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services under a contract with (name of contractor) on behalf of (name of public employer) has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the subcontractor with the information required by O.C.G.A. § 13-10-91(b). Additionally, the undersigned subcontractor will forward notice of the receipt of an affidavit from a sub-subcontractor to the contractor within five business days of receipt. If the undersigned subcontractor receives notice of receipt of an affidavit from any sub-subcontractor that has contracted with a sub-subcontractor to forward, within five business days of receipt, a copy of such notice to the contractor. Subcontractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

Federal Work Authorization User Identification Number

Date of Authorization

Name of Subcontractor

Name of Project

Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, ____, 201__ in _____ (city), _____ (state).

Signature of Authorized Officer or Agent

Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____, 201__.

NOTARY PUBLIC

My Commission Expires:

Sub-subcontractor Affidavit under O.C.G.A. § 13-10-91(b)(4)

By executing this affidavit, the undersigned sub-subcontractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services under a contract for (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract) and (name of contractor) on behalf of (name of public employer) has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned sub-subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned sub-subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the sub-subcontractor with the information required by O.C.G.A. § 13-10-91(b). The undersigned sub-subcontractor shall submit, at the time of such contract, this affidavit to (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Additionally, the undersigned sub-subcontractor will forward notice of the receipt of any affidavit from a sub-subcontractor to (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Sub-subcontractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

Federal Work Authorization User Identification Number

Date of Authorization

Name of Sub-subcontractor

Name of Project

Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, ____, 201__ in _____(city), _____(state).

Signature of Authorized Officer or Agent

Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____, 201__.

NOTARY PUBLIC
My Commission Expires:

SECTION 01450
QUALITY CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this Section.
- B. Related Requirements specified elsewhere. Requirements for testing are described in various Sections of the Specifications. Sections in which testing requirements are described include, but are not limited to:
 - 1. Earthwork; Section 02300.
 - 2. Utilities System Trenching; Section 02321.
 - 3. Erosion Control and Grassing; Section 02370.
 - 4. Concrete Work; Section 03300, 03310, 03315.
 - 5. Unit Masonry; Section 04200 and 04230.
 - 6. Steel; Section 05100, 05210 and 05301.
 - 7. Light Gauge Steel Trusses; Section 05450.
 - 8. EIFS (Exterior Insulation Finish System); Section 07240
 - 9. Carpeting; Section 09680.
 - 10. Wet Automatic Sprinkler System; Section 13930.
 - 11. Domestic Water System; Section 15401.
 - 12. Soil, Vent and Waste System; Section 15405.
 - 13. Air Distribution System; Section 15840.
 - 14. Elsewhere where indicated.

1.02 DESCRIPTION OF REQUIREMENTS

- A. General:
 - 1. Required inspection and testing services intended to assist in determination of probable compliance of work with requirements specified or indicated.
 - 2. These required services do not relieve Contractor of responsibility for compliance with these requirements or for compliance with requirements of Contract Documents.
- B. Definitions:
 - 1. Requirements of this section relate primarily to customized fabrication and installation procedures, not to production of standard products.
 - 2. Quality control services include inspections and tests and related actions including reports, performed by independent agencies and governing authorities, as well as directly by Contractor.
 - 3. These services do not include Contract enforcement activities performed directly by Architect or Engineer.
 - 4. Specific quality control requirements for individual units of work specified in section of these specifications that specify individual element of Work.
 - 5. These requirements, including inspections and tests, cover both production of standard products, and fabrication of customized work.
 - 6. These requirements also cover quality control of installation procedures.
- C. Inspections, tests and related actions specified in this section and elsewhere in Contract Documents not intended to limit Contractor's own quality control procedures which facilitate overall compliance with requirements of Contract Documents.
- D. Requirements for Contractor to provide quality control services required by Architect/Engineer, Owner, governing authorities or other authorized entities not limited by provisions of this Section.

1.03 RESPONSIBILITIES

A. Contractor Responsibilities:

1. Except where specifically indicated as being Owner's responsibility, or where provided by another identified entity, inspections, tests and similar quality control services and measures are the **Contractor's** responsibility; these services also include those specified as performed by independent agency and not directly by Contractor.
2. Include costs for these services in Contract Sum.
3. **Contractor** shall employ and pay independent agency, testing laboratory or other qualified firm to perform quality control services specified.

B. Owner's Responsibilities:

1. **Owner** to engage and pay for services of independent agency to perform inspections and tests only where specifically specified as Owner's responsibilities.
2. The Owner shall pay for services of and independent testing agency, testing laboratory or other qualified firm to perform **ONLY** those services which are classified herein as Owner's Responsibilities.
3. For the purposes of this section the testing associated with the following, as further defined on Sheet S0.1, Special Structural Inspections, Note C, shall be considered as the Owner's Responsibilities:
 - a. Inspection of steel fabricators.
 - b. Steel Construction.
 - c. Concrete Construction
 - d. Masonry construction.
 - e. Soils.
 - f. Exterior Insulation and Finish System (EFIS)
 - g. Carpet Testing (At the Owner's Option).

C. Retest Responsibility:

1. Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related work with requirements of Contract Documents, then retests are responsibility of Contractor, regardless of whether original test was Contractor's responsibility.
2. Retest work revised or replaced by Contractor is Contractor's responsibility, where required tests performed on original work.

D. Owner's Convenience Testing:

1. Nothing contained within this specification shall be construed as limiting the owners right to test building systems to verify conformance with contract provisions. Where no testing requirements are defined in referenced technical specifications, the Architect and / or owner may at their option, elect to have testing performed.
2. Optional testing under this paragraph to be paid for by owner.

E. Contractor's Convenience Testing:

1. Inspections, tests and related actions specified in this section and elsewhere in Contract Documents not intended to limit Contractor's own quality control procedures which facilitate overall compliance with requirements of Contract Documents.
2. Inspections or testing performed exclusively for the Contractor's convenience and quality control shall be the sole responsibility of the contractor.
 - a. The Contractor shall be responsible for costs associated with convenience testing.

F. Code Compliance Testing:

1. Inspections and tests required by codes or ordinances, or by plan approval authority, and made by a legally constituted authority, shall be the responsibility of and shall be paid for by the contractor.

G. Responsibility for Associated Services:

1. Contractor required to cooperate with independent agencies performing required inspections, tests and similar services.
2. Provide such auxiliary services reasonably requested.
3. Notify testing agency sufficiently in advance of operations to permit assignment of personnel.

4. These auxiliary services include but not necessarily limited to following:
 - a. Providing access to the work.
 - b. Taking samples or assistance with taking samples.
 - c. Delivery of samples to test laboratories.
 - d. Security and protection of samples and test equipment at project site.

H. Coordination:

1. Contractor and each independent agency engaged to perform inspections, tests and similar services for Project coordinate sequence of their activities to accommodate required services with min. of delay in progress of Work.
2. In addition, Contractor and each independent testing agency coordinate their work to avoid necessity of removing and replacing work to accommodate inspections and tests.
3. Contractor responsible for scheduling times for inspections, tests, taking of samples and similar activities.
 - a. By advanced discussion with the Testing Laboratory, determine the time required for laboratory to perform its tests and to issue reports of findings.
 - 1) Provide all required time within construction schedule.
 - b. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with Testing Laboratory.
 - c. When Testing Laboratory is ready to test according to determined schedule, but is prevented from testing or taking specimens due to incompleteness of the work, all extra costs for testing attributable to the delay shall be charged to and paid by the contractor.

- I. Payment for Tests: The Owner shall pay the cost associated with testing defined as 'Owner responsibilities' only to the extent that the work is performed and billed at normal (non-overtime) work hours. Where testing is performed at times and dates where overtime rates apply the contractor shall be responsible for the 'additional' costs associated with the 'over-time' work.

1.04 QUALITY ASSURANCE

A. Qualification for Service Agencies:

1. Except as otherwise indicated, engage inspection and test service agencies, including independent testing laboratories, prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by American Council of Independent Laboratories, and recognized in industry as specialized in types of inspections and tests performed.
2. Inspecting and Testing Firm shall be selected by contractor and approved by Architect.

B. Codes and Standards:

1. Testing will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing Materials.

1.05 SUBMITTALS

A. General:

1. Refer to Division-1 section on "Submittals" for general requirements on submittals.
2. If Contractor responsible for service, submit certified written report of each inspection, test or similar service through Contractor, in triplicate.
3. Submit additional copies of each written report directly to governing authority, when authority so directs.

B. Report Data: Written reports of each inspection, test or similar service shall include, but not limited to following:

1. Name of testing agency or test laboratory.
2. Dates and locations of samples and tests or inspections.
3. Names of individuals making the inspection or test.
4. Designation of the work and test method.
5. Complete inspection or test data.
6. Test results.
7. Interpretations of test results.
8. Notation of significant ambient conditions at time of sample-taking and testing.

9. Comments or professional opinion as to whether inspected or tested work complies with requirements of Contract Documents.
10. Recommendations on retesting, if applicable.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.01 TAKING SPECIMENS

- A. All specimens and samples for testing, unless otherwise specified in these contract documents, shall be taken by Testing Laboratory.
 1. Sampling equipment and personnel to be provided by testing laboratory.
 2. Deliveries of samples and specimens to testing laboratory to be by testing laboratory's personnel.

3.02 REPAIR AND PROTECTION

- A. General:
 1. Upon completion of inspection, testing, sample-taking and similar services performed on Work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
 2. Comply with Contract Document requirements for "Cutting and Patching".
 3. Protect work exposed by or for quality control service activities, and protect repaired work.
 4. Repair and protection is Contractor's responsibility, regardless of assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01450

SECTION 01500
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this Section.

1.02 DEFINITIONS

- A. Temporary Services and Facilities: For the purpose of this contract the term Temporary Services and Facilities shall be defined as project utility services, temporary construction and support facilities, temporary project security and protections systems and measures, temporary safety control measures, temporary and construction signage, temporary lighting and other materials and systems herein described.
 - 1. The term 'project utility services', 'temporary utility services' and 'utility services' shall include all utilities regardless of whether the utility is temporary or permanent in nature.
 - 2. Unless specifically noted otherwise herein, the contractor shall be responsible for all costs, including use costs, associated with temporary and permanent utilities for the duration of the project up to the date of final acceptance of the building.

1.03 DESCRIPTION OF REQUIREMENTS

- A. This Section specifies administrative and procedural requirements for temporary services and facilities, including such items as temporary utility services, temporary construction and support facilities, and project security and protection.
 - 1. All costs associated with the installation, maintenance, use and removal of temporary facilities and controls specified herein to be paid by the contractor unless specifically noted otherwise.
 - 2. In the absence of provisions to the contrary, the Contractor shall pay for all utilities services (water, gas, sewer, electricity) until the final certificate has been executed or until the work is occupied, whichever is the earlier.
 - 3. Unless specifically noted otherwise, no cost or usage charges for temporary services or facilities chargeable to Owner or Architect.
 - 4. Costs or use charges for temporary services or facilities not accepted as basis for claims for change-orders for added costs.
- B. Temporary utility services:
 - 1. Those required for use at project site include but not limited to following:
 - a. Water service and distribution.
 - b. Temporary electric power and light.
 - c. Telephone and Fax service.
 - d. Storm and sanitary sewer.
 - 2. Provide adequate utility capacity at each stage of construction.
 - a. Prior to availability of temporary utilities at site, provide trucked-in services for start-up of construction operations.
 - 3. Obtain and pay for temporary easements required to bring temporary utilities to project site, where Owner's permanent easement cannot be utilized for that purpose.
- C. Temporary construction and support facilities:
 - 1. Those required for project include but not limited to following:
 - a. Temporary heat.
 - b. Field offices and storage sheds.
 - c. Temporary roads and paving.
 - d. Sanitary facilities, including drinking water.
 - e. Dewatering facilities and drains.
 - f. Temporary enclosures.
 - g. Hoists and temporary elevator use.
 - h. First aid station.

- i. Project identification, bulletin boards and signs.
 - j. Waste disposal services.
 - k. Rodent and pest control.
 - l. Construction aids and miscellaneous general services and facilities.
2. Alternate temporary services and facilities, equivalent to those specified, may be used, subject to acceptance by Architect.
- D. Security and protection facilities and services:
1. Those required for project include but not limited to following:
 - a. Temporary fire protection.
 - b. Barricades, warning signs, lights.
 - c. Sidewalk bridge or enclosure fence for the site.
 - d. Environmental protection.
 2. Alternate security and protection methods or facilities, equivalent to those specified, may be used, subject to acceptance by Architect.

1.04 QUALITY ASSURANCE

- A. Regulations: Comply with requirements of local laws and regulations governing construction and local industry standards, in installation and maintenance of temporary services and facilities, including but not limited to following:
1. Building Codes, including local requirements for permits, testing and inspection.
 2. Health and safety regulations.
 3. Utility company regulations and recommendations governing temporary utility services.
 4. Police and Fire Department rules and recommendations.
 5. Police and Rescue Squad recommendations.
 6. Environmental protection regulations governing use of water and energy, and control of dust, noise and other nuisances.
- B. Standards: Comply with requirements of NFPA Code 241, "Building Construction and Demolition Operations", the ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA National Joint Guideline NJG-6 "Temporary Job Utilities and Services".
1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", as prepared jointly by AGC and ASC for industry recommendations.
- C. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities not intended to interfere with normal application of trade regulations and union jurisdictions applicable to work.
- D. Inspections:
1. Inspect and test each service before placing temporary utilities in use.
 2. Arrange for required inspections and tests by governing authorities, and obtain required certifications and permits for use.

1.05 SUBMITTALS

- A. Reports and Permits:
1. During progress of Work, submit copies of reports and permits required by governing authorities, or necessary for installation and efficient operation of temporary services and facilities.
 2. Submit copies of reports of tests, inspections, meter readings and similar procedures performed on temporary utilities before, during and after performance of work.
 3. Submit copies of permits, easements and similar documentation necessary for installation, use and operation of temporary utility services.
- B. Reports and permits required for use of temporary utility services and their use include but not limited to following:
1. Temporary heat.
 2. Ventilation.
 3. Temporary electric power and light.

1.06 JOB CONDITIONS

- A. General: Provide each temporary service and facility ready for use at each location when service or facility first needed to avoid delay in performance of work.
 - 1. Maintain, expand as required and modify temporary services and facilities as needed throughout progress of Work.
 - 2. Do not remove until services or facilities no longer needed, or replaced by authorized use of completed permanent facilities.
 - 3. With establishment of job progress schedule, establish schedule for implementation and termination of service for each temporary utility.
 - 4. At earliest feasible time, and when acceptable to Owner and Architect, change over from use of temporary utility service to use of permanent service, to enable removal of temporary utility and eliminate possible interference with completion of work.
- B. Conditions of Use:
 - 1. Operate temporary services and facilities in safe and efficient manner.
 - 2. Do not overload temporary services or facilities, and do not permit them to interfere with progress of work.
 - 3. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on jobsite.
- C. Temporary Utilities:
 - 1. Do not permit freezing of pipes, flooding or contamination of water sources.
- D. Temporary Construction and Support Facilities:
 - 1. Maintain temporary facilities in such manner as to prevent discomfort to users.
 - 2. Take necessary fire prevention measures.
 - 3. Maintain temporary support facilities in sanitary manner to avoid health problems and other deleterious effects.
- E. Security and Protection:
 - 1. Maintain site security and protection facilities in safe, lawful and publicly acceptable manner.
 - 2. Take necessary measures to prevent erosion of the site.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. General: Provide new materials and equipment for temporary services and facilities; undamaged used materials and equipment in serviceable condition may be used, if acceptable to Architect.
 - 1. Provide only materials and equipment recognized as suitable for intended use, by compliance with appropriate standards.
- B. Temporary Utilities: When local utility company provides only portion of temporary utility, provide remainder with matching, compatible materials and equipment.
 - 1. Comply with utility company's recommendations.
- C. Water Hoses: Where shut-off nozzles used at water hose discharge, provide heavyduty abrasion-resistant hoses with pressure rating greater than maximum pressure of water distribution system.
 - 1. Where non-potable water used, provide warning signs on discharge end of each length of hose.
- D. Electrical Service:
 - 1. Comply with applicable NEMA, NECA and UL standards and governing regulations for materials and layout of temporary electric service, including those requirements included in Division-16 sections.
 - 2. Voltage Differences:
 - a. Provide identification warning signs at power outlets which are other than 110-120 volt power.
 - b. Provide polarized outlets for plug-in type outlets, to prevent insertion of 110-120 volt plugs into higher voltage outlets.

3. Ground-Fault Protection: Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for plug-in connection of power tools and equipment.
 4. Electrical Power Cords:
 - a. Use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic.
 - b. Use single lengths or use waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas of work.
 5. Lamps and Light Fixtures:
 - a. Provide general service incandescent lamps of wattage indicated or required for adequate illumination.
 - b. Protect lamps with guard cages or tempered glass enclosures, where fixtures exposed to breakage by construction operations.
 - c. Provide exterior fixtures where fixtures are exposed to weather or moisture.
- E. Temporary Construction and Support Facilities: Provide facilities that can be maintained properly throughout their time at jobsite.
1. Heating Units: Provide temporary heating units tested and labeled by UL, FM or another recognized trade association related to fuel being consumed.
 2. Temporary Offices and Similar Construction:
 - a. For temporary offices, fabrication shops, storage sheds and similar construction, provide either standard prefabricated or mobile units or the equivalent job-built construction.
 - b. Provide insulated, weathertight units, heated or air-conditioned where indicated, lockable entrances, operable windows, roofing, foundations adequate for normal loading, including wind loads, serviceable finishes, and mechanical and electrical equipment necessary to achieve ambient conditions indicated.
 3. Fire-Resistance:
 - a. Provide fire-resistant construction for offices, shops, and sheds located within construction work area, or within 50 feet of building lines.
 - b. Provide UL labeled Class "A" fire treated lumber and plywood for framing, sheathing and siding, and UL Class "A" asphalt shingle or roll roofing.
 - c. Provide gypsum board (drywall) interior walls.
 4. Self-Contained Toilet Units: Provide single-occupant self-contained toilet units of chemical, aerated recirculating, or combustion type, properly vented and fully enclosed with glass fiber reinforced polyester shell or similar non-absorbent material.
 5. Tarpaulins:
 - a. Provide waterproof, fire-resistant, UL labeled tarpaulins with max. flame-spread rating of 15.
 - b. For temporary enclosures where work being or will be performed, provide translucent tarpaulins made of nylon reinforced laminated polyethylene to admit max. amount of daylight and reduce need for temporary lighting.
 6. First Aid Supplies: Comply with governing regulations and recognized recommendations within construction industry.
 7. Drinking Water: Provide potable water approved by local health authorities.
 - a. Where well water used, comply with local health authorities recommendations for type and frequency of testing water for potability.
 8. Sign Materials: For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thicknesses indicated.
 - a. Provide exterior grade acrylic-latex-base enamel for painting panels and applying graphics.
- F. Security and Protection Facilities:
1. Fire Extinguishers: Provide Type "A" fire extinguishers for temporary offices and similar spaces where minimal danger of electrical or grease-oil-flammable liquid fires exists.
 - a. In other locations provide type "ABC" dry chemical extinguishers, or combination of several extinguishers of NFPA recommended types for exposures in each case.
 2. Plywood: For fences and vision barriers, provide exterior types, min. 3/8" thick plywood, prime and finish painted.
 3. Open-Mesh Fencing: Provide No. 11-gage galvanizing chain link fabric fencing 6 feet high with galvanized barbed wire top strand and galvanized steel pipe posts, 1-1/2" I.D. for line posts, and 2-1/2" I.D. for corner posts.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. General:
 - 1. Use qualified tradesmen for installation of temporary services and facilities.
 - 2. Locate temporary services and facilities where they will serve entire project adequately and result in min. interference with performance of Work.
- B. Relocate, modify and extend services and facilities required during course of work to accommodate entire work of Project.

3.02 TEMPORARY UTILITY INSTALLATION

- A. Temporary Water Service:
 - 1. General: Install water service and distribution piping of sizes and pressures adequate for construction purposes during construction period and until permanent service is use, including but not limited to following uses:
 - a. Construction processes.
 - b. Fire protection.
 - c. Drinking water.
 - d. Sanitary facilities.
 - e. Cleaning.
 - f. Plant and lawn watering.
 - 2. Where available supply of potable water inadequate, provide non-potable water for purposes other than drinking and washing.
 - a. Provide warning signs at each outlet of non-potable water.
 - 3. Obtain water service from nearby water main of local water authority, as permitted by governing authority.
 - a. Pay water service use charges, whether metered or otherwise, for all water used by entities authorized to be at or to perform work at project site.
 - b. Exercise control over usage in effort to conserve water.
 - 4. Provide temporary water service with 2" meter and shut-off valve near connection to water main.
 - 5. Soon as construction operations at each floor level require water, extend service, full height of building to form temporary water and fire water standpipe.
 - 6. Provide distribution piping for temporary water to each location of use.
 - a. Provide one outlet for each floor level of construction spaced so that water reached with 100 foot length of hose.
 - b. Provide one 3/4" flexible rubber hose 100 feet long with adjustable nozzle, at each outlet where work in progress requires water.
 - c. Maintain hose connections and outlet valves in leakproof condition.
 - 1) Where finish work below an outlet might be damaged by spillage or leakage, provide drip pan of suitable size to minimize possibility of water damage.
 - 2) Drain water promptly from pans as it accumulates.
 - 7. Pumping:
 - a. Where water pressure is to provide min. 20 psig pressure at highest point of use, provide temporary pumps to supply required flow of water and min. of 30 psig static pressure at highest point of use.
 - b. Equip pumps with adequate surge and storage tanks and automatic controls to supply water uniformly, at reasonable pressures.
 - 8. Sterilization:
 - a. Except piping of non-potable water, sterilize temporary water piping prior to use.
 - b. Refer to Division-15 sections for procedures.

- B. Temporary Electric Service;
1. General:
 - a. Provide weatherproof, grounded temporary electric power service and distribution system of sufficient size, capacity, and power characteristics to accommodate performance of work during construction period.
 - b. Whenever overhead floor or roof deck installed, install temporary lighting adequate to provide sufficient illumination for safe work and traffic conditions in every area of work.
 2. Temporary Service:
 - a. Install service and grounding in compliance with National Electric Code (NFPA 70).
 - b. Include necessary meters, transformers, overload protected disconnect and main distribution switch gear.
 - c. Install electric power service underground except where overhead service must be used to avoid construction conflicts or to comply with governing regulations.
 - d. Connect temporary service to local electric power company main in manner directed by company officials.
 - 1) Pay use charges, whether metered or otherwise, for electricity used by all entities authorized to be at or to perform work at project site.
 - 2) Exercise control over power usage in effort to conserve energy.
 3. Provide temporary service with automatic ground-fault interrupter features, activated from circuits of system.
 4. Power Distribution System:
 - a. Provide circuits of adequate size and proper characteristics for each use.
 - b. In general run wiring overhead, and rise vertically where wiring least exposed to damage from construction operations.
 - c. Provide rigid steel conduit or equivalent raceways for wiring exposed on grade, floors, decks or other areas of possible damage or abuse.
 - d. Provide metal conduit, tubing or armored cable for protection of temporary power wiring where exposed to possible damage during construction operations.
 - e. Where permitted by code, wiring of circuits not exceeding 110-120 Volt 20 Amp rating, and wiring of lighting circuits may be non-metallic sheathed cable in areas where located overhead and exposed for surveillance.
 - f. Do not wire temporary lighting with plain, exposed (insulated) electrical conductors.
 - g. Provide metal enclosures or boxes for wiring devices.
 - h. Provide overload-protected disconnect switch for each temporary circuit and each temporary lighting circuit, located at power distribution center.
 5. For power hand tools and task lighting, provide temporary 4-gang outlets at each floor level, spaced so that 100 foot extension cord can reach each area of work.
 - a. Provide separate 110-120 Volt, 20 Amp circuit for each 4-gang outlet (4 outlets per circuit).
- C. Temporary Lighting:
1. Provide local switching of temporary lighting, spaced to allow lighting to be turned off in patterns to conserve energy and retain light suitable for work-in-progress, access traffic, security check and project lock-up.
 2. Provide min. one 200-watt incandescent lamp per 1000 square feet of floor area, uniformly distributed, for general construction lighting, or equivalent illumination of similar nature.
 - a. In corridors and similar traffic areas provide one 100-watt incandescent lamp every 50 feet.
 - b. In stairways and at ladder runs, provide lamp minimum per story, located to illuminate each landing and flight.
 3. Install and operate temporary lighting to fulfill security and protection requirements, without necessity of operating entire temporary lighting system.
- D. Temporary Telephones and Fax:
1. Arrange for local telephone company to install temporary service to Project.
 2. Provide service of type and capacity indicated in other Division-1 sections.
 3. Install telephone on separate line for each temporary office and first aid station; provide fax in each office trailer.
 - a. Where office has more than two occupants, install telephone for each additional occupant or pair of occupants.

4. At each telephone location post list of important telephone numbers, including following:
 - a. Local police and fire department.
 - b. Doctor.
 - c. Ambulance service.
 - d. Contractor's temporary and home office.
 - e. Architect's temporary and home office.
 - f. Engineer's temporary and home office.
 - g. Owner's temporary and home office.
 - h. Principal subcontractors' temporary and home offices.

E. Sewers and Drainage:

1. General: If existing sewers available for temporary drainage near site prior to completion of permanent sewers, provide temporary connections to remove effluent that can be lawfully discharged into sewers.
 - a. If existing sewers cannot be used for discharge, provide drainage ditches, dry wells, waste stabilization ponds and similar discharge facilities to remove effluent that can be lawfully discharged in that manner.
 - b. If neither existing sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off site in lawful manner.
2. Before discharge of liquid wastes into sewers or drainage facilities, filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways.
 - a. Provide temporary filter beds, settlement tanks, separators and similar devices to purify effluent to acceptable levels.
3. Connect temporary sewers to municipal sewer systems in manner directed by sewer department officials.
4. Maintain temporary sewers and drainage facilities in clean, sanitary condition, ready for maximum use.
 - a. Following heavy usage, restore normal conditions promptly.
 - b. Provide and maintain temporary earthen embankments and similar barriers in and around construction excavations and subgrade construction, sufficient to prevent flooding of work by runoff of storm water from heavy rain storms.

3.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. General:

1. Provide reasonably neat and uniform appearance in temporary construction and support facilities acceptable to Architect and Owner.
2. Locate field offices, storage and fabrication sheds and other support facilities for easy access to Work.
3. Position offices so that windows give best possible view of construction activities.
4. Except as otherwise indicated, make change-over from use of temporary services and facilities to use of permanent services and facilities at earliest feasible date at each portion of building, to minimize hazards and interferences with performance of Work.
5. Maintain field offices, storage and fabrication sheds, temporary sanitary facilities, waste collection and disposal systems, and project identification and temporary signs until near Final Acceptance.
 - a. Immediately prior to Final Acceptance remove these facilities.
 - b. Personnel remaining at site beyond Final Acceptance permitted to use certain permanent facilities, under restricted use conditions acceptable to Owner.

B. Temporary Heat:

1. Provide temporary heat where indicated or needed for performance of Work, curing or drying of recently installed work or protection of work in place from adverse effects of low temperatures or high humidity.
2. Select facilities known to be safe and without deleterious effect upon the work in place or being installed.
3. Coordinate with ventilation requirements to produce indicated ambient condition required and minimize consumption of fuel or energy.
4. Maintain min. temperature of 45°F (7°C) in permanently enclosed portions of building and areas where finished work installed.

5. Heating Facilities: Except where conditions make it necessary to use another system, and where use of permanent heating system available and authorized, provide properly vented self-contained LP gas or fuel oil heaters with individual space thermostatic control for temporary heat.
 - a. Limit use of gasoline-burning space heaters to indirect-fired type, located outside building space or space being heated.
 - b. Use gasoline-burning space heaters only where specified system for temporary heating cannot be used.
 - c. Do not use open burning or salamander type heating units where prohibited by governing regulations, or when combustible materials located in or near space being heated, or when work installed or being installed includes work exposed to view in completed project.
- C. Field Offices:
 1. Provide temporary field offices of for use by Contractor, Owner and Architect located as directed by the Owner and complying with the following:
 - a. Building shall afford protection against weather with a minimum of one (1) door, at least one window. Window to be equipped with adjustable blinds and insect screens.
 - b. Provide field offices with light colored resilient floor covering material and painted drywall wall and ceiling finishes.
 - c. Provide vented space heater, capable of maintaining uniform indoor temperature of 68°F (20°C), and air-conditioning unit capable of maintaining max. indoor temperature of 72°F (24°C).
 - d. Provide switch controlled fluorescent light fixtures capable of maintaining average illumination of 20 foot-candles at desk height, and 110-120 volt duplex outlets spaced at 12' intervals, with min. of one per wall in each room.
 - e. Furnish suitably with not less than one lockable desk and chair, 2 guest chairs, 4-drawer file cabinet with lock, plan table, plan rack, and desk lamp.
 - f. Equip office with drinking-water cooler and private toilet complete with water closet, lavatory and mirror-medicine cabinet unit.
 - g. Maintain one complete readable updated set of drawings and specifications with all addenda, post-bid addenda and change orders posted.
 - h. Maintain one complete set of reviewed shop drawings, completed with Architect's and engineer's review comments accessible to the Owner and Architect.
 2. Provide, as part of field office, or as separate facility, room min. of 10'-0" X 12'-0" for exclusive use by Owner and project architect equipped and furnished as described for contractor's office above.
 - a. Provide with lockable door.
 - b. Furnish with plan rack and table.
 3. Provide, as part of field office, or as separate facility, room min. of 240 sq. ft. for project meetings, furnished with conference table, 8 folding chairs and tackboard
- D. Storage and Fabrication Sheds:
 1. Install storage and fabrication sheds, properly sized, furnished and equipped, as required to accommodate work.
 2. Comply with applicable provisions specified elsewhere for distribution and use of temporary utilities.
 3. Sheds may be open shelters or fully enclosed spaces, whether within building construction area or elsewhere on site.
- E. Temporary Roads and Paving:
 1. To fullest extent possible, locate temporary roads and paving for storage areas and temporary parking, in same locations as permanent facilities for similar uses.
 2. To incorporate temporary paving provisions, review significant modifications of permanent paving requirements with Architect for acceptance of proposed improvements.
 3. Coordinate development of temporary roads and paved areas with grading and compaction of subgrade, installation and stabilization of subbase and installation of base and finish courses of permanent paving.
 - a. Coordinate development in manner to minimize exposure of incomplete work to deterioration and need to rework installations, to provide adequate temporary roads and paving during course of work, and to result in completion of permanent roads and paved areas new in appearance and without damage or deterioration at time of Owner's occupancy.

- b. Delay installation of final course of permanent asphalt concrete paving in areas exposed to temporary use, until immediately before Final Acceptance.
 - 1) Coordinate with normal weather conditions to avoid unsatisfactory results.
 - 4. Extend temporary paving in and around site construction area as necessary to accommodate following:
 - a. Delivery and storage of materials.
 - b. Fabrication operations.
 - c. Use of equipment, including truck cranes.
 - d. Administration and supervision.
 - e. Safety and protection activities.
 - 5. Provide temporary traffic control facilities at junction of temporary roads with public roads, including warning signs for public traffic and "STOP" signs for access road entrance onto public roads.
 - a. Comply with requirements and recommendations of local traffic authorities.
 - 6. Paving:
 - a. Construct and maintain temporary roads and paving to adequately support indicated loading and withstand exposure to traffic during construction period.
 - b. Provide reasonably level graded and well drained subgrade of satisfactory soil material, as defined in Division-2 sections, well compacted to min. 95% of max. dry density in top 6".
 - c. Provide gravel paving course of well graded subbase material min. 3" thick, roller compacted to level, smooth, dense surface.
 - d. Provide dust control treatment consisting of recognized "roadoil" or other petro-chemical compound known to be non-polluting and non-tracking.
- F. Sanitary Facilities:
- 1. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures.
 - 2. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities; provide min. specified requirements.
 - a. Install in locations that best serve Project's needs.
 - 3. Locate toilets and drinking water fixtures so that no one within construction area need walk more than 2 stories vertically or 200 feet horizontally to reach these facilities.
 - a. Supply and maintain toilet tissue, paper towels, paper cups and similar disposable materials appropriate for each facility.
 - b. Provide appropriate covered waste containers for used material.
 - 4. Toilets:
 - a. Install self-contained toilet units or water and sewer connected temporary toilet facilities, to extent permitted by governing regulations.
 - b. Use of pit-type privies not permitted.
 - c. Provide lavatories, mirrors, urinals (where applicable) and water closets in water and sewer connected units.
 - 1) Provide only potable water at lavatories.
 - 2) Provide individual compartments for water closets where unit is intended for occupancy by more than one person.
 - 3) Provide suitable enclosure with nonabsorbent sanitary finish materials and adequate heat, ventilation and lighting.
 - 5. Drinking Water Fixtures:
 - a. Provide drinking water fountains where and when piped potable water reasonably accessible from permanent or temporary lines.
 - 1) Otherwise, provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.
 - b. Where power accessible, provide electric drinking water coolers to maintain dispensed water temperature at 45 to 55°F (7 to 13°C).
- G. Janitorial Services:
- 1. General:
 - a. Provide daily janitorial services for temporary offices, first aid stations, toilets, wash facilities, lunchrooms and similar areas.
 - b. Require users of other temporary facilities to help maintain clean and orderly premises.

- H. Dewatering Facilities and Drains:
1. For temporary drainage and dewatering facilities and operations not directly associated with performance of work included under individual work sections, comply with dewatering requirements of applicable Division-2 sections.
 2. Where feasible, utilize same facilities.
 3. Maintain site, excavations and construction free of water.
 4. Dispose of rainwater in lawful manner not resulting in flooding project or adjoining property, nor endanger either permanent work or temporary facilities.
 5. Provide temporary drainage where roofing or similar waterproof deck construction completed prior to connection and operation of permanent drainage piping system, provide temporary drainage.
- I. Temporary Enclosures:
1. At earliest practical time provide temporary enclosure of materials, equipment, work in progress and completed portions of Work to provide protection to Work and employees from effects of exposure, foul weather, other construction operations, and similar activities on site.
 2. Provide temporary enclosures where temporary heat needed and permanent building enclosure not yet completed, and there is no other adequate provision for containment of temporary heat.
 3. Coordinate enclosures with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 4. Enclosure: Provide temporary enclosures by installing tarpaulins or equivalent materials securely, using minimum of wood framing and other combustible materials.
 - a. Individual openings of 25 square feet or less may be closed with plywood or similar materials.
 - b. Close openings through floor or roof decks and other horizontal surfaces with substantial load-bearing wood-framed or similar construction.
- J. Hoists Use:
1. Provide adequate facilities for hoisting materials and employees.
 2. Do not permit employees to ride hoists which comply only with requirements for hoisting materials.
 3. Contractor responsible for selection of type, size and number of facilities.
 4. Truck cranes and similar devices used for hoisting considered as "tools and equipment" and not temporary facilities.
- K. Project Identification and Temporary Signs:
1. Prepare project identification and other temporary signs.
 2. Project identification sign:
 - a. Facing: 3/4" CDX plywood
 - b. Size: Min. 8'-0" X 12'-0"
 - c. Quantity: One Each
 - d. Engage experienced sign painter to apply graphics in neat professional manner.
 3. Support on suitable posts or framing of treated wood or steel.
 - a. Size: Min. 4' X 4"
 - b. Quantity: Min 4 each
 4. Maintain signs in manner to properly inform public and persons seeking entrance to Project.
 5. Do not permit installation of unauthorized signs visible outside site.
 6. Temporary Signs:
 - a. Prepare temporary signs within site which will provide directional assistance and information to construction personnel and visitors to help locate following:
 - 1) Access roads and parking.
 - 2) Offices and first aid stations.
 - 3) Telephones.
 - 4) Emergency exits.
 - 5) Fire protection facilities.
 - 6) Barricades and obstructions.
 - 7) Hazardous elements of construction work.

7. Temporary Lighting:
 - a. Install exterior lights, yard lights and sign lights so that signs clearly visible when work being performed.
 - b. Operate project identification sign lighting from dusk until 10:00 PM every calendar day.
 - L. Collection and Disposal of Wastes:
 1. Establish system for daily collection and disposal of waste materials from construction areas and elsewhere on site.
 2. Enforce requirements strictly.
 3. Do not hold collected materials at site longer than 7 days during normal weather or 3 days when daily temperature expected exceed 80°F (27°C).
 4. Handle hazardous, dangerous, or unsanitary waste materials separately from other inert waste by containerizing appropriately.
 5. Dispose of waste material in lawful manner.
 6. Burying or burning of waste materials on site not permitted.
 7. Washing waste materials down sewers or into waterways not permitted.
 8. Provide rodent proof containers located on each floor level of construction work, to encourage depositing of garbage and similar wastes by construction personnel.
 - M. Rodent and Pest Control:
 1. Early in construction process before deep foundation work completed, retain recognized local exterminator or insect-and-pest control company to recommend practices to minimize attraction and harboring of rodents, roaches and other pests.
 2. Employ service to perform extermination and control procedures at regular intervals so that Project relatively free of pests and their residues at Final Acceptance.
 3. Perform control operations in lawful manner using environmentally safe materials.
 - N. Construction Aids and Miscellaneous Services and Facilities:
 1. Design, construct, and maintain construction aids and miscellaneous general services and facilities as needed to accommodate performance of work.
 2. Construction aids and miscellaneous general services and facilities include, but not limited to following:
 - a. Temporary stairs and ladders.
 - b. Guardrails and barriers.
 - c. Walkways.
 3. Stairs:
 - a. Provide temporary stairs where ladders not adequate for performance of work, and until permanent stairs available.
 - b. Cover finished permanent stairs exposed to occupants' use, with durable protective covering of plywood or similar material so finishes are undamaged at time of acceptance.
 4. Walkways:
 - a. Install and maintain temporary walkways around work and to field offices, toilets and similar places.
 - b. Construct walkways of washed, well graded gravel 6" deep by 36" wide, or of duckboard units 30" wide with 1 x 6 rough-sawn crossboards on pair of 3 x 4 runners.
- 3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION
- A. Provide reasonably neat and uniform appearance in security and protection facilities acceptable to Architect and Owner.
 - B. Except for utilization of permanent fire protection facilities, as soon as available in each area, do not change over from use of temporary security and protection facilities to use of permanent facilities until Final Acceptance, or for longer periods of time as requested by Architect.
 - C. Temporary Fire Protection:
 1. Until fire protection needs may be fulfilled by permanent facilities, install and maintain temporary fire protection facilities of types needed to adequately protect against reasonably predictable and controllable fire losses.
 2. Comply with applicable recommendations of NFPA Standard 10 "Standard for Portable Fire Extinguishers".

3. Locate fire extinguishers where most convenient and effective for their intended purpose, but provide min. one extinguisher on each floor at or near each usable stairwell.
 4. Store combustible materials in containers in recognized fire-safe locations.
 5. Develop and supervise an overall fire prevention and first-aid fire protection program for personnel at project site.
 - a. Review needs with local fire department officials and establish procedures to be followed.
 - b. Instruct personnel in methods and procedures to be followed.
 - c. Post warnings and information and enforce strict discipline.
 - d. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires.
 - e. Prohibit smoking in hazardous fire exposure areas.
 - f. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of ignition for possible fires.
 6. Where temporary water outlets available, provide hoses of sufficient length to reach construction areas.
 - a. Hang hoses with warning sign, to effect that hoses are for fire protection purposes and not to be removed.
 - b. Match hose size with outlet and equip with suitable nozzles.
- D. Permanent Fire Protection:
1. At the earliest feasible date in each area of the project, complete installation of permanent fire protection facility, including connected services, and place into operation and use.
 2. Instruct key personnel at the site on how to use facilities which may not be self-explanatory.
- E. Barricades, Warning Signs and Lights:
1. Comply with recognized standards and code requirements for erection of substantial, structurally adequate barricades where needed to prevent accidents and losses.
 2. Paint with appropriate colors, graphics and warning signs to inform personnel at site and public, of hazard being protected against.
 3. Provide lighting where appropriate and needed, including flashing red lights where appropriate.
- F. Enclosure Fence:
1. General: When excavation or other substantial elements of Work begin, install general enclosure fence with suitable lockable entrance gates.
 2. Provide fencing as required to prevent access to construction site and as required to provide secure access to and around student areas.
 - a. Locate where indicated, or if not indicated, enclose substantially entire site or portion thereof determined sufficient to accommodate entire construction operation.
 - b. Coordinate final location of fencing with the Owner prior to installing fence.
 - c. Install in manner to prevent persons, dogs and similar animals from easily entering site, except by way of entrance gates when open.
 3. Except as otherwise indicated, provide open-mesh, chain-link fencing with posts set in compacted mixture of gravel and earth.
- G. Security Enclosure and Lockup:
1. Install substantial and durable general temporary enclosure of partially completed areas of construction.
 2. Provide locking entrances adequate to prevent unauthorized entrance, vandalism, theft and similar deleterious effects and violations of project security.
 3. Storage: Where materials and equipment temporarily stored, prior to and during construction, and are of substantial value or are attractive for possible theft, provide secure lockup and enforce strict discipline in connection with timing of installation and release of materials, so that opportunity for theft and vandalism minimized.

H. Environmental Protection:

1. Provide general protection facilities, operate temporary facilities, conduct construction activities, and enforce strict discipline for personnel on site in ways and by methods that comply with environmental regulations, and that minimize possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result from performance of work at site.
2. Avoid the use of tools and equipment which produce harmful noise.
3. Restrict use of noise making tools and equipment to hours of use to minimize noise complaints from persons or firms near project site.

3.05 OPERATION, TERMINATION AND REMOVAL

A. Supervision:

1. Enforce strict discipline in use of temporary services and facilities at site.
2. Limit availability of temporary services and facilities to essential and intended uses to minimize waste and abuse.
3. Do not permit temporary installations to be abused or endangered.
4. Do not allow hazardous, dangerous or unsanitary conditions to develop or persist on project site.

B. Maintenance:

1. Operate and maintain temporary services and facilities in good operating condition throughout time of use and until removal authorized.
2. Protect from damage by freezing temperatures and similar elements.
3. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on 24-hour day basis where required to achieve indicated results in Work and to avoid possibility of damage to Work or to temporary facilities.

C. Protection:

1. Prevent water filled piping from freezing, by use of ground covers, insulation, by keeping drained or by temporary heating.
2. Maintain distinct markers for underground lines.
3. Protect from damage during excavation operations.

D. Termination and Removal: Unless Architect requests it be maintained for longer period of time, remove each temporary service and facility promptly when need for it or substantial portion of it has ended, or when replaced by authorized use of permanent facility, or no later than Final Acceptance.

1. Complete, or, if necessary, restore permanent work delayed because of interference with temporary service or facility.
2. Repair damaged work, clean exposed surfaces and replace work which cannot be satisfactorily repaired.

E. Materials and facilities that constitute temporary services and facilities are and remain property of Contractor.

1. Owner reserves right to take possession of project identification signs.

F. Remove temporary roads and paving materials not intended for or acceptable for integration into permanent paving.

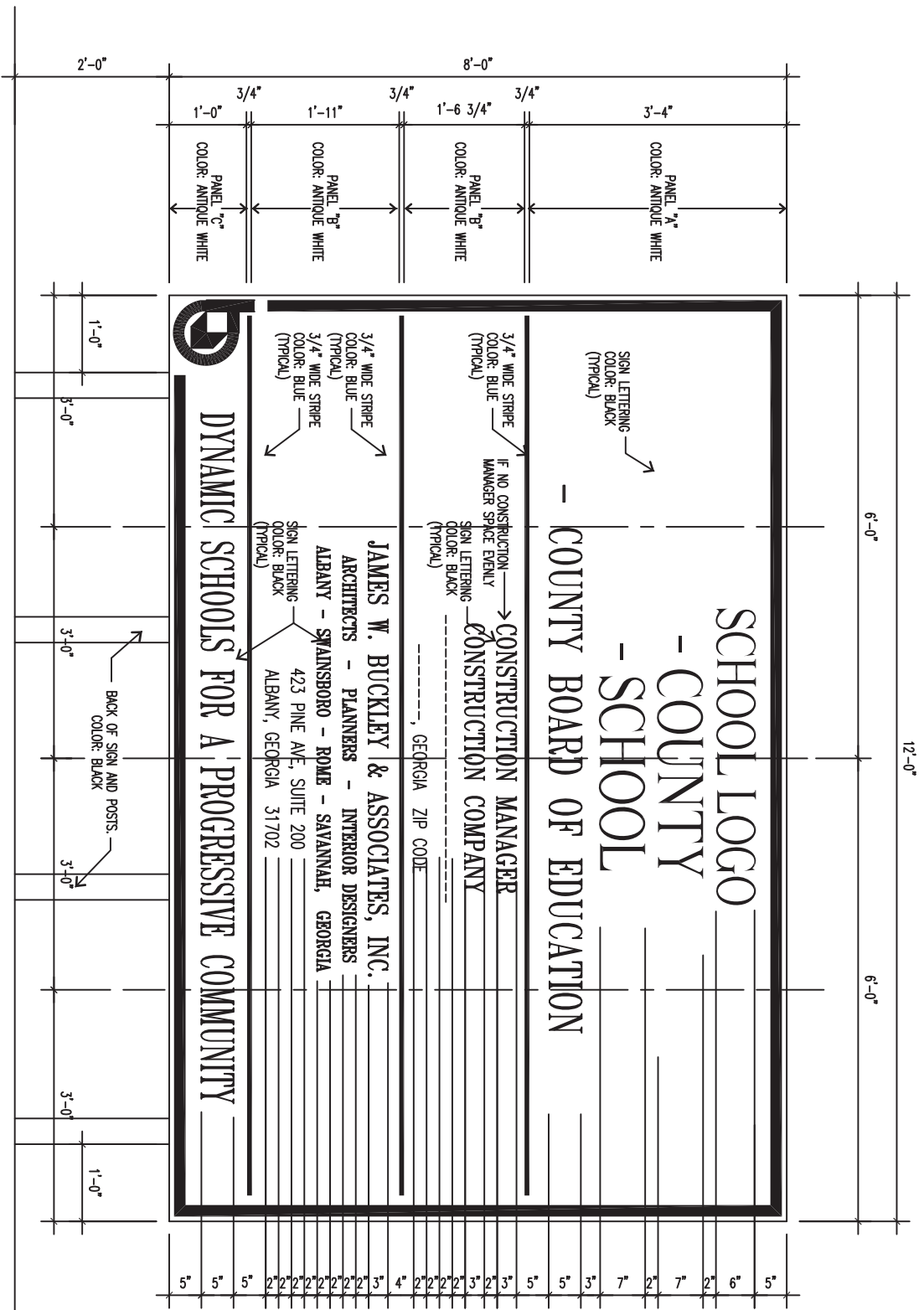
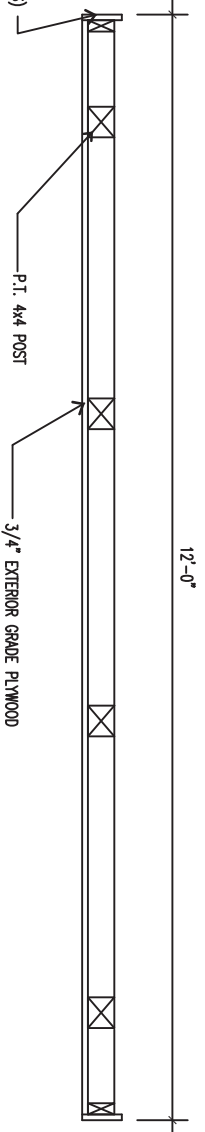
1. Where area shown intended for landscape development, remove soil and aggregate fill not complying with requirements for fill or subsoil in landscape area.
2. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances which might impair growth of plant materials or lawns.
3. Repair or replace street paving, curbs and sidewalks at temporary entrances, as required by governing authority.

G. At Final Acceptance, clean and renovate permanent services and facilities used to provide temporary services and facilities during construction period, including but not limited to following:

1. Replace air filters and clean inside of ductwork and housings.
2. Replace significantly worn parts and parts subject to unusual operating conditions.
3. Replace lamps in lighting system that are burned out or noticeably dimmed by substantial hours of use.

END OF SECTION 01500

CONT. P.1. 1x6 EDGE TRIM (ALL FOUR SIDES)



SECTION 01630
PRIOR-APPROVED PRODUCT OPTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Furnish and install products specified, under options and conditions for substitutions stated in this Section and referenced in General Conditions.

1.02 DESCRIPTION OF WORK

- A. Provide products specified within technical provisions of specifications.
- B. Contractors wishing to use products other than those specifically listed in contract documents shall request "prior approval" of proposed product in accordance with the provisions of this section.
- C. Where contractor wishes to use products under the "Or-Equal" provision of the specifications, approval of the product(s) shall be in accordance with this section.
 - 1. Architect will not consider product substitutions under the "Or-Equal" clause after receipt of bids.
- D. Product Substitution after receipt of bids included in Section 01631, Products and Substitutions.

1.03 PRODUCTS LISTS

- A. Within bidding period, non-listed manufacturers of items specified by reference standards submit, to Architect, five copies of complete list of major Products proposed for installation.
- B. Tabulate products by specification section number and title.
- C. For products only by reference standards, list for each product:
 - 1. Name and address of manufacturer
 - 2. Trade name
 - 3. Model or catalog designation
 - 4. Manufacturer's data
 - a. Reference standards
 - b. Performance test data

1.04 CONTRACTOR'S OPTIONS

- A. For products specified only by reference standard, select product meeting that standard, by any manufacturer.
- B. For products specified by naming several products or manufacturers, select any one of products and manufacturers named complying with specifications.
- C. For products specified by naming several products or manufacturers and stating "or equivalent", "or equal", or "or approved equal" submit request for substitutions, for any product or manufacturer not specifically named.

1.05 SUBSTITUTIONS

- A. Contractor's submit Base Bid in strict accordance with the Contract Documents.
 - 1. Contractor has option of requesting substitutions during bidding period by submitting completed substitution request minimum of 10 days prior to Bid Date.
 - 2. Products submitted on requests received by Architect 10 days prior to Bid Date included in addendum, if acceptable.
 - 3. After end of that period, requests considered only in case of product unavailability or other conditions beyond control of Contractor.

- B. Submit separate request for each substitution; support each request with following:
 - 1. Complete data substantiating compliance of proposed substitution with requirements of Contract Documents.
 - a. Product identification, including manufacturer's name and address.
 - b. Manufacturer's literature; identify:
 - 1) Product description
 - 2) Reference standards
 - 3) Performance and test data
 - c. Samples, as applicable
 - d. Name and address of similar projects on which product used, and date of each installation.
 - 2. Itemized comparison of proposed substitution with product specified; list significant variations.
 - 3. Data relating to changes in construction schedule.
 - 4. Any effect of substitution on separate contracts.
 - 5. List of changes required in other work or products.
 - 6. Designation of required license fees or royalties.
 - 7. Designation of availability of maintenance services, sources of replacement materials.
- C. Substitutions not considered for acceptance when:
 - 1. They are indicated or implied on shop drawings or product data submittals without formal request from Contractor.
 - 2. Acceptance requires substantial revision of Contract Documents.
 - 3. In judgement of Architect, do not include adequate information necessary for complete evaluation.
 - 4. If requested after Contract Award directly by Trade-Contractor, Sub-Contractor or Supplier.
- D. Do not order or install substitute products without written acceptance of Architect.
- E. Architect will determine acceptability of proposed substitutions.

1.06 CONTRACTOR'S REPRESENTATION

- A. In making formal request for substitution Contractor represents following:
 - 1. He has investigated proposed product and determined that it is equivalent to or superior in all respects to that specified.
 - 2. He will provide same or better warranties or bonds for substitution as for product specified.
 - 3. He will coordinate installation of accepted substitution into Work, and make such changes required for Work to be complete in all respects.
 - 4. He waives claims for additional costs caused by substitution which may subsequently become apparent.

1.07 ARCHITECT DUTIES

- A. Review Contractor's request for substitutions with reasonable promptness.
- B. Notification to Contractor: In accordance with General Conditions, Article E-03.

1.08 SUBSTITUTION REQUEST FORM

- A. Form attached to this Section.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01630

SUBSTITUTION REQUEST FORM

TO: _____

PROJECT: _____

We hereby submit for your consideration following product instead of specified item for above project:

<u>DRAWING</u>	<u>SPEC. SECT. NO</u>	<u>PARAGRAPH</u>	<u>SPECIFIED ITEM</u>
_____	_____	_____	_____

Proposed Substitution: _____

(NOTE: Attach complete information on changes to Drawings and/or Specifications which proposed substitution will require for proper installation. Submit, with request, all necessary samples and substantiating data to prove equal quality and performance to that specified. Clearly mark manufacturer's literature to indicate equality in performance.)

Fill in Blanks Below:

A. Does substitution affect dimensions shown on the Drawings? Yes _____ No _____

If yes, clearly indicate changes. _____

B. Will undersigned pay for changes to building design, including engineering and detailing costs caused by requested substitution? Yes _____ No _____

If no, fully explain: _____

C. What effect does substitution have on other Contracts or other Trades?

D. What effect does substitution have on construction schedule? _____

E. Manufacturer's warranties of proposed and specified items are:

Same _____ Different _____ (explain on attachment).

F. Reason for request: _____

G. Itemized comparison of specified item(s) with the proposed substitution;

list significant variations: _____

H. Accurate cost data comparing proposed substitution with product specified:

I. Designation of maintenance services and sources: _____

(Attach additional sheets if required.)

**CERTIFICATION OF EQUAL PERFORMANCE
AND ASSUMPTION OF LIABILITY FOR
EQUAL PERFORMANCE**

For Use By Architect:

____ Accepted ____ Accepted as Noted
____ Not Accepted ____ Received Too Late

The undersigned states that the function,
appearance and quality are equivalent or
superior to the specified item.

Submitted By:

Signature Title

By _____

Firm

Date _____

Address

Remarks _____

Telephone Date

Signature shall be by person having authority
to legally bind his firm to the above terms.
Failure to provide legally binding signature
will result in rejection of proposed substitution

**SECTION 01631
PRODUCT SUBSTITUTIONS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF REQUIREMENTS

- A. Substitutions: Contractor's requests for changes in products, materials, equipment and methods of construction required by Contract Documents, after receipt of bids considered requests for "substitutions", and subject to requirements specified herein.
- B. Following not considered substitutions:
 - 1. Revisions to Contract Documents, where requested by Owner, Architect or Engineer considered as "changes" not substitutions.
 - 2. Substitutions requested during bidding period, accepted prior to Contract Date, are included in Contract Documents and not subject to requirements for substitutions herein specified.
 - 3. Specified Contractor options on products and construction methods included in Contract Documents are choices available to Contractor and not subject to requirements for substitutions herein specified.
 - 4. Except as otherwise provided in Contract Documents, Contractor's determination of and compliance with governing regulations and orders as issued by governing authorities do not constitute "substitutions" and do not constitute basis for change orders.
- C. Prior approved product options specified in Section 01630, Prior Approved Product Options. Section 01630 Includes:
 - 1. Approval of products and substitutions requested during bidding period.
 - 2. Approval of products during bidding period, where said request is based on the assumption that the product complies with the "Or-Equal" provision.

1.03 DEFINITIONS AND STANDARDS

- A. Definitions: Definitions not intended to negate meaning of other terms used in Contract Documents, including such terms as, "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction" and similar terms.
 - 1. Such terms are self-explanatory and have recognized meanings in construction industry.
- B. "Products": Items purchased for incorporation in Work, regardless of whether specifically purchased for project or taken from Contractor's previously purchased stock.
 - 1. "Product" as used herein includes terms "material", "equipment", "system" and other terms of similar intent.
- C. "Named Products": Products identified by use of manufacturer's name for product, including such items as make or model designation, as recorded in published product literature, of latest issue as of date of Contract Documents.
- D. "Materials": Products substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form units of work.
- E. "Equipment": Product with operational parts, regardless of whether motorized or manually operated, and in particular, product that requires service connections such as wiring or piping.
- F. Standards: Refer to Division-1 section "Definitions and Standards" for applicability of industry standards to products specified for Project, and for acronyms used in text of specification sections.

1.04 QUALITY ASSURANCE

- A. Source Limitations: To fullest extent possible, provide products of same generic kind, from single source, for each unit of work.
 - 1. When discovered that specified products available only from sources that do not or cannot produce adequate quantity to complete project requirements in timely manner, consult Architect for determination of what product qualities are most important before proceeding.
 - a. Architect will designate those qualities, such as visual, structural, durability, or compatibility, that are most important.
 - b. When Architect's determination made, select products from those sources that produce products that possess most important qualities, to fullest extent possible.
- B. Compatibility of Options:
 - 1. Compatibility of products is basic requirement of product selection.
 - 2. When Contractor given option of selecting between two or more products for use on project, product selected must be compatible with other products previously selected, even if products previously selected were also Contractor options.
 - 3. Complete compatibility between various choices available to Contractor not assured by various requirements of Contract Documents, but must be provided by Contractor.
- C. Foreign Product Limitations:
 - 1. "Foreign products" as distinguished from "domestic products" defined as products either manufactured substantially (50% or more of value) outside the United States and its possessions, or produced or supplied by entities known substantially owned (more than 50%) by persons not citizens of, nor living within the United States and its possessions.
 - 2. Except under one or more of following conditions, select and provide domestic, not foreign products for inclusion of Work:
 - a. No domestic product available complying with requirements of Contract Documents.
 - b. Available domestic products complying with requirements of Contract Documents available only at prices or other procurement terms substantially higher (25 percent or more) than for available foreign products complying with requirements of Contract Documents.

1.05 SUBMITTALS

- A. Product Listing Submittal:
 - 1. General:
 - a. Prepare product-listing schedule in form acceptable to Architect.
 - 1) Show names of principal products required for work, by generic name.
 - 2) Show proprietary product names and name of manufacturer for each item listed to be purchased and incorporated into Work.
 - 2. Form:
 - a. Prepare product-listing schedule with information on each item tabulated under following scheduled column headings:
 - 1) Generic name as used in Contract Documents.
 - 2) Proprietary name, model number and similar product designation.
 - 3) Manufacturer's and supplier's name and city/state addresses.
 - 4) Related unit-of-work specification section number.
 - 5) Installer's name and primary trade of workmen.
 - 6) Projected delivery date, or time span of delivery period.
 - 3. Submittal:
 - a. Submit 3 copies of product-listing schedule within 30 days after date of commencement of Work.
 - b. Provide written explanation for omissions of data, and for known variations from contract requirements.
 - c. At the Contractor's option, initial submittal of product-listing schedule may be limited to product selections and product designations to be established early in Contract Time.
 - 1) Submit completed product-listing schedule within 60 days after commencement of Work.

4. Architect's Action:
 - a. Architect will respond to Contractor in writing within 2 weeks of receipt of product-listing schedule.
 - b. No response by Architect within 2 week time period constitutes no objection to listed products or manufacturers, but does not constitute waiver of requirement that products comply with requirements of Contract Documents.
 - c. Architect's response will include following:
 - 1) The Architect's listing of unacceptable product selection, if any, containing explanation of reasons for action.
 - 2) Request for additional data necessary for review and possible acceptance of products and manufacturer's listed.
 - B. Substitution Request Submittal:
 1. Requests for Substitutions:
 - a. Submit 3 copies of each request for substitution using form included at end of this section.
 - b. In each request identify product or fabrication or installation method replaced by substitution; include related specification section and drawing numbers, and complete documentation showing compliance with requirements for substitutions.
 - c. Include following information, as appropriate, with each request.
 - 1) Provide complete product data, drawings and descriptions of products, and fabrication and installation procedures.
 - 2) Provide samples where applicable or requested.
 - 3) Provide detailed comparison of significant qualities of proposed substitution with those of work originally specified; significant qualities include elements such as size, weight, durability, performance and visual effect where applicable.
 - 4) Provide complete coordination information; include all changes required in other elements of work to accommodate substitution, including work performed by Owner and separate Contractors.
 - 5) Provide statement indicating effect substitution has on work schedule in comparison to schedule without approval of proposed substitution; include information regarding effect of proposed substitution on Contract Time.
 - 6) Provide complete cost information, including proposal of net change, if any in Contract Sum.
 - 7) Provide certification by Contractor to effect that, in Contractor's option, after thorough evaluation, proposed substitution results in work that in every significant respect is equal-to or better than work required by Contract Documents, and it will perform adequately in application indicated.
 - 8) Include in certification, Contractor's waiver of rights to additional payment or time, which may be necessary because of failure of substitution to perform adequately.
 2. Change Order Form:
 - a. Submit requests for substitutions in form and in accordance with procedures required for change order proposals.
 3. Architect's Action:
 - a. Within one week of receipt of Contractor's request for substitution, Architect will request additional information or documentation as needed for evaluation of request.
 - b. Within 2 weeks of receipt of request, or within one week of receipt of requested additional information or documentation, which ever is later, Architect will notify Contractor of either acceptance or rejection of proposed substitution.
 - c. Acceptance will be in form of change order.
 - d. Rejection will include statement giving reasons for rejection.
- 1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING
- A. General: Deliver, store, and handle products in accordance with manufacturer's recommendations, using means and methods to prevent damage, deterioration and loss, including theft.
 1. Control to prevent overcrowding of construction spaces.
 2. In particular coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss.
 - B. Deliver products to site in manufacturer's sealed container or other packaging system, complete with labels and instructions for handling, storage, unpacking, protecting and installing.

- C. Store products at site in manner to facilitate inspection and measurement of quantity or counting of units.
- D. Store heavy materials away from project structure in manner to not endanger supporting construction.

1.07 WARRANTIES (GUARANTEES)

- A. Categories of Specific Warranties:
 - 1. Warranties on work are in several categories, including those of General Conditions, and including (but not necessarily limited to) following specific categories related to individual units of work specified in sections of Divisions 2 through 16 of specifications:
 - 2. Special Project Warranty (Guarantee): Warranty specifically written and signed by Contractor for defined portion of Work; and, where required, countersigned by subcontractor, installer, manufacturer or other entity engaged by Contractor.
 - 3. Specified Product Warranty: Warranty required by Contract Documents, provided for manufactured product incorporated into Work; regardless of whether manufacturer published similar warranty without regard for specific incorporation of product into Work, or has written and executed special product warranty as direct result of Contract Document requirements.
 - 4. Coincidental Product Warranty: Warranty not specifically required by Contract Documents (other than as specified in this Section); but which is available on product incorporated into Work, by virtue of fact that manufacturer of product published warranty in connection with purchases and uses of product without regard for specific applications except as otherwise limited by terms of warranty.
- B. Refer to individual sections of Divisions 2 through 16 for determination of units of work required to be specifically or individually warranted, and for specific requirements and terms of warranties (or guarantees).
- C. General Limitations: It is recognized that specific warranties intended primarily to protect Owner against failure of Work to perform as required, and against deficient, defective and faulty materials and workmanship, regardless of sources.
 - 1. Except as otherwise indicated, specific warranties do not cover failures in Work which result from:
 - a. Unusual and abnormal phenomena of elements.
 - b. Owner's misuse, maltreatment of improver maintenance of Work.
 - c. Vandalism after time of Final Acceptance.
 - d. Insurrection or acts of aggression including war.
- D. Related Damages and Losses:
 - 1. In connection with Contractor's correction of failed warranted work, remove and replace other work of Project damaged as result of such failure, or must be removed and replaced to provide access or correction of warranted work.
 - 2. Consequential Damages: Except as otherwise indicated or required by governing regulations, special project warranties and product warranties are not extended to cover damage to building contents (other than work of Contract) which occurs as result of failure of warranted work.
- E. Warranty Periods:
 - 1. All warranties begin on date of **FINAL ACCEPTANCE** for specified period of time from that date.
 - 2. No warranty period less than one year.
- F. Reinstatement of Warranty Period: Except as otherwise indicated, when work covered by special project warranty or product warranty failed and was corrected by replacement or restoration, reinstate warranty by written endorsement for following time period, starting on date of acceptance of replaced or restore work.
 - 1. Period of time equal to original warranty period of time.
- G. Replacement Cost, Obligations: Except as otherwise indicated, costs of replacing or restoring failing warranted units or products is Contractor's obligation, without regard for whether Owner has benefitted from use through portion of anticipated useful service lives.
- H. Rejection of Warranties: Owner reserves right, at time of Final Acceptance or thereafter, to reject coincidental product warranties submitted by Contractor, which in opinion of Owner tend to detract from or confuse interpretation of requirements of Contract Documents.

- I. Contractor's Procurement Obligations: Do not purchase, subcontract for, or allow others to purchase or sub-subcontract for materials or units or work for Project where special project warranty, specified product warranty, certification or similar commitment required, until determined that entities required to countersign such commitments are willing to do so.
- J. Specific Warranty Forms: Where special project warranty (guarantee) or specified product warranty required, prepare written document to contain terms and appropriate identification, ready for execution by required parties.
 - 1. Submit draft to Owner (through Architect) for approval prior to final executions.

PART 2 - PRODUCTS

2.01 GENERAL PRODUCT COMPLIANCE

- A. General:
 - 1. Requirements for individual products indicated in Contract Documents; compliance with these requirements is in itself a contract requirement.
 - 2. These requirements may be specified in any one of several different specifying methods, or in any combination of these methods.
 - 3. These methods include following:
 - a. Proprietary.
 - b. Descriptive.
 - c. Performance.
 - d. Compliance with Reference Standards.
 - 4. Compliance with codes, compliance with graphic details, allowances, and similar provisions of Contract Documents also have a bearing on selection process.
- B. Procedures for Selecting Products:
 - 1. Contractor's options in selecting products limited by requirements of Contract Documents and governing regulations.
 - 2. Options not controlled by industry traditions or procedures experienced by Contractor on previous construction projects.
 - 3. Required procedures include but not limited to following for various indicated methods of specifying:
 - a. Proprietary and Semi-proprietary Specification Requirements:
 - 1) Single Product Name: Where only single product or manufacturer named, provide product indicated, unless specification indicates possible consideration of other products.
 - a) Advise Architect before proceeding, when discovering that named product not reasonable or feasible solution.
 - 2) Two or More Product Names:
 - a) Where two or more products or manufacturers named, provide one of products named, at Contractor's option.
 - b) Exclude products that do not comply with specification requirements.
 - c) Do not provide or offer to provide unnamed product, unless specification indicates possible consideration of other products.
 - d) Advise Architect before proceeding where none of named products comply with specification requirements or are feasible for use.
 - 3) Where products or manufacturers specified by name, accompanied by term "or-equal" or similar language, comply with Contract Document provisions concerning "substitutions" to obtain approval from Architect for use of unnamed product.
 - a) Products approved under the "Or-Equal" provision only approved during bidding period; refer to Section 01630.
 - b. Non-Proprietary Specification Requirements: Where specifications name products or manufacturers available and may be incorporated in Work, but do not restrict Contractor to use of these products only, Contractor may, at his option, use any available product that complies with contract requirements.
 - c. Descriptive Specification Requirements:
 - 1) Where specifications describe product or assembly generically, in detail, listing exact characteristics required, but without use of brand or trade name, provide products or assemblies that provide characteristics indicated and otherwise comply with contract requirements.

- d. Performance Specification Requirements:
 - 1) Where specifications require compliance with indicated performance requirements, provide products that comply with specific performance requirements indicated, and recommended by manufacturer for application indicated.
 - a) Manufacturer's recommendations may be contained in published product literature, or by manufacturer's individual certification of performance.
 - b) General overall performance of product implied where product specified for specific performances.
 - e. Compliance with Standards, Codes, and Regulations:
 - 1) Where specifications require only compliance with imposed standard, code or regulation, Contractor has option of selecting product that complies with specification requirements, including standards, codes, and regulations.
- C. Visual Matching:
1. Where matching established sample required, final judgment of whether product proposed by Contractor matches sample satisfactorily determined by Architect.
 2. Where no product available within specified product category that matches sample satisfactorily and also complies with other specified requirements, comply with provisions of Contract Documents concerning "substitutions" and "change orders" for selection of a matching product in another product category, or for non-compliance with specified requirements.
- D. Visual Selection:
1. Except as otherwise indicated, where specified product requirements include phrase "...as selected from manufacturer's standard colors, patterns, textures..." or similar phrases, Contractor has option of selecting product and manufacturer, provided selection complies with other specified requirements.
 2. Architect subsequently responsible for selecting color, pattern and texture from product line selected by Contractor.
- E. Producer's Statement of Applicability:
1. Where individual specification sections indicate products that require "Statement of Applicability" from manufacturer or other producer, submit written-certified statement from producer stating that producer reviewed proposed application of product on Project.
 2. Statement state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 3. Statement also state that proposed application of product on project is suitable and proper.
- 2.02 SUBSTITUTIONS
- A. Conditions: Contractor's request for substitution received and considered when extensive revisions to Contract Documents not required, when proposed changes in keeping with general intent of Contract Documents, when requests are timely, fully documented and properly submitted, and when one or more of following conditions satisfied, all as judged by Architect; otherwise requests returned without action except to record non-compliance with requirements.
1. Architect will consider request for substitution where:
 - a. Specified product or method cannot be provided within Contract Time; however, request not considered if product or method cannot be provided as result of Contractor's failure to pursue work promptly or coordinate various activities properly.
 - b. Specified product or method cannot receive necessary approval by governing authority, and requested substitution can be approved.
 - c. Substantial advantage offered Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting of offsetting responsibilities Owner may be required to bear; these additional responsibilities may include such considerations as additional compensation to Architect for redesign and evaluation services, increased cost of other work by Owner or separate contractors, and similar considerations.
 - d. Specified product or method cannot be provided in manner compatible with other materials of Work, and where Contractor certifies that substitution will overcome incompatibility.
 - e. Specified product or method cannot be properly coordinated with other materials in Work, and where Contractor certifies that proposed substitution can be properly coordinated.

- f. Specified product or method cannot receive warranty required by Contract Documents and where Contractor certifies that proposed substitution receive required warranty.
 - B. Work-Related Submittals: Contractor's submittal of and Architect's acceptance of shop drawings, product data or samples which relate to work not complying with requirements of Contract Documents, does not constitute acceptable or valid request for substitution, nor approval thereof.
- 2.03 GENERAL PRODUCT REQUIREMENTS
- A. General: Provide products that comply with requirements of Contract Documents undamaged and, unless otherwise indicated, unused at time of installation.
 - 1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for complete installation and for intended use and effect.
 - B. Standard Products: Where available, provide standard products of types produced and used successfully in similar situations on other projects.
 - C. Continued Availability: Where, because of nature of application, Owner is likely to need replacement parts or additional amounts of product at later date, either for maintenance and repair or replacement, provide standard, domestically produced products for which manufacturer has published assurances that products and parts will be available to Owner at later date.
 - D. Nameplates: Except as otherwise indicated for required labels and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on exterior of completed project.
 - E. Labels: Locate required product labels and stamps on concealed surface or, where required for observation after installation, on accessible surface which, in occupied spaces, is not conspicuous.
 - F. Equipment Nameplates:
 - 1. Provide permanent nameplate on each item of service-connected or power-operated equipment.
 - 2. Locate nameplate on easily accessible surface, inconspicuous in occupied spaces.
 - 3. Nameplate to contain following information and other essential operating data.
 - a. Name of manufacturer
 - b. Name of product
 - c. Model number
 - d. Serial number
 - e. Capacity
 - f. Speed
 - g. Ratings

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS

- A. General:
 - 1. Except as otherwise indicated in individual sections of specifications, comply with manufacturer's instructions and recommendations for installation of products in applications indicated.
 - 2. Anchor each product securely in place, accurately located and aligned with other work.
 - 3. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at time of acceptance.

END OF SECTION 01631

SUBSTITUTION REQUEST FORM

TO: _____

PROJECT: _____

We hereby submit for your consideration following product instead of specified item for above project:

<u>DRAWING</u>	<u>SPEC. SECT. NO</u>	<u>PARAGRAPH</u>	<u>SPECIFIED ITEM</u>
_____	_____	_____	_____

Proposed Substitution: _____

(NOTE: Attach complete information on changes to Drawings and/or Specifications which proposed substitution will require for proper installation. Submit, with request, all necessary samples and substantiating data to prove equal quality and performance to that specified. Clearly mark manufacturer's literature to indicate equality in performance.)

Fill in Blanks Below:

A. Does substitution affect dimensions shown on the Drawings? Yes _____ No _____

If yes, clearly indicate changes. _____

B. Will undersigned pay for changes to building design, including engineering and detailing costs caused by requested substitution? Yes _____ No _____

If no, fully explain: _____

C. What effect does substitution have on other Contracts or other Trades?

D. What effect does substitution have on construction schedule? _____

E. Manufacturer's warranties of proposed and specified items are:

Same _____ Different _____ (explain on attachment).

F. Reason for request: _____

G. Itemized comparison of specified item(s) with the proposed substitution;

list significant variations: _____

H. Accurate cost data comparing proposed substitution with product specified:

I. Designation of maintenance services and sources: _____

(Attach additional sheets if required.)

**CERTIFICATION OF EQUAL PERFORMANCE
AND ASSUMPTION OF LIABILITY FOR
EQUAL PERFORMANCE**

For Use By Architect:

____ Accepted ____ Accepted as Noted
____ Not Accepted ____ Received Too Late

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted By:

Signature Title

By _____

Firm

Date _____

Address

Remarks _____

Telephone Date

Signature shall be by person having authority to legally bind his firm to the above terms. Failure to provide legally binding signature will result in rejection of proposed substitution

**SECTION 01732
CUTTING AND PATCHING**

PART 1 - GENERAL

1.01 SUMMARY

- A. Definitions:
1. Cutting and Patching: Cutting into existing or new construction for installation, performance of other work, subsequent fitting, and patching to restore surface to original condition. Work performed for following activities considered to be cutting and patching:
 - a. Removal of new work where not in compliance with requirements of specifications.
 - b. Coordination of work.
 - c. Uncovering work for access and/or inspection.
 - d. Obtaining samples for inspection.
 - e. Permitting alterations to be performed.
 - f. Other similar purposes.
 2. Not Cutting and Patching: The following activities not considered to be cutting and patching activities when performed during:
 - a. Manufacturing of products.
 - b. Initial fabrication.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this Section.
- B. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.
- C. Unless otherwise specified, requirements of this Section apply to mechanical and electrical work; refer to Division-15 and Division-16 sections for additional requirements and limitations on cutting and patching of mechanical and electrical work.

1.03 QUALITY ASSURANCE

- A. Requirements for Structural Work:
1. Do not cut and patch structural work in manner resulting in reduction of load-carrying capacity or of load-deflection ratio.
 2. When in doubt, notify Architect.
- B. Operational and Safety Limitations:
1. Do not cut and patch operational elements or safety related components in manner resulting in reduction of their capacity to perform in manner intended, including energy performance, or resulting in increased maintenance, or decreased operational life or decreased safety.
 2. Before cutting and patching following elements of work, and similar work elements where directed, obtain Architect's approval to proceed with cutting and patching proposed in proposal for cutting and patching.
 - a. Shoring, bracing, and sheeting.
 - b. Primary operational systems and equipment.
 - c. Water/moisture/vapor/air/smoke barriers, membranes and flashings.
 - d. Noise and vibration control elements and systems.
 - e. Control, communication, conveying, and electrical wiring systems.
 - f. Special construction, as specified by Division-13 sections.
- C. Visual Requirements:
1. Do not cut and patch work exposed on building's exterior or in occupied spaces, in manner that would, in Architect's opinion, result in lessening building's aesthetic qualities.

2. Do not cut and patch work in manner resulting in substantial visual evidence of cut and patch work.
3. Remove and replace work judged by Architect to be cut and patched in visually unsatisfactory manner.
4. If possible retain original installer or fabricator, or another recognized experienced and specialized firm to cut and patch following categories of exposed work.
 - a. Roofing.
 - b. Preformed metal panels.
 - c. Acoustical ceilings.
 - d. Terrazzo
 - e. Finish wood flooring
 - f. Carpeting.
 - g. Wall covering.
 - h. HVAC enclosures, cabinets or covers.

1.04 SUBMITTALS

- A. Procedural Proposal for Cutting and Patching:
 1. Where prior approval of cutting and patching required, submit proposed procedures well in advance of time work to be performed and request approval to proceed.
 2. Include following information, as applicable, in submittal:
 - a. Describe nature of work and how it is to be performed, indicating why cutting and patching cannot be avoided.
 - b. Describe anticipated results of work in terms of changes to existing work, including structural, operational and visual changes as well as other significant elements.
 - c. List products to be used and firms to perform work.
 - d. Give dates when work expected to be performed.
 - e. List utilities that disturbed or otherwise affected by work, including those to be relocated and those to be out-of-service temporarily; indicate how long utility service to be disrupted.
 - f. Where cutting and patching of structural work involves addition of reinforcement, submit details and engineering calculations to show how reinforcement integrated with original structure to satisfy requirements.
- B. Approval by Architect to proceed with cutting and patching work does not waive Architect's right to later require complete removal and replacement of work found cut and patched in unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General:
 1. Except as otherwise indicated, or as directed by Architect, use materials for cutting and patching identical to existing materials.
 2. If identical materials not available, or cannot be used, use materials that match existing adjacent surfaces to fullest extent possible with regard to visual effect.
 3. Use materials for cutting and patching resulting in equal-or-better performance characteristics

PART 3 - EXECUTION

3.01 INSPECTION

- A. Before cutting, examine surfaces to be cut and patched and conditions under which work to be performed.
 1. If unsafe or otherwise unsatisfactory conditions encountered, take corrective action before proceeding with work.
- B. Before start of cutting work, meet at jobsite with all parties involved in cutting and patching, including mechanical and electrical trades.
 1. Review areas of potential interference and conflict between various trades.
 2. Coordinate layout of work and resolve potential conflicts before proceeding with work.

3.02 PREPARATION

- A. Temporary Support: To prevent failure provide temporary support of work to be cut.
- B. Protection: Protect other work during cutting and patching to prevent damage.
 - 1. Provide protection from adverse weather conditions for that part of Project exposed during cutting and patching operations.
 - 2. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
 - 3. Take precautions not to cut existing pipe, conduit or duct serving building but scheduled to be relocated until provisions made to bypass them.

3.03 PERFORMANCE

- A. General:
 - 1. Employ skilled workmen to perform cutting and patching work.
 - 2. Except as otherwise indicated or approved by Architect, proceed with cutting and patching at earliest feasible time and complete work without delay.
- B. Cutting:
 - 1. Cut work using methods least likely to damage work to be retained or adjoining work.
 - 2. Where possible review proposed procedures with original installer; comply with original installer's recommendations.
 - 3. In general, where cutting required use hand or small power tools designed for sawing or grinding, not hammering and chopping.
 - 4. Cut through concrete and masonry using cutting machine such as carborundum saw or core drill to insure neat hole.
 - 5. Cut holes and slots neatly to size required with min. disturbance of adjacent work.
 - 6. To avoid marring existing finished surfaces, cut or drill from exposed or finished side into concealed surfaces.
 - 7. Temporarily cover openings when not in use.
 - 8. Comply with requirements of applicable sections of Division 2 where cutting and patching requires excavating and backfilling.
 - 9. By-pass utility services such as pipe and conduit, before cutting, where such utility services shown or required to be removed, relocated or abandoned.
 - a. Cut-off conduit and pipe in walls or partitions to be removed.
 - b. After by-pass and cutting, cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.
- C. Patching:
 - 1. Patch with seams durable and invisible as possible.
 - 2. Comply with specified tolerances for the work.
 - 3. Where feasible, inspect and test patched areas to demonstrate integrity of work.
 - 4. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in manner which eliminates evidence of patching and refinishing.
 - 5. Where removal of walls or partitions extends one finished area into another finished area, patch and repair floor and wall surfaces in new space to provide even surface of uniform color and appearance.
 - 6. Patch, repair or rehang existing ceilings as necessary to provide even plane surface of uniform appearance.
- D. Touch Up Painting:
 - 1. Where patch occurs in smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area receives prime and base coat.
 - a. Areas to be patched shall receive the same number of coats of paint as the area adjacent to area being patched.
 - b. 'Spot' touch of painted surfaces not acceptable.
 - c. Finished surface of areas being patched to match, in color, sheen, texture and general appearance of adjacent, non-patched areas.
 - 2. If necessary to achieve uniform color and appearance, remove existing floor and wall coverings and replace with new materials.

3.04 CLEANING

- A. Thoroughly clean areas and spaces where work performed or used as access to work.
 - 1. Remove completely paint, mortar, oils, putty and items of similar nature.
 - 2. Thoroughly clean piping, conduit and similar features before painting or other finishing applied.
 - 3. Restore damaged pipe covering to original condition.

END OF SECTION 01732

SECTION 01770
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF REQUIREMENTS

- A. Definitions: Project closeout is term used to describe certain collective project requirements, indicating completion of Work that are fulfilled near end of Contract time in preparation for final acceptance and occupancy of Work by Owner, as well as final payment to Contractor and normal termination of Contract.
- B. Specific requirements for individual units of work included in appropriate sections in Divisions 2 through 16.
- C. Time of closeout directly related to "Final Acceptance".
 - 1. Time of closeout may be either single time period for entire Work or series of time periods for individual elements of Work certified substantially complete at different dates.
 - 2. This time variation, if any, applicable to other provisions of this Section.
 - 3. Project close-out is to be obtained no later than **60 days** after the date of Substantial Completion. If, in the opinion of the Owner and Architect, it is evident that the Contractor is unwilling to bring the project to a close within the allotted time frame, and upon the issuance of two, 48 hour notices, the Owner will then complete all unfinished work and/or assign a value to any incomplete work and documentation. The final application for payment will be adjusted accordingly.

1.03 INSPECTIONS

- A. General: Contractors are reminded that it is the responsibility of the contractor(s) to install the work in full compliance with the contract documents. It is not the responsibility of the Owner, Architect and/or Consultants to discover incorrect, incomplete, or omitted work. The performance of inspections by the Architect and/or consultants shall in no way relieve the contractor of his requirements of complying fully with the contact documents.
- B. Contractor's Work List: Prior to requesting the Architect perform pre-final and final inspections the contractor shall conduct a detailed inspection of the building and develop a work list of items remaining to be completed and or corrected.
 - 1. Upon completion of "work-list" items contractor shall certify to the Architect that work is 100% completed.
- C. Inspection Procedures: Upon receipt of Contractor's written request for inspection, Architect and/or Consultants will conduct a "Pre-Final" visit. Results of completed inspection will form initial "punch-list" for final acceptance.
- D. Reinspection Procedure: Architect will reinspect Work upon receipt of Contractor's notice that Work, including punch-list items resulting from earlier inspections, completed, except for items whose completion delayed because of circumstances acceptable to Architect.
 - 1. As part of the request for re-inspection, the contractor shall submit to the architect, a copy of all previous punch lists with the project superintendent's or project manager's signature placed by each item attesting to the fact that the contractor has personally viewed each item and verified that the work has been completed. No re-inspections will be performed by the architect until the contractor certifies that work previously identified on the punch has been corrected.
 - 2. Upon completion of reinspection, Architect will either prepare certificate of final acceptance, or will advice Contractor of incomplete work or of obligations not fulfilled, but required for final acceptance. Results of reinspection will form revised "punch list" for final acceptance.
 - 3. If necessary, the reinspection procedure will be repeated.

- E. Contractor's Certification: Submit certified copy of Architect's initial and revised punch-list of itemized work to be completed or corrected, stating that each item completed or otherwise resolved for acceptance and endorsed and dated by Architect; list known exceptions in request.
- F. False Start Inspections: Should contractor request any inspections for which he is not ready the contractor shall be liable for costs incurred by Architect and/or Consultants in the performance of the requested inspections in accordance with the provisions of Article E-13 of the General Conditions of the specifications.
 - 1. Reinspection by the Architect and/or consultants will not be performed until such time as payment for "false start" visits received by Architect.

1.04 PREREQUISITES TO FINAL ACCEPTANCE

- A. General: Complete following before requesting Architect's inspection for certification of Final Acceptance, either for entire Work or for portions of Work.
 - 1. Submit certified copy of Architect's final punch-list of itemized work to be completed or corrected, stating that each item completed or otherwise resolved for acceptance and endorsed and dated by Architect; list known exceptions in request.
 - 2. Submit to the Owner the original and to the architect a copy of each of the following occupancy permits:
 - a. Fire Marshall's Occupancy Permit
 - b. Building Inspection Department Occupancy Permit.
 - 3. Certification from Contractor stating that all materials, products and assemblies incorporated into the work of this project are 100% free from asbestos, Lead, PCB's or other hazardous materials.
- B. In progress payment request that coincides with, or if first request following, date Final Acceptance claimed, show either 100% completion for portion of Work claimed as complete, or list incomplete items, value of incomplete work, and reasons for Work being incomplete.
 - 1. Include supporting documentation for completion as indicated in these Contract Documents.
 - 2. Advise Owner of pending insurance change-over requirements.
 - a. Include certificates of insurance for products and completed operations where required.
 - b. Evidence of final, continuing insurance coverage complying with insurance requirements.
 - 3. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
 - 4. Obtain and submit releases enabling Owner's full, unrestricted use of Work and access to services and utilities.
 - a. Where required, include occupancy permits, operating certificates and similar releases.
 - b. Submit consent of surety.
 - 5. Deliver tools, spare parts, extra stocks of material and similar physical items to Owner.
 - 6. Make final change-over of locks and transmit keys (General Conditions, Article E-54) to Owner; advise Owner's personnel of change-over in security provisions.
 - 7. Complete start-up testing of systems, and instruction of Owner's operating and maintenance personnel.
 - 8. Discontinue or change over and remove temporary facilities and services from project site, along with construction tools and facilities, mock-ups, and similar elements.
 - 9. Complete final cleaning up requirements, including touch-up painting of marred surfaces.
 - 10. Touch-up and otherwise repair and restore marred exposed finishes.
- C. Final Submittals: Submit following documents:
 - 1. List of all major suppliers and sub-contractors, including firm name, address, telephone number, and contact person, for each major supplier and sub-contractor.
 - 2. Final payment request with final releases and supporting documentation not previously submitted and accepted and final statement, accounting for changes to Contract Sum.
 - 3. Consent of Surety to Close-Out Project and issue final payment.
 - 4. Non-Influence Affidavit (General Conditions, Article E-28).
 - 5. Statutory Affidavit (General Conditions, Article E-28).
 - 6. Copy of Fire Marshall's Occupancy Permit.
 - 7. Notice of Readiness for Final Inspection (General Conditions, Article E-41).
 - 8. Operation and Maintenance Data and Instructions General Conditions, Article E-55).
 - 9. Certificates of Manufacturers for Major Components (General Conditions, Article E-67).
 - 10. Certification of installation and proper operation of Fire Alarm System.
 - 11. Testing and Balancing of Air Distribution Systems.

12. Record Documents (General Conditions, Article E-6 and Supplementary General Conditions, Article 1 and Article in this Section below).
 13. Certification of installation and proper operation finish hardware (Section 08710 - Finish Hardware).
 14. Inspection reports of regulatory agencies (Section 01060 - Regulatory Requirements).
 15. Certification from all individual manufacturers of materials known to contain asbestos or in the past known to contain asbestos, that their products used on Project do not contain asbestos.
 16. Soil Treatment Guarantee (Section 02282 - Termite Control).
 17. List of extra materials (attic) stock transmitted to Owner. List to include type of material, quantity of materials, date of delivery, and location of delivery. Contractor to have Owner sign list verifying receipt of materials noted.
 18. Supporting documentation showing that required training and instruction in use of building systems have been performed. Documentation to include date of training, agenda used for training, parties present, video recording session.
 19. Final meter readings for utilities, measured record of stored fuel, and similar data as of date of Final Acceptance, or else when Owner took possession of and responsibility for corresponding elements of Work.
 20. Specified Warranties.
 21. Other Documents specified herein.
 22. Similar final record information.
- D. Include all above items in loose-leaf, notebook type binder in same order as listed above and tabbed accordingly.
1. Provide type-written statement stating disposition of items not included in binder because of physical limitations.
 2. Submit items not listed above, but required by other Sections of Project Manual, at completion of job, and include in binder, numbered consecutively by Specifications Section.
- E. Submit all closeout documents at one time; partial submittals returned for completion and correction.
1. Submit three (3) complete copies of all required closeout documents.
- F. Delivery of Closeout Documents: Submit close out documents in accordance with the following:
1. Complete closeout documents, including as-built survey, to be submitted a minimum of thirty days prior to request for final inspection or building occupancy, which ever occurs first.
- 1.05 AS-BUILT SURVEY
- A. Upon completion of work the contractor shall arrange to have an As-Built survey developed by an land surveyor and submitted to the Architect for use in verifying that work performed under this contract complies with the requirements of the contract.
1. Contractor responsible for costs associated with survey.
- B. The survey shall be performed by an independent, Georgia Licensed land surveyor selected by the contractor and approved by the Architect.
- C. Provide a detailed As-Built topographic and utility survey of sufficient detail and accuracy to verify compliance with contract provisions. The min. requirements for the survey shall include:
1. Locate all features required to show full compliance with contract documents. Locate horizontal features as follows:
 - a. +/- 0.05' for building corners and line.
 - b. +/- 0.10' for drainage and utility structures.
 - c. +/- 0.10' for pavements, walks and other improvements.
 2. The topographic and utility survey shall meet following requirements:
 - a. Grid: Maximum of 25'-0" grid.
 - b. Contour Interval: Maximum 1'-0".

- D. Survey data shall be furnished to the Architect utilizing both printed, hard copy and electronic file formats.
 - 1. Provide 1 original and 5 copies of survey on 30" X 42" sheets; each sheet containing an original surveyor's seal and signature.
 - 2. Provide two each memory sticks (thumb drives) containing survey data on a Cad version which is fully compatible with Auto Cad Version 2002.
- E. The topographic and utility survey shall be completed within thirty (30) calendar days of the completion of the site grading activities.
 - 1. The contractor shall include the required time for the survey in his project time schedule.
- F. Engineer's Responsibilities: Upon receipt of survey data, the Civil engineer shall verify that grades, elevations, lines and inverts comply with the contract provisions. Should conditions not comply with contract requirements, the Engineer shall notify the contractor through the Architect of noted deficiencies.
- G. Re-Survey Responsibility: Where results of required survey prove unsatisfactory and do not indicate compliance of related work with requirements of Contract Documents, then re-surveys are responsibility of Contractor, regardless of whether original survey was Contractor's responsibility.
 - a. The topographic and utility survey performed by the contractor shall be by the same surveyor and meet the same requirements as the original verification survey described above.

1.06 UTILITY SYSTEM INSPECTION AND CLEANING

- A. In addition to the As-Built survey defined above the contractor shall conduct certain post construction activities to ensure that the building utilities are functioning as intended. Post construction activities to include, but shall not be strictly limited to:
 - 1. Video Inspection of Systems: The contractor shall view and video tape the condition of the interior of the building drainage lines using video camera equipment of type suitable for pipes to be viewed.
 - a. Scope: The following lines shall be viewed and video taped:
 - 1) Roof Drain lines; Building interior and exterior; all
 - 2) Sanitary Sewer lines; Building interior and exterior; all trunk lines and lines over 3" in size.
 - b. Schedule: Viewing of lines to be performed after the drainage lines have been installed and prior to the use of the system. As a minimum the following shall be completed prior to the viewing of the lines:
 - 1) Placement of all concrete, including floor slabs, roof deck and other concrete shown.
 - 2) Installation of all building finishes including drywall, ceramic and quarry tile, terrazzo and other similar materials.
 - c. Preparation: Prior to conduction the viewing and video taping of the drain lines the contractor shall thoroughly clean the lines, fill the lines with clean water, and let the water drain from the piping.
 - d. Record of Video: The contractor shall provide four (4) identical copies of the video tape of each of the drainage lines. Each video tape to include the following information:
 - 1) Name of firm conducting test
 - 2) Date and time of test
 - 3) Location of test; identify lines by building spaces and manholes.
 - 2. Cleaning of Sewer Lines: It is the intent, that upon the completion of all construction activities and prior to the occupancy of the building that the contractor thoroughly clean out all drainage lines (Roof drains, roof drain laterals, storm lines and sanitary sewage lines) to ensure that the lines are clean and free from construction materials. Methods utilized to clean lines to include metal tapes/snakes and high pressure water.
 - a. Where work includes the renovation of existing buildings the cleaning of the sewer to include both the new and existing sewage systems.

1.07 RECORD DOCUMENT SUBMITTALS

- A. General:
 - 1. Specific requirements for record documents indicated in individual sections of these specifications.
 - 2. Other requirements indicated in General Conditions.
 - 3. General submittal requirements indicated in "submittals" sections.
 - 4. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.

- B. Record Drawings:
1. Maintain record set of blue or black line white-prints of contract drawings and shop drawings in clean, undamaged condition.
 2. Mark-up set of record documents to show actual installation where installed work varies substantially from work originally shown.
 3. Mark whichever drawing most capable of showing actual "field" condition fully and accurately; however, where shop drawings used for mark-up, record cross-reference at corresponding location on working drawings.
 4. Give particular attention to concealed work that would be difficult to measure and record at later date.
 5. Mark record sets with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work.
 6. Mark-up new information known to be important to Owner, but for some reason was not shown on either contract drawings or shop drawings.
 7. Show, on appropriate place on drawings, addendum, post-bid addendum, and change orders which affect the contract. Note related addendum, post-bid addendum, and change-order number where applicable.
 8. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set.
- C. Preparation of Transparencies:
1. In preparation for certification of Final Acceptance on last major portion of work, review completed markup of record drawings with Architect.
 2. When authorized, proceed with preparation of full set of corrected transparencies for contract drawings and shop drawings.
 3. Incorporate changes and additional information previously marked-up on print sets, by erasing and redrawing where applicable, and by adding details and notations where applicable; refer instances of uncertainty to Architect for determination.
 4. Identify and date each updated drawing.
 5. Printing of original drawings to produce transparencies and other prints as required herein is Contractor's responsibility; Architect will make original contract drawings available to Contractor's print shop.
- D. Copies, Distribution:
1. Upon completion of record drawings, prepare 3 blueline or blackline prints of each drawing, with changes and additional information recorded thereon.
 2. Organize each of 3 copies into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set.
 3. Organize and bind mark-up set of prints (maintained during construction period) in same manner.
 4. Organize transparencies into sets matching print sets, place set in durable tube-type drawing container (with end caps), and mark end cap of each with suitable identification.
 5. Submit records (Architect will retain one copy set).
 6. Review of Transparencies:
 - a. Prior to copying and distributing, submit corrected transparencies and mark-up prints to Architect for review and acceptance.
 - b. When acceptable, Architect will initial and date each transparency, indicating acceptance of general scope of changes and additional information recorded thereon, and of general quality of draftsmanship thereon (erasures and drafting).
 - c. Transparencies and mark-up prints will be returned to Contractor for organizing into sets, printing, binding, and final submittal.
- E. Record Specifications:
1. Maintain one complete copy of Project Manual, including specifications and addenda, and one copy of other written construction documents such as change orders and similar modifications issued in printed form during construction.
 2. Mark these documents to show substantial variations in actual work performed in comparison with text of specifications and modifications as issued.
 3. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at later date by direct observation.
 4. Note related record drawing information and product data, where applicable.
 5. Immediately prior to date or dates of Final Acceptance, complete record product data and place in good order, properly identified and bound or filed, ready for continued use and reference.

- F. Record Product Data:
 - 1. Maintain one copy of each product data submittal.
 - 2. Mark documents to show significant variations in actual Work performed in comparison with submitted information.
 - 3. Include both variations in products as delivered to site, and variations from manufacturer's instructions and recommendations for installation.
 - 4. Give particular attention to concealed products and portions of Work not otherwise readily discerned at later date by direct observation.
 - 5. Note related change orders and mark-up of record drawings and specifications.
 - 6. Upon Completion of mark-up, submit complete set of record product data to Architect for Owner's records.
- G. Record Sample Submittal:
 - 1. Immediately prior to date or dates of Final Acceptance, Contractor meet at site with Architect and Owner's personnel, if desired, to determine which, if any, of submitted samples maintained by Contractor during progress of Work, to be transmitted to Owner for record purposes.
 - 2. Comply with delivery to the Owner's sample storage space.
- H. Miscellaneous Record Submittals:
 - 1. Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with actual performance of Work.
 - 2. Immediately prior to date or dates of Final Acceptance, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference.
 - 3. Submit to Architect for Owner's records.
- I. Maintenance Manuals:
 - 1. Organize operating and maintenance data into suitable sets of manageable size.
 - 2. Bind data into individual binders properly identified and indexed.
 - 3. Bind each set of data in heavy-duty 2-inch, 3-ring vinyl-covered binder, with pocket folders for folded sheet information.
 - 4. Mark appropriate identification on both front and spine of each binder.
 - 5. Include following types of information in operation and maintenance manuals:
 - a. Emergency instructions.
 - b. Spare parts listing.
 - c. Copies of warranties.
 - d. Wiring diagrams.
 - e. Recommended "turn-around" cycles.
 - f. Inspection procedures.
 - g. Shop drawings and product data.

1.08 WARRANTY INSPECTION

- A. General: As part of the contract provisions the contractor, sub contractors, suppliers and vendors are required to warrant products and installations to be free of defects for no less than twelve (12) months from the date of substantial completion of the work.
 - 1. Refer to general conditions to the contract for additional requirements related to the contractor's obligations for the correction of work after final payment, including work covered by the one year warranty.
 - 2. Products and installation found to be defective during the warranty period shall be repaired or replaced promptly by the contractor.
- B. Nine Month Inspection: Approximately nine months after the date of substantial completion of the work, a detailed inspection of the building will be performed to determine the contractor's responsibilities for the correction of non-conforming and/or defective work.
- C. Participants: The nine month inspection of the building shall be conducted by all major parties to the contract, including, as a minimum the following:
 - 1. General Contractor, project manager and superintendent
 - 2. All major subcontractors, including site, utilities, flooring, metal roofing, modified bitumen roofing, plumbing, mechanical and electrical sub contractors.

- D. Documentation of Deficiencies: Upon the completion of the inspection the architect will develop and transmit to the contractor a deficiency list.
- E. Contractor's Responsibilities: The contractor(s), subcontractors, vendors and suppliers shall repair or replace work found to be defective.
 - 1. The contractor shall not be responsible for the repair and/or replacement of materials damaged as a result of abuse.
- F. Schedule for Correction of Work: All work identified on the deficiency list shall be correct within ninety days of the date of the nine month inspection.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 CLOSEOUT PROCEDURES

- A. General Operating and Maintenance Instructions:
 - 1. Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at site with Owner's personnel to provide necessary basic instruction in proper operation and maintenance of entire Work.
 - 2. Where installers not experienced in required procedures, include instruction by manufacturer's representatives.
 - 3. As part of this instruction provide detailed review of following items:
 - a. Maintenance manuals
 - b. Record documents
 - c. Spare parts and materials
 - d. Tools
 - e. Lubricants
 - f. Fuels
 - g. Identification systems
 - h. Control sequences
 - i. Hazards
 - j. Cleaning
 - k. Warranties, bonds, maintenance agreements and similar continuing commitments.
 - 4. As part of this instruction for operating equipment demonstrate following procedures:
 - a. Start-up
 - b. Shut-down
 - c. Emergency operations
 - d. Noise and vibration adjustments
 - e. Safety procedures
 - f. Economy and efficiency adjustments
 - g. Effective and energy utilization

3.02 FINAL CLEANING

- A. General:
 - 1. Special cleaning requirements for specific units of Work included in appropriate sections of Divisions 2 through 16.
 - 2. General Cleaning during regular progress of Work required by General Conditions and included under section "Temporary Facilities".
- B. Cleaning:
 - 1. Provide final cleaning of Work at time indicated.
 - 2. Employ experienced workers or professional cleaners for final cleaning.
 - 3. Clean each surface or unit of work to condition expected from normal, commercial building cleaning and maintenance program.
 - 4. Comply with manufacturer's instructions for operations.
 - 5. Complete following cleaning operations before requesting Architect's inspection for certification of Final Acceptance.

- a. Remove labels not required as permanent labels.
 - b. Clean transparent materials, including mirrors and glass in doors and windows, to polished condition.
 - 1) Remove putty and other substances noticeable as vision-obscuring materials.
 - 2) Replace chipped or broken glass and other damaged transparent materials.
 - c. Clean exposed exterior and interim hard-surfaced finishes to dust-free condition, free of dust, stains, films and similar noticeable distracting substances.
 - 1) Restore reflective surfaces to their original reflective condition.
 - 2) Leave concrete floors broom clean.
 - 3) Vacuum carpeted surfaces.
 - d. Wipe surfaces of mechanical and electrical equipment clean.
 - 1) Remove excess lubrication and other substances.
 - 2) Clean plumbing fixtures to sanitary condition.
 - 3) Clean light fixtures and lamps.
 - e. Clean project site, including landscape development areas, of rubbish, litter and foreign substances.
 - 1) Sweep paved areas to a broom-clean condition; remove stains, spills, and other foreign deposits.
 - 2) Rake grounds that are neither paved nor planted, to smooth, even-textured surface.
- C. Pest Control: Engage experienced exterminator to make final inspection of project, and rid project of rodents, insects, and other pests.
- D. Removal of Protection: Except as otherwise indicated or requested by Architect, remove temporary protection devices and facilities installed during course of work to protect previously completed work during remainder of construction period.
- E. Compliances:
- 1. Comply with safety standards and governing regulations for cleaning operations.
 - 2. Do not burn waste materials at site.
 - 3. Do not bury debris or excess materials on Owner's property.
 - 4. Do not discharge volatile or other harmful or dangerous materials into drainage systems.
 - 5. Remove waste materials from site and dispose of in lawful manner.
 - 6. Where extra materials of value remaining after completion of associated work have become Owner's property, dispose of these to Owner's best advantage as directed.

END OF SECTION 01770

SECTION 02010

GEOTECHNICAL DATA

PART 1 - GENERAL

1.01 PRELIMINARY SOIL BORINGS

- A. A sub-surface exploration was performed by Geo-Hydro Engineering of Kennesaw, Georgia.
- B. A copy of the report may be viewed by bidders in the Office of the Architect only.
 - 1. Such data is not intended as representations or warranties by the Owner or Architect of accuracy or continuity between soil bearing or types, nor conclusions or recommendations contained within report.
 - 2. It is expressly understood that neither the Owner nor Architect shall be responsible for interpretations or conclusions drawn therefrom by the Contractor.

1.02 EXISTING CONDITIONS

- A. The contractor shall visit the site and acquaint himself with all existing conditions.
 - 1. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to the site and subsurface conditions, but such subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the Architect.

1.03 PROJECT DESCRIPTION OF SUBSURFACE CONDITIONS

- A. General Information: Information shown is taken directly fro the geotechnical and subsurface report. This information is for the courtesy of the contractor only and is not intended as representations or warranties by the Owner or Architect of accuracy or continuity between soil bearing or types, nor conclusions or recommendations contained within information provided.

Date of Geotechnical Report	
Ground cover type	
Thickness of topsoil	
Water Table (approximate elevations)	
Bearing Capacity (required)	
Types of Soils encountered	
Site Classification (IBC 2006)	

- B. Information provided is for date of testing only. The groundwater levels can be anticipated to fluctuate seasonally and with changes in climatic conditions.
- C. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to the site and subsurface conditions, but such subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the Architect.

1.04 QUALITY ASSURANCE

- A. Soils tests may be conducted by the Owner or Architect to observe performance of work in connection with excavation, filling, and grading.
 - 1. Contractor shall repair or replace work performed that does not meet technical or design requirements.
 - 2. Architect has the right to require additional testing to determine if work performed meets the design requirements. If the test indicate the requirements are not met the contractor shall be responsible for the cost of the testing.
 - 3. Make no deviations from the Contract Documents without specific and written approval of Architect.

END OF SECTION 02010

**SECTION 02070
SELECTIVE DEMOLITION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of selective demolition work indicated on drawings and described herein.
- B. Types of Selective Demolition Work: Demolition requires selective removal and subsequent offsite disposal of following:
 - 1. Portions of building structure indicated on drawings and required to accommodate new construction.
 - 2. Removal of interior partitions and walls indicated on drawings.
 - 3. Removal of gypsum board ceiling and wood framing systems where indicated.
 - 4. Removal of doors and frames indicated "remove."
 - 5. Removal of built-in casework indicated "remove."
 - 6. Removal of existing windows indicated to be bricked-in.
 - 7. Removal of existing breeze windows indicated to be enclosed.
 - 8. Removal of existing finishes where new finishes are specified to be installed.
 - 9. Removal of existing structural members where indicated. Work includes temporary shoring necessary.
 - 10. Removal of existing concrete floor slabs where indicated.
 - 11. Removal and protection of existing fixtures and equipment items indicated "salvage."
 - 12. Removal of construction, including existing finishes, as necessary for installation of items specified in Division 15 and Division 16.
 - 13. Enclosure of openings resulting from equipment removal.
 - 14. Replacement of finishes where removed for installation of new materials, finishes and/or equipment.
- C. Contractor Removed / Owner Salvaged items: Items that are "Contractor removed/Owner salvaged" identified on drawings and in specifications.
- D. Removal work specified elsewhere: Roofing removal is specified in another Division 2 Section.
- E. Related work specified elsewhere:
 - 1. Remodeling construction work and patching included within respective sections of specifications, including removal of materials for re-use and incorporated into remodeling or new construction.
 - 2. Relocation of pipes, conduits, ducts, other mechanical and electrical work specified by respective trades.
- F. Owner removed items: Owner will remove movable items plus certain fixed items identified on drawings as "Owner removed".

1.03 REFERENCED STANDARDS

- A. The following standards shall be incorporated into the contract documents by reference:
 - 1. American National Standards Institute (ANSI); ANSI A10.6; 1983, Demolition Operations - Safety Requirements.
 - 2. Code of Federal Regulations (CFR); 40 CFR 61-SUBPART M; National Emission Standard for Asbestos.

1.04 SUBMITTALS

- A. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's Representative for review prior to commencement of work.
 - 1. Include coordination for shut-off, capping, and continuation of utility services required, together with details for dust and noise control protection.
 - 2. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
 - 3. Existing plumbing, mechanical and electrical systems shall remain in operation until such time as new systems are placed into service and functioning properly.
 - 4. Coordinate with Owner's continuing occupation of portions of existing building, with Owner's partial occupancy of completed new addition, and with Owner's reduced usage during summer months.

1.05 JOB CONDITIONS

- A. Occupancy:
 - 1. Owner to continuously occupy areas of building immediately adjacent to areas of selective demolition.
 - 2. Conduct selective demolition work in manner to minimize need for disruption of Owner's normal operations.
 - 3. Provide min. of 72 hours advance notice to Owner of demolition activities impacting Owner's normal operations.
- B. Condition of Structures:
 - 1. Owner assumes no responsibility for actual condition of items or structures to be demolished.
 - 2. Conditions existing at time of commencement of contract maintained by Owner insofar as practicable.
 - 3. Variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
- C. Partial Demolition and Removal:
 - 1. Remove items indicated to be removed, but of salvable value to Contractor, from structure as work progresses.
 - 2. Transport salvaged items from site when removed.
 - 3. Storage or sale of removed items on site not permitted.
- D. Protections:
 - 1. Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.
 - 2. Provide protective measures required to provide free and safe passage of Owner's personnel and general public to and from occupied portions of building.
 - 3. Erect temporary covered passageways required by authorities having jurisdiction.
 - 4. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.
 - 5. Protect from damage existing finish work to remain in place and becomes exposed during demolition operations.
 - 6. Protect floors with suitable coverings when necessary.
 - 7. Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations performed.
 - 8. Equip partitions with dustproof doors and security locks if required.
 - 9. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to insure that no water leakage or damage occurs to structure or interior areas of existing building.
 - 10. Remove protections at completion of work.
- E. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.
 - 1. Repair adjacent surfaces and materials with materials to match existing in composition, thickness, finish and appearance.

- F. Traffic:
 - 1. Conduct selective demolition operations and debris removal in manner to ensure min. interference with roads, streets, walks, and other adjacent occupied or used facilities.
 - 2. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction.
 - 3. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- G. Explosives:
 - 1. Use of explosives not permitted.
- H. Utility Services:
 - 1. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.
 - 2. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction.
 - 3. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
- I. Environmental Controls:
 - 1. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level.
 - 2. Comply with governing regulations pertaining to environmental protection.
 - 3. Do not use water if creating hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 - PRODUCTS

2.01 Materials:

- A. Materials utilized to repair and/or patch areas as a result of minor demolition shall match existing materials and conform to requirements of applicable sections of specification.

PART 3 - EXECUTION

3.01 SCOPE OF WORK

- A. It is the intent of the contract documents to require that the contractor provide demolition activities necessary and required for the performance of the work specified whether such demolition is specifically indicated or not.
 - 1. Notes regarding demolition of existing work are included in specifications and on drawings.
 - 2. These notes are intended to provide a general scope of the demolition work required. However such notes shall not be considered as all inclusive. The contractor shall remove existing construction (materials, finishes and equipment) as required for the installation of the new construction.

3.02 DIMENSIONS:

- A. Existing Dimensions and Conditions: Dimensions indicated on drawings relative to existing conditions are approximate. Contractor shall verify dimensions which affect bid price prior to bidding.
- B. No changes to the contract amount shall be considered if the change is the result of not verifying dimensions.
- C. The drawings indicate the approximate existing conditions. Contractor to field verify all visible conditions prior to bidding. Notify the architect of any discrepancies between drawings and existing conditions prior to receipt of bids.

3.03 GENERAL WORK

- A. Immediately report existing utilities and service lines discovered during removal operations to Owner, Architect and Installer responsible for particular utility or service involved.
- B. Remove rubbish and debris using duct chutes or containers adequately enclosed to prevent unwanted debris spill during removal.

- C. Burn, store or sell no material either in building or on site.
 - 1. All removed material and debris, unless identified otherwise, is Contractor's property; Contractor remove immediately and completely from site.
- D. Remove no structural component without prior approval of Architect. Provide braces and shores where necessary to preserve integrity of existing structure.
- E. Where removal of entire walls or floors required, percussion-type methods permitted; where removal of portions of existing walls or floors required or new openings required in existing walls or floors, perform by saw cutting in order to prevent damage to remaining construction.
- F. Perform demolition or removal work required to accomplish work of Contract Documents, whether specifically noted or not, with care not to damage existing construction remaining.
- G. Repair and refinish damages to existing construction to match existing using materials and methods of construction consistent with existing conditions.

3.04 INSPECTION

- A. Prior to commencement of selective demolition work, inspect areas in which work performed.
 - 1. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work.
 - 2. File photographs with Owner's Representative prior to starting work.
- B. Contractor take photographs (35 mm) throughout interior and exterior of buildings to document existing conditions prior to starting of construction; keep photographs on file at jobsite.
 - 1. This requirement included to protect Contractor's interest, and filing of such list will preclude possibility of damages being assigned Contractor for repairs.
 - 2. Contractor does not have responsibility of repairing any damages not result of his own negligence.
- C. When Contractor moves on site and starts construction, it is be construed as his complete acceptance of existing site conditions.

3.05 PREPARATION

- A. Prior to commencing demolition activities contractor shall identify, to the greatest extent possible, the location of all utilities. Contractor shall refer to existing building drawings, contact school system maintenance personnel and review site conditions to assist in determining utility locations.
 - 1. Identified utilities to be flagged.
 - 2. Utilities which could be located and identified or reasonably assumed to be in or below materials being demolished which are damaged through the performance of this contract shall be repaired or replaced to original condition without added cost to the contract.
- B. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures demolished and adjacent facilities remaining.
 - 1. Cease operations and notify Owner's Representative immediately if safety of structure appears endangered.
 - 2. Take precautions to support structure until determination made for continuing operations.
- C. Cover and protect furniture, equipment and fixtures to remain from soiling or damage when demolition work performed in rooms or areas from which such items not removed.
- D. Erect and maintain dust-proof partitions and closures required to prevent spread of dust or fumes to occupied portions of building.
 - 1. Where selective demolition occurs immediately adjacent to occupied portions of building, construct dust-proof partitions of min. 4" studs, 5/8" drywall (joints taped) on occupied side, 1/2" fire-retardant plywood on demolition side, and fill partition cavity with sound-deadening insulation.
 - 2. Provide weatherproof closures for exterior openings resulting from demolition work.

- E. Locate, identify, stub off and disconnect utility services not indicated to remain.
 - 1. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building.
 - 2. Provide min. of 72 hours advance notice to Owner if shut-down of service necessary during change-over.

3.06 REMOVAL OF EXISTING CONSTRUCTION

- A. Where either indicated on contract documents or required by existing conditions contractor to remove existing construction as necessary for the performance work of this contract.
 - 1. Remove existing site concrete, including walks, drives, concrete curb and gutter where required for installation of new work.
 - 2. Remove existing asphalt pavement where required for new work.
- B. Where new materials indicated to be installed the contractor shall remove existing materials completely unless specifically noted otherwise.
- C. Removal of existing construction shall be accomplished using means and methods necessary to minimize damage to adjacent and/or remaining materials and finishes.
- D. Where new finishes are specified to be installed, the contractor shall, unless noted otherwise, remove the existing finish completely.
 - 1. Where new floor covering is specified to be installed the contractor shall remove the existing flooring and adhesive or setting bed completely.
 - 2. Where new base is specified to be installed the contractor shall remove existing base and adhesive completely.
 - 3. Where new ceiling is specified to be installed the contractor shall remove the existing ceiling tile(s), grid(s) and suspension system(s) completely.
- E. Where tile (asphalt, vinyl or vinyl asbestos) is scheduled to be removed, remove tile and adhesive as asbestos containing material. Refer to other sections of these specifications for requirements.

3.07 INSTALLED ITEMS

- A. The contractor shall assume that plumbing and electrical utilities exist within and below existing floor slabs and within existing partitions.
 - 1. Remove concrete slabs and masonry walls in small sections and as necessary to identify location of utilities.
 - 2. Relocate utilities encountered during demolition and as necessary to maintain existing remaining systems in fully operational condition.
- B. Perform removal/demolition of existing masonry and concrete to install new conduit and other new concealed piping by saw cutting and not percussion type methods.
- C. Unless specifically noted otherwise, all new plumbing, mechanical and electrical systems are to be run concealed in walls and above finished ceilings.
- D. Where indicated to install new work concealed in masonry walls, install work (conduit, plumbing, etc.) as follows:
 - 1. Remove concrete block face shell by saw cutting.
 - 2. Install conduit in block cell.
 - 3. Install new face shell "slab" of texture and appearance to match adjacent area.

3.08 DEMOLITION AND PATCHING

- A. Perform all demolition and patching required to accomplish the work called for under this contract.
- B. All material shown to be removed, unless noted otherwise, shall become the property of the contractor and shall be removed from the site and disposed of in a legal manner.

- C. Repair and patch all damaged materials (finishes, systems, etc.) resulting from work performed under this contract. The "patched" work shall match the existing material, finish, and color of adjacent surrounding materials.
- D. Where existing materials, surfaces, or finishes damaged due to work of this contract the contractor shall repair such damaged areas with new materials of type, size, and finish to match existing.
- E. Where removal of materials results in openings in existing surfaces contractor shall fill opening with materials and using methods to match existing.
- F. Perform selective demolition work in systematic manner.
 - 1. Use such methods required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
 - 2. Demolish concrete and masonry in small sections.
 - 3. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
 - 4. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.
 - 5. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
 - 6. Demolish foundation walls to min. depth of 12" below existing ground surface.
 - 7. Demolish and remove below-grade wood or metal construction.
 - 8. Break up below-grade concrete slabs.
 - a. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions.
 - b. Use power saw where possible.
 - 9. Completely fill below-grade areas and voids resulting from demolition work.
 - 10. Provide fill consisting of approved earth, gravel or sand, free of trash and debris, stones over 6" diameter, roots or other organic matter.
- G. Concrete Floor Slabs:
 - 1. Where indicated or where necessary to complete specified work remove existing concrete floor slab. Where existing slab removed replace as follows:
 - a. Compact subgrade to 98% standard proctor.
 - b. Provide 4" thick compacted sand fill.
 - c. Provide 6 mil floor slab membrane.
 - d. Pour min. 4" thick concrete slab reinforced with 6X6 6/6 WWM
 - 2. Where existing concrete slab is damaged through performance of work of this contract repair with materials and methods to match adjacent surfaces.
 - 3. At locations where wall is removed and concrete slab is un-level between adjacent spaces provide materials and labor necessary to level slab.
- H. Removal of Concrete Block Walls:
 - 1. Where existing masonry walls indicated to be removed and wall extends below finished floor slab the contractor shall remove existing masonry wall to a point not less than 8" below finished floor slab. Fill gap between floor slabs with minimum of 8" thick concrete. Level floor slabs to within 1/8" in 10'-0". Where necessary provide additional leveling/grinding necessary to provide smooth transition between adjacent floor levels.
 - 2. Masonry; Concrete Block and Brick:
 - a. New face brick and mortar to match existing in size, color, bond, joint type and overall appearance.
 - b. New concrete block to match existing in type of coursing.
- I. Building Finishes:
 - 1. Floor Tile; Soft: Where new floor tile is indicated to be installed the contractor shall remove the existing floor tile and adhesive completely.
 - 2. Contractor shall note that in certain areas more than one layer of floor tile may exist. For the purposes of this contract the contractor shall consider all vinyl floor tile to be asbestos.
 - 3. Floor Base: Where new floor base (rubber) indicated to be installed the contractor shall remove existing base and adhesive completely.

4. Floor Tile; Hard: Where new finished flooring indicated to be installed where hard tile (ceramic or quarry) exists the contractor shall remove existing tile and setting bed.
5. Where new floor covering is soft tile or carpet fill depressed floor slab area with concrete topping to level slab.
6. Ceiling Tile and Grid: Where new ceiling tile and grid indicated to be installed the contractor shall remove the existing ceiling tile, grid and hanger wire system completely.
7. Contractor shall note that in certain areas more than one ceiling system may exist. Verify area prior to bidding.

J. Doors, Frames and Hardware:

1. Where indicated, remove existing door, frame and hardware completely.
2. Turn door and hardware over to Owner and dispose of frame unless otherwise noted.
3. Where removal of door and frame results in an opening in an existing wall, where the wall is scheduled to remain, enclose opening with new materials and methods to match existing unless detailed or noted otherwise.

K. Windows:

1. Where indicated to remove existing windows, remove existing window, glass, trim and related materials completely.
2. Where existing breeze window indicated to be enclosed perform following work, unless specifically detailed or noted otherwise:
3. Remove and dispose of existing glass completely.

3.09 FLOOR SLABS

A. Where indicated to install new work concealed in or below floor, install work (conduit, plumbing) completely under existing slab.

1. Remove slab by saw cutting.
2. When patching slab compact existing grade to 98% standard proctor density.
3. Fill with min. 4000 psi concrete with maximum 3" slump.
4. Reinforce with 6x6 - 10/10 WWM.
5. Install #3 rebars 4" long, drilled 2" into existing slab; space 3'-0" max. o.c.

3.010 MECHANICAL - ELECTRICAL WORK

A. Demolition: Where necessary for installation of the new plumbing and mechanical systems, remove existing finishes, materials, equipment and related items as required to allow for the proper installation of new materials and equipment.

1. Where the removal of a system component results in an opening or hole in surface fill in opening with materials to match adjacent surfaces.
2. Where installation of new materials and equipment results in a damage to the existing materials and/or finishes, replace materials with new to match existing.

B. Disconnect all service piping necessary to completion of removal operations.

1. Cap and abandon service lines not extended or re-used.
2. Re-route services which must be maintained.
3. Remove plumbing and heating fixtures from site if not specifically noted on drawings as "Owner salvaged".

C. Disconnect all power and illumination necessary for completion of removal operations.

1. Abandon services not extended or re-used.
2. Re-route services which must be maintained.
3. Remove items not "Owner salvaged" from site.

- D. Remove plumbing, mechanical and electrical equipment not indicated to be reused.
 - 1. Completely remove equipment, curbs, support structure and associated plumbing, mechanical and electrical services for equipment.
 - 2. Where opening exists in roof structure as a result of equipment removal, enclose opening with materials similar to adjacent area.
 - a. Use of wood as part of enclosure not acceptable.
- E. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design encountered, investigate and measure both nature and extent of conflict.
 - 1. Submit report to Owner's Representative in written, accurate detail.
 - 2. Pending receipt of directive from Owner's Representative rearrange selective demolition schedule as necessary to continue overall job progress without delay.
- F. Plumbing and Mechanical Systems:
 - 1. For additional demolition requirements refer to engineering drawings.
 - 2. Where new plumbing and mechanical system indicated to be installed contractor to remove existing abandoned system completely.
 - 3. Portions of existing systems required to maintain proper operation of system shall be retained in working condition.
 - 4. Where existing plumbing or mechanical is to be removed the contractor shall repair/replace existing remaining surface to match adjacent area.
 - 5. If a question exists as to what material should be used contact architect for direction prior to proceeding.
 - 6. Where new or existing pipes penetrate new or existing finished ceilings within area of building being renovated, neatly cut tile 1/4" larger than size of pipe, caulk gap and provide escutcheon ring of finish to match ceiling grid around pipe at ceiling. Secure to ceiling.
- G. Electrical Systems:
 - 1. Where new electrical system indicated to be installed contractor to remove existing abandoned system completely.
 - 2. Portions of existing systems required to maintain proper operation of system shall be retained in working condition.
 - 3. Abandoned existing electrical fixtures, conduit, and cable to be removed completely except as noted. Where conduit is in located masonry walls or below slab remove conduit to a point behind finished surface, cap conduit, and repair finished surface.
 - 4. The contractor is reminded that all electrical conduit/wire shown on electrical drawings is shown in a schematic form only. All new conduit to be run on solid backing. Do not run conduit across windows, openings or other areas where solid backing not available.
 - 5. All new electrical conduit to be run concealed in existing and/or new construction unless otherwise noted or directed by the architect.

3.11 SALVAGE MATERIALS

- A. Salvage Items: Where indicated on Drawings as "Owner Salvage," carefully remove indicated items, clean, store and turn over to Owner and obtain receipt.
 - 1. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance remain property of Owner.
 - 2. Notify Owner's Representative if such items encountered and obtain acceptance regarding method of removal and salvage for Owner.
- B. Throughout the existing building there are existing items not scheduled for re-use which the owner wishes to salvage. The contractor shall remove, in good condition, all items listed below. The owner will view potential salvage materials and determine which of the materials removed will be retained by owner.
 - 1. Materials retained by owner shall be stored in area on site designated by owner. The owner will remove material from site.
 - 2. Materials not selected by owner for salvage shall be disposed of by the contractor in a legal fashion. Contractor to pay all disposal costs.

- C. The contractor shall remove the following materials in good conditions and allow the owner to inspect to determine whether the owners wishes to salvage:
1. Architectural:
 - a. Doors and Hardware (excluding frames)
 - b. Hardware
 - c. Windows (excluding interior breeze windows)
 - d. Chalk boards.
 - e. Teachers and Storage Cabinets.
 - f. Base and overhead Cabinets.
 - g. Fire Extinguishers.
 2. Plumbing:
 - a. Plumbing fixtures (Water closets, Urinals, and Lavatories)
 - b. Electric water coolers, boilers, and water heaters.
 - c. Copper piping
 - d. Motors and Pumps.
 - e. Additional Items identified on engineering drawings.
 3. Mechanical:
 - a. Window, Wall and Pad HVAC units
 - b. Boiler, Chiller, Fans, Motors
 - c. Exhaust Fans
 - d. Packaged HVAC units
 - e. Additional Items identified on engineering drawings.
 4. Electrical System:
 - a. Electrical panels, disconnects and switch gear.
 - b. Electrical conduit over 1"
 - c. Wire larger than #8
 - d. Additional Items identified on engineering drawings.
- D. All items scheduled for removal not specifically listed above (or elsewhere) to be salvaged shall become the property of the contractor and shall be disposed of off site by contractor.

3.12 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove debris, rubbish and other materials resulting from demolition operations from building site.
1. Transport and legally dispose of materials off site.
 2. If hazardous materials encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.
 3. Burning of removed materials not permitted on project site.

3.13 CLEAN-UP AND REPAIR

- A. Upon completion of demolition work, remove tools, equipment and demolished materials from site.
1. Remove protections and leave interior areas broom clean.
- B. Repair demolition performed in excess of that required.
1. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work.
 2. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 02070

SECTION 02225

DEMOLITION, CLEARING, AND GRUBBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification section, apply to work of this Section.
- B. Related work described elsewhere includes:
 - 1. Geotechnical Data; Section 00320.
 - 2. Earthwork, Section 02300.
 - 3. Erosion and Sedimentation Control; Section 02370.

1.02 SCOPE OF WORK

- A. It is the intent that, under this contract, a portion of the site, as defined on the drawings and / or as required for construction activities, be cleared and grubbed in preparation for the earthwork.
- B. This Section includes, but is not necessarily limited to, the following:
 - 1. Protection of existing trees.
 - 2. Felling of trees and removal of stumps, roots, tree debris, and other vegetation within the defined "Limits of Work".
 - 3. Topsoil stripping.
 - 4. Clearing and grubbing.
 - 5. Removal of wood framed structure(s) completely, including but not limited to above ground construction, foundation walls, footings, and basements.
 - 6. Removal of concrete loading dock structure(s).
 - 7. Removing above-grade improvements.
 - 8. Removing below-grade improvements.
 - 9. Removal of miscellaneous debris; Debris includes residential garbage, construction materials and other material not indigenous to site.
 - 10. Construction of necessary barriers and barricades where required.

1.03 DEFINITIONS

- A. The term "demolition, clearing, and grubbing" as used herein, includes the removal of all existing objects, except for those designated to remain, down to existing ground level, plus other work as described herein.
- B. The term "clearing" shall consist of felling, cutting up, and satisfactory disposal of all trees, bushes, shrubs, vegetation and debris occurring within area to be cleared.
- C. The Term "grubbing" shall consist of the removal and disposal of all stumps, roots larger than 1/2" in diameter to a minimum depth of 2'-6" below finished grade, and matted roots from areas designated for clearing.

1.04 QUALITY ASSURANCE

- A. Qualifications of workmen: Provide at least one person who shall be present at all times during demolition, clearing and grubbing operations, and who is thoroughly familiar with the work involved and who shall be responsible for directing the work.

- B. Code and Standards:
 - 1. Conform to all Federal, State, and Local laws and regulations.
 - 2. In addition to complying with all pertinent codes and regulations, comply with the requirements of those insurance carriers providing coverage for this work.

1.05 PROJECT CONDITIONS

- A. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect improvements on adjoining properties and on Owner's property.
 - 2. Restore damaged improvements to original condition, and acceptable to property owner.
- B. Protection of Existing Utilities: Provide adequate facilities for protecting all utilities which may be present on the project site.
 - 1. In the event of damage, immediately make repairs and replacements necessary. Where damaged item is a public utility the contractor shall arrange to have utility repair damage.
 - 2. All costs for repair to be paid by contractor.
 - 3. All work subject to approval of Architect.
- C. Streets and Highways: Provide, erect, and maintain effective barricades, danger signals, and signs on all intercepted streets and highways and in other locations where required for the protection of work and safety of public.
 - 1. Provide with lights, barricades or obstructions which encroach on, or are adjacent to public right-of-way. Keep lights burning at all times from sunset to sunrise.
- D. Traffic Services: Arrange work to cause minimum of disturbance to vehicular and pedestrian traffic.
 - 1. Provide adequate means of access to all public and private properties during construction.
 - 2. Do not close or obstruct streets, walks, or other used facilities without permission from authority having jurisdiction.
- E. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.
 - 1. Provide temporary guards to protect trees and vegetation to be left standing.
 - 2. Provide protection for roots over 1-1/2" dia. cut during construction operations.
 - a. Coat cut faces with emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues.
 - b. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth soon as possible.
 - 3. Repair or replace trees and vegetation indicated to remain, but damaged by construction operations, in manner acceptable to Architect.
 - 4. Employ licensed arborist to repair damages to trees and shrubs.
 - 5. Replace trees which cannot be repaired and restored to full-growth status, as determined by arborist.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Where fill is required, all dirt shall be free from vegetation and debris and shall be obtained from a site approved by Geo Technical Laboratory, Architect and/or Civil Engineer.
 - 1. Fill material shall comply with requirements of Section 02300, Earthwork.
- B. All other materials not specifically specified, but required for proper completion of work specified, shall be as selected by contractor, subject to approval by Architect.

PART 3 - EXECUTION**3.01 PREPARATION:**

- A. Notification: Notify Architect at least one full week prior to commencing work.
- B. Site Inspection: Prior to performing any work under this section, carefully inspect the entire site and all objects designated to be removed and preserved.
 - 1. Locate all existing utility lines and determine all requirements for disconnecting and capping or relocating.
 - 2. Locate utility lines traversing the site and determine the requirements for their protection.
- C. Clarification: The drawings do not purport to show all objects existing on the site.
 - 1. Before commencing the work the contractor shall verify with the Architect all objects to be removed and all objects to be preserved. The contractor shall be responsible for removal of existing construction as necessary to accommodate new construction, whether specifically shown on drawings or not.
- D. Scheduling: Schedule all work in a careful manner with all necessary consideration for neighbors and the public.
 - 1. Avoid interference with the use of, and passage to and from, adjacent buildings and facilities.
- E. Protection of Utilities: Preserve in operating condition all active utilities traversing the site where not indicated to be removed or relocated.
- F. Limits of Demolition, Clearing and Grubbing: The limits of demolition, clearing and grubbing are shown on the contract drawings and / or as necessary to perform specified new work.
 - 1. The limits of the clearing and grubbing shall include all areas shown to receive new construction (building, walks, drives, etc), all areas where grading activities are indicated and 10'-0" outside the limits of these areas.
 - 2. Additional areas shall be as shown and / or noted on plans and as required for construction of project including space for control stakes and hubs.

3.02 DEMOLITION

- A. Demolish all buildings, foundations, basements, walls, concrete slabs, concrete walks, asphalt walks, asphalt and concrete paving and curb and gutter where existing within the limits of the clearing and grubbing.
- B. Remove all existing septic tanks, fuel tanks, abandoned utility lines and leaching lines within limits of work. Observe all requirements of environmental protection agencies having jurisdictional authority, especially if petroleum or other hazardous substances encountered.
- C. Remove existing above-grade and below-grade improvements indicated and where necessary to facilitate new construction.
- D. Refill depressions left as a result of removing improvements. Use suitable structural fill materials compacted to densities indicated and to make surface conform to surrounding areas. Fill abandoned wells according to procedures of agency having jurisdiction or where none exist in accordance with requirements for structural fill as defined in Section 02200.
 - 1. Compact materials in maximum 8" lifts to min. 98% standard proctor where under pavement, walks, building or other improvements and 90% standard proctor where under lawns.

3.03 CLEARING

- A. Within the "Limit of Work": Remove trees, bushes, grass, shrubs and other vegetation, improvements, or obstructions required to permit installation of new construction.
 - 1. Remove rubbish, vines, undergrowth to ground level and below.
 - 2. Remove obstructions resting on or protruding through the surface of the ground.

3. "Removal" includes digging out and off-site disposing of stumps and roots.

- B. Trees and shrubs which are to remain in place shall be trimmed and shall be carefully protected from injury and defacement.
 - 1. Limbs and branches required to be trimmed shall be neatly cut close to bole of tree or to main branches.
 - 2. Cuts shall be painted with an approved pruning paint in strict accordance with manufacturers recommendations.

3.04 GRUBBING

- A. Within "Limit of Work": Excavate and Remove stumps, roots, logs, limbs, and other timber more than 1/2 inch in diameter, matted roots and other debris to a depth of not less than 2'-6" below the surface of the grade, shoulder, or slope.
 - 1. All depressions remaining as a result of removal of roots, stumps and other debris shall be refilled with suitable material, compacted to 90% standard proctor to make surface conform with surrounding ground surface.
 - 2. Ground surface shall be left smooth, uniform, and free of deleterious material. No roots or other debris shall be visible.

3.05 TOPSOIL

- A. Remove heavy growths of grass from areas being stripped.
- B. Remove top soil and stock pile on site for future redistribution during final grading phase of project.
 - 1. Topsoil defined as friable clay loam surface soil found in depths of 4-8" as indicated in soils report.
 - 2. Satisfactory Topsoil defined as reasonably free of subsoil, clay lumps, stones, and other objects over 2" in dia., and without weeds, roots, and other objectionable material.
- C. Strip topsoil to whatever depths encountered in manner to prevent intermingling with underlying subsoil or other objectionable material.
 - 1. Top soil to be stripped from entire area of site on which new construction is to be placed and 10'-0" beyond such new construction.
 - 2. "New Construction" shall include building, paving, walks and other work performed under this contract.
 - 3. Where existing trees indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
 - 4. Stockpile topsoil in storage piles in areas indicated or directed.
 - a. Construct storage piles to provide free drainage of surface water.
 - b. Cover storage piles to prevent wind erosion.
 - c. Silt Fence shall be placed along entire base of stockpile.

3.06 LEVELING

- A. Contractor shall, using mechanical equipment, smooth and level rough spots on the site .
 - 1. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork indicated.
 - 2. Place fill material in horizontal layers maximum of 6" thick, loose depth, and thoroughly compact to a density equal to original ground.

3.07 DISPOSAL OF WASTE MATERIAL

- A. Within "Limits of Work":
 - 1. Remove all material and debris from site.
 - a. Ground surface shall be left smooth, uniform and free of irregularities.
 - b. Ground surface shall be free of visible vegetation.

2. Remove all "unsuitable" soil and top soil from Owner's property.
 3. Redistribute excess top soil on Owner's property; location as directed by Architect.
- B. On Site Burning: Where on-site burning of vegetation (trees, stumps, ect.) is acceptable and is to be performed comply with following:
1. Contractor to obtain a burning permit from agencies having jurisdiction.
 2. Burn only when allowed by agencies having jurisdiction.
 3. Provide protective systems and measures recommended by agency having jurisdiction and as required to prevent the spread of fire to areas of site not scheduled to be cleared and as required to prevent fire and smoke damage to trees not scheduled to be removed.
 4. Perform burning in designated and approved areas only.
 5. Contractor to be responsible for all costs including permits and fire and smoke protection systems.
 6. Contractor responsible for coordinating with officials having jurisdiction.
- C. Removal of Contaminated Soil
1. Soil from old septic field and trash areas are considered to be contaminated soil. Contaminated soils shall be taken to an approved landfill. Contractor to pay costs associated with disposal.
- D. Removal of Debris:
1. Material not burned shall be removed of and disposed of off site in a legal and approved manner; Contractor to pay for all costs of disposal.
 2. On site burying of material **NOT** acceptable.

END OF SECTION 02225

SECTION 02250

SHORING AND UNDERPINNING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of shoring and underpinning work includes, but not limited to, following:
 - 1. Shoring and underpinning as necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
 - 2. Maintenance of shoring and underpinning.
 - 3. Removal of shoring and underpinning, as required.
- B. Types of shoring and underpinning system includes, but not limited to, following:
 - 1. Soldier piles.
 - 2. Lagging.
- C. Building excavation is specified in another Division-2 section.

1.03 SUBMITTALS

- A. Layout Drawings:
 - 1. Provide layout drawings for shoring and underpinning system and other data prepared and sealed by registered Professional Engineer licensed in State of Georgia.
 - 2. System design and calculations must be acceptable to local authorities having jurisdiction.

1.04 QUALITY ASSURANCE

- A. Supervision:
 - 1. Engage and assign supervision of shoring and underpinning work to qualified foundation consultant.
 - 2. Submit name of engaged consultant and qualifying technical experience.
- B. Regulations: Comply with local codes and ordinances of governing authorities having jurisdiction.

1.05 JOB CONDITIONS

- A. Before starting work, check and verify governing dimensions and elevations.
 - 1. Survey condition of adjoining properties.
 - 2. Take photographs, to record any prior settlement or cracking of structures, pavements, and other improvements.
 - 3. Prepare list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.
- B. Survey adjacent structures and improvements, establishing exact elevations at fixed points to act as benchmarks.
 - 1. Clearly identify benchmarks and record existing elevations.
 - 2. Locate datum level used to establish benchmark elevations sufficiently distant not to be affected by movement resulting from excavation operations.

1.06 EXISTING UTILITIES

- A. Protect existing active sewer, water, gas, electricity and other utility services and structures.
- B. Notify municipal agencies and service utility companies having jurisdiction.
- C. Comply with requirements of governing authorities and agencies for protection, relocation, removal and discontinuing of services, as affected by Work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Provide suitable shoring and underpinning materials to support loads imposed.
 - 2. Materials need not be new, but be in serviceable condition.
- B. If wood part of shoring system used near existing structures, use pressure preservative treated materials or remove before placement of backfill.

PART 3 - EXECUTION

3.01 SHORING

- A. Whenever shoring required, locate system to clear permanent construction and permit forming and finishing of concrete surfaces.
 - 1. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.
- B. Leave shoring systems retaining earth on which support or stability of existing structures dependent in place at completion of work.

3.02 BRACING

- A. Locate bracing to clear columns, floor framing construction, and other permanent work.
 - 1. If necessary to move brace, install new bracing prior to removal of original brace.
 - 2. Do not place bracing where cast into or included in permanent concrete work, except as otherwise acceptable to Architect.
- B. Install internal bracing, if required, to prevent spreading or distortion to braced frames.
- C. Maintain bracing until structural elements rebraced by other bracing or until permanent floor construction able to withstand lateral earth and hydrostatic pressures.
- D. Remove sheeting, shoring and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.
- E. Repair or replace, as acceptable by Architect, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION 02250

SECTION 02282
TERMITE CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Provide soil treatment for termite control, as herein specified.

1.03 GENERAL REQUIREMENTS:

- A. As stipulated by the Georgia Structural Pest Control Act, the pest control company selected to perform the termiticide work shall enter into a written, signed contract with the contractor.
- B. Comply with pesticide manufacturer's label and labeling specifications and recommendations for all pesticides used and work performed including preparation of substrate.
 - 1. Apply termiticides at the maximum dosages permitted by the label and state and federal regulations unless otherwise noted below.
 - 2. Comply with all rules and regulations governing pre-construction termiticide applications as set forth under Georgia Law and enforced by the Georgia Department of Agriculture Structural Pest Control Commission.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and application instructions.
- B. Provide copy of Applicator's State of Georgia's License
- C. Provide copy of Five year warranty against infestation and re-infestation.

1.05 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.
- B. Engage professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution.
- C. Use only termiticides which bear Federal registration number of U. S. Environmental Protection Agency.
- D. Comply with requirements of applicable codes and regulations, including the Georgia Structural Pest Control Act of 1995.
- E. Comply with requirements of Federal Insecticide, Fungicide, and Rodenticide Act for proper disposal of residue and contaminated debris.
- F. Failure to Comply: Failure of contractor to comply with contract requirements shall result in the placement of complete post-construction, subterranean termite treatment to be performed as specified in the rules and regulations of the Georgia Structural Pest Control Act with all costs paid by contractor.

1.06 JOB CONDITIONS

- A. Comply with handling and application instructions of soil toxicant manufacturer.

- B. Restrictions:
 - 1. Do not apply soil treatment solution until excavating, filling and grading operations completed, except as otherwise required in construction operations.
 - 2. Do not apply soil treatment to frozen or excessively wet soils or during inclement weather.
- C. Fill and Back Fill Materials: Use only clean fill dirt for back fill. Remove all foreign materials, including but not limited to brick, concrete, rocks, insulation, cellulose, wood, paper or paper products, prior to application of termiticide.
 - 1. Remove existing logs, stumps, limbs, roots or other bio-degradable materials from below buildings, pavements, walks and other site improvements.
- D. After termiticide has been applied no further excavating, filling, grading or other soil disturbances permitted unless the disturbed or added soil is treated/re-treated as stipulated in these specifications.

1.07 SPECIFIC PRODUCT WARRANTY

- A. Furnish written warranty certifying that applied soil poisoning treatment will prevent infestation of subterranean termites and, that if subterranean termite activity discovered during warranty period, Contractor retreat soil and repair or replace damage caused by termite infestation.
 - 1. The guarantee shall specifically state that if subterranean termite infestation is discovered during the guarantee period, the Pest Control Contractor, shall eliminate the termite infestation by properly treating the infected and adjacent areas within thirty (30) days of notification by the Owner's representative.
 - 2. Retreatments shall be performed at no additional cost to the Owner.
- B. Provide warranty for a period of 5 years from date of Final Approval signed by Applicator and Contractor.
 - 1. Premium and re-inspection(s) costs for initial five (5) year warranty to be included in the Pest Control Contractor's bid price.
 - 2. Warranty shall list chemicals used and concentration of each chemical.
- C. The Owner reserves the right to collect soil samples and test concentrates of termiticides used utilizing the State of Georgia Enforcement Agency or other government agencies or commercial companies as deemed appropriate and as determined by the Owner.

PART 2 - PRODUCTS

2.01 SOIL TREATMENT SOLUTION

- A. Initial Treatment: Use emulsible concentrate insecticide for dilution with water, specially formulated to prevent infestation by termites.
 - 1. Fuel oil not permitted as diluent.
- B. Final Treatment; "Post Construction Treatment"; non-repellent type.
- C. Use only those solutions above or other solutions acceptable to Architect and containing termiticides registered with United States Environmental Protection Agency and Georgia Department of Agriculture.
 - 1. Use only soil treatment solutions not injurious to planting.
 - 2. Do not substitute specified product with a generic version of the specified product.
- D. Provide working solution of one of following products, chemical elements and concentrations:
 - 1. Under footing and under slab locations: Provide working solution of the following products, chemical elements and concentrations.
 - 2. Provide products from one of the following:
 - a. Demon
 - b. Pro-Bill
 - c. Tel Star
 - d. Premise

- E. Mixing: Mix and apply termiticides at a minimum concentration of 0.06% (1qt/100gal).
 - 1. Termiticides to poured into a tank and mixed at the job site under the observation of the Owner's representative.

PART 3 - EXECUTION

3.01 NOTIFICATION

- A. The contractor shall notify the Owner and Architect, a minimum of 24 hours prior to application of soil treatment operations.
 - 1. Prior to application of soil treatment the Owner and Architect shall have an opportunity to observe the site conditions.
 - 2. Failure to provide proper notifications shall subject treatment area to rejection and require the contractor to re-treat area.
- B. Schedule: All soil treatment activities to be performed during normal working hours unless otherwise approved by Architect/Owner.

3.02 EQUIPMENT

- A. General: Termiticide application equipment, including vehicles and repair tools and parts shall be maintained in good proper working conditions.
- B. Each treatment unit (vehicle, hose, ect) shall be of sufficient size and capacity to properly apply, as a pre-treatment, 1,000 gallons of chemical within five (5) hours including refill time.
 - 1. The equipment shall have a minimum termiticide output, when applied through a coarse spray through a 200 foot hose, of seven (7) gallons per minute.
 - 2. Treatment unit(s) to have a minimum tank capacity of 100 gallons and a minimum hose length of 300 feet with each segment no longer than 100 feet. All connectors between reel, hose segments, and nozzle to be rapid connect/disconnect type.
- C. Nozzle Gun: The nozzle gun shall be capable of producing a variable output pattern of solid stream of very coarse spray.
- D. Re-Fill Equipment: Contractor to have, on site, the necessary equipment to refill tanks from a fire hydrant or other water source.
 - 1. Provide a minimum of 25 feet of 2" diameter fire hose with backflow devices, and cut off/on wrenches in compliance with local regulations.
- E. Back-Up Vehicle: Contractor shall have at least one back-up vehicle, properly equipped, available within two hours for emergency use in the event of breakdown or malfunction of regularly designated equipment.

3.03 PREPARATION

- A. Complete excavating, filling, and grading operations prior to application of termiticides.
- B. Remove foreign matter which could decrease effectiveness of treatment on areas to be treated.
- C. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations.
- D. Toxicants may be applied before placement of compacted fill under slabs, if recommended by toxicant manufacturer.

3.04 APPLICATION: GENERAL

- A. Allow min. 12 hours for drying after application, before beginning concrete placement or other construction activities.
- B. Post signs in areas of application warning workers that soil poisoning applied.
 - 1. Remove signs when areas are covered by other construction.
- C. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.
- D. Reapply soil treatment solution to areas exposed to rainfall.
- E. Treatment shall be applied immediately prior to application of floor slab membrane (polyethylene).

3.05 APPLICATION; RATES

- A. General: Treatments to be performed in strict compliance with the requirements of the Rules of the Structural Pest Control Act of the State of Georgia.
- B. Foundations and Footings: Apply 4 gallons of chemical solution per 10 lin. ft. to soil areas under footings, along entire inside perimeter of foundation walls, along both sides of interior partition walls, and around plumbing pipes and electric conduit penetrating foundations and slab, and around interior wall and column footers.
- C. Floor Slab Areas: Apply one gallon of chemical solution per 10 sq. ft. as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel.
 - 1. Apply 1-1/2 gallons of chemical solution per 10 sq. ft. to areas if washed gravel or other coarse absorbent fill material sand, stone (#89 or similar), or gravel (#57 or similar) used.
- D. Outside Edge of Building: Apply 4 gallons of chemical solution per 10 lin. ft. of trench, for each foot of depth from grade to footing, along outside edge of building.
 - 1. Dig trench 6" to 8" wide along outside of foundation to min. depth of 12".
 - 2. Punch holes to top of footing at max. of 12" o.c. and apply chemical solution.
 - 3. Mix chemical solution with soil as it is being replaced in trench.
- E. At hollow masonry foundations or grade beams, treat voids at rate of 2 gal. per 10 lin. ft., poured directly into hollow spaces.
- F. At expansion joints, control joints, and areas where slabs will be penetrated, at rate of 4 gals. per 10 lin. ft. of penetration.

3.06 POST CONSTRUCTION TREATMENT

- A. Upon completion of construction activities re-treat entire facility in accordance with the requirements of the Georgia Structural Pest Control Act of 1995.
 - 1. Dig trench around perimeter of building.
 - 2. Treat trench in accordance with provisions of the Structural Pest Control Act.

END OF SECTION 02282

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes, but not necessarily limited to, the following:
 - 1. Excavation as shown or required to attain specified grades.
 - 2. Surface and subsurface dewatering.
 - 3. Filling and backfilling as shown and required to attain finished grades shown.
 - 4. Rough and finished grading of site.
 - 5. Preparing of subgrade for building foundations, slabs, walks, and pavements.
 - 6. Installation of Drainage fill course for support of building slabs.
 - 7. Excavation and backfilling of trenches within building lines.
 - 8. Final Grading and redistribution and preparation of top soil.
- B. Related work described elsewhere:
 - 1. Quality Control Services; Section 01450.
 - 2. Demolition, Clearing and Grubbing; Section 02225.
 - 3. Trenching; Section 02321.
- C. Quantity of Soil removal to be included in the contractor's base bid:
 - 1. Refer to Section 01210 - Allowances

1.03 WORK INCLUDED IN THIS CONTRACT

- A. Current Contract: The contractor, under the scope of this contract shall provide additional required earthwork activities necessary to complete work in accordance with the requirements of the contract documents and as described herein:
 - 1. Provide building drainage coarse as herein indicated.
 - 2. Remove/add soil necessary to obtain level building pad and remove 'crown'.
 - 3. Maintain grades and elevations of site for duration of contract.
 - 4. Grade around building perimeter from building line to 50'-0" from building line to provide positive and uniform drainage away from building.
 - 5. Grade as necessary to provide positive drainage into storm drainage collection structures.
 - 6. Upon completion of construction activities, restore grades to within 0.10 feet of indicated grades and elevations.
- B. Acceptance of Site: Prior to commencement of construction activities the contractor shall perform surveys and tests necessary to provide, to the contractor's satisfaction, verification that the site conditions related to grades and compaction, are as indicated on contract documents.
 - 1. Costs for tests and surveys requested or performed by the contractor shall be at the contractor's expense.
 - 2. The mobilization by the contractor shall be considered as acceptance of the site conditions as being suitable for the performance of work under this contract.

1.04 DEFINITIONS

- A. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.
- B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect; unauthorized excavation, as well as remedial work directed by Architect, made at Contractor's expense.
 - 1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation.
 - 2. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect.
 - 3. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect.
- C. Additional Excavation:
 - 1. When excavation has reached required subgrade elevations, notify Architect, who will make inspection of conditions.
 - 2. If Architect determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Architect.
 - 3. Contract Sum may be adjusted by an appropriate Contract Modification.
 - 4. Removal of unsuitable material and its replacement as directed will be paid on a unit cost basis. Unit costs shall be in accordance with prices submitted on proposal form, Section B.
- D. Subgrade: Undisturbed earth or compacted soil layer immediately below granular subbase, drainage fill, or topsoil materials.
- E. Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

1.05 SUBMITTALS

- A. Test Reports: Submit the following reports directly to Architect from the testing services, with copy to Contractor:
 - 1. Test reports on borrow material.
 - 2. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
 - 3. Field reports; in-place soil density tests.
 - 4. One optimum moisture-maximum density curve for each type of soil encountered.
 - 5. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

1.06 QUALITY ASSURANCE

- A. Codes and Standards: Perform work specified in compliance with applicable requirements of authorities having jurisdiction. Applicable standards include, but are not limited to:
 - 1. Density of Soil In Place, Sand Cone Method; ASTM D1556.
 - 2. Moisture Density Relationship of Soil, 5.5# rammer and 12" Drop; ASTM D698.
 - 3. Density of Soil In-Place, Drive Cylinder Method, ASTM D 2937.
- B. All work to be performed in accordance with applicable provisions of the Southern Standard Building Code, OSHA Safety Requirements, State and Local Ordinances and other authorities having jurisdiction.
- C. All Construction shall comply with the Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, subpart P, revised July 1, 1995.

- D. Testing and Inspection Service: An experienced soil engineer technician, under the direct supervision of an independent geotechnical engineer shall observe all proof rolling, excavation, fill and compaction activities.
 - 1. Refer to Section 01450, Quality Control Services.
- E. Testing Laboratory Qualifications: To qualify for acceptance, geotechnical testing laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has experience and capability to conduct required field and laboratory geotechnical testing without delaying progress of Work.

1.07 PROJECT CONDITIONS

- A. Site Information:
 - 1. Report available for Contractor's review at Architect's office.
 - 2. Data on indicated subsurface conditions not intended as representations or warranties of accuracy or continuity between soil borings.
 - 3. It is expressly understood that Owner not responsible for interpretations or conclusions drawn therefrom by Contractor.
 - 4. Data made available only for convenience of Contractor.
 - 5. Additional test borings and other exploratory operations may be performed by Contractor, at Contractor's option; however, no change in the Contract Sum authorized for such additional exploration.
- B. Existing Utilities: Locate existing underground utilities in areas of excavation work.
 - 1. If utilities indicated to remain in place, provide adequate means of support and protection during earthwork operations.
 - 2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions.
 - 3. Cooperate with Owner and utility companies in keeping respective services and facilities in operation.
 - 4. Repair damaged utilities to satisfaction of utility owner.
 - 5. Provide minimum of 48-hour notice to Architect, and receive written notice to proceed before interrupting any utility.
 - 6. Demolish and completely remove from site existing underground utilities indicated to be removed.
 - 7. Coordinate with utility companies for shutoff of services if lines are active.
- C. Protection of Persons and Property:
 - 1. Excavations to comply with applicable safety regulations. ALL excavations to be shored and/or stepped back in accordance with requirements of OSHA and other regulatory agencies.
 - 2. Barricade open excavations occurring as part of this work and post with warning lights.
 - 3. Operate warning lights as recommended by authorities having jurisdiction.
 - 4. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
 - 5. Perform excavation by hand within dripline of large trees to remain.
 - a. Protect root systems from damage or dry out to the greatest extent possible.
 - b. Maintain moist condition for root system and cover exposed roots with moistened burlap.
- D. Dust Control: Use all means necessary to control dust on and near the work and on or near all off-site borrow areas, if such dust is caused by the Contractor's operation during the performance of the work or resulting from the condition in which the contractor leaves the site.
 - 1. Thoroughly moisten all surfaces to prevent dust being a nuisance to the public and neighbors.
 - 2. Dust control measures shall be commence immediately upon the disturbance of soil and shall continue concurrently with work for duration of construction.
 - 3. Refer to Section 02370; Erosion and Sedimentation Control for additional requirements.

- E. Conflicts: Immediately repair or replace structures, facilities, and paving damaged through the performance of work under this contract.
 1. Restore damaged materials to condition existing prior to damage in accordance with best standard practices as approved by Architect.
 2. Restoration and repair to be at no additional cost to the contract.
- F. Use of Explosives: Use of explosives not permitted.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Satisfactory soil materials defined as those complying with ASTM D 2487 soil classification groups GC, GW, GP, GM, SC, SM, SW, and SP.
- B. Unsatisfactory soil materials defined as those complying with ASTM D 2487 soil classification groups ML, MH, CL, CH, OL, OH, and PT.
- C. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, and natural or crushed sand.
- D. Drainage Fill (under building slab); Provide the following material; Minimum 4" deep:
 1. Clean washed, white river sand conforming with fine aggregate analysis of ASTM C-33.
 2. Clean washed #87 stone.
 3. Approval of material required prior to placement
- E. Structural Fill Materials: Comply with the following requirements:
 1. Free of organics, deleterious material, debris, rocks greater than 4".
 2. Any fill within 6" of exposed finish grade to have no rock or gravel larger than 1/2" in any dimension.
 3. Plastic Index: Less than 25.
 4. Liquid Limit: Less than 45.
 5. Standard Proctor Dry Density (ASTM D 698): Minimum 95 psf.
 6. Complying with ASTM D 2487 soil classification groups GC, GW, GP, GM, SC, SM, SW, and SP.
 7. Material shall contain no more than thirty-five percent (35%) by weight finer than No. 200 U.S. Standard Sieve.
 8. Material shall be approved by Geotechnical Testing Laboratory.
- F. Pipe Bedding materials – See Trenching Specification.
- G. Requirements of Suitable and Unsuitable Soils
 1. For the purposes of this contract, the term ‘unsuitable soils’ shall be defined as being **existing** undisturbed soils which are determined by the testing laboratory to be unsuitable for use as structural fill for reasons other than moisture or water content.
 2. Water saturated soils, regardless of whether water is from above or below ground, shall not be considered as unsuitable. Contractor responsible for dewatering or drying out of water saturated soils to the extent necessary to satisfy the requirements for structural fill.
 3. Fill Material: Fill material placed on site from contractor, regardless of whether fill is on-site or off-site borrow, cannot, by its nature, be classified as unsuitable soils. Only structural, suitable soils to be used for fill.
 4. Materials placed as structural fill shall not be classified as unsuitable soils regardless of conditions encountered.
 5. Water Saturated Soils: Should soils become saturated the contractor shall, as part of the scope of this contract, perform activities necessary to mediate and/or replace water saturated soils as required to obtain suitable structural fill as required by the testing laboratory.

- H. Other Materials: the contractor shall provide all other materials not specifically described herein but required for proper completion of the work of this Section.
1. Material shall be selected by Contractor and approved by Architect.

PART 3 - EXECUTION

3.01 EXCAVATION

- A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

3.02 STABILITY OF EXCAVATIONS

- A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
1. All work to be performed in accordance with applicable provisions of the Southern Standard Building Code, OSHA Safety Requirements, State and Local Ordinances and other authorities having jurisdiction.
- B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction.
1. Shore and brace where sloping not possible because of space restrictions or stability of material excavated.
 2. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- C. Use of Heavy Equipment
1. DO NOT use heavy equipment or vibratory equipment adjacent to existing structures or buildings. Contractor shall monitor existing building to ensure no damage is caused by equipment operating near existing structures.
- D. Shoring and Bracing:
1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition.
 2. Maintain shoring and bracing in excavations regardless of time period excavations open.
 3. Extend shoring and bracing as excavation progresses.

3.03 DEWATERING

- A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
- B. Soils which are made soft from a lack of dewatering are not considered unsuitable soils. The contractor is responsible for the removal of these soils and replacement with 57 stone under the direction of the geotechnical engineer at no cost to the owner.
- C. Do not allow water to accumulate in excavations. Contractor shall provide measures necessary to dewater the site at no additional cost.
1. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrade and foundations.
 2. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
 3. Provide temporary storm drainage systems which may include modifying permanent storm drainage structure for temporary use, under drains and holding ponds.
 4. Provide temporary diversion and ditches consisting of moving both wet and dry soil.
- D. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas.
1. Do not use trench excavations or as temporary drainage ditches.
 2. Lower and maintain groundwater level min. of 2'-0" below bottom of excavation and ground surface during preparation and compaction of foundation soils and during placement and compaction of fill and backfill.

3.04 STORAGE OF EXCAVATED MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill where directed.
 - 1. Place, grade, and shape stockpiles for proper drainage.
 - 2. Locate and retain soil materials away from edge of excavations.
 - 3. Do not store within drip line of trees indicated to remain.
- B. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill. This disposal of soil is not limited to removal from site to landfill or other location. When material is taken off site material becomes responsibility of the contractor.

3.05 PLACEMENT AND COMPACTION

- A. Ground Surface Preparation:
 - 1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills.
 - 2. Remove grass, roots and other vegetation completely.
- B. Organic Laden Soils:
 - 1. Remove all organic laden soils (top soil) to whatever depth encountered.
- C. Proofrolling:
 - 1. Proofroll building and pavement subgrades with a heavily loaded tandem axle dump truck by systematically traversing site with overlapping passes.
 - 2. Areas which pump or rut excessively shall be undercut and backfilled or re-worked in place in accordance with recommendations by the testing laboratory.
 - 3. Proofrolling shall be performed in the presence of a representative of the geo-technical laboratory.
- D. Scarify Sub-grade:
 - 1. After proofrolling and undercutting, scarify top 6" of subgrade.
 - 2. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- E. Compact Sub-grade:
 - 1. Moisture-condition cleared, under cut ground surface to optimum moisture content.
 - 2. Compact subgrade using a non-vibratory roller, to densities indicated below.
- F. Verification:
 - 1. Upon completion of removal of top soil, undercutting, proofrolling, scarifying, and compaction activities, geo-technical lab to inspect conditions and verify that subgrade is suitable for installation of building pad and/or structural fill, as applicable.
 - 2. Laboratory shall be required to verify soil bearing strength at footing bottom and compaction of top 6" sub grade.
 - 3. DO NOT proceed until sub grade is found, by testing laboratory and Architect, to be suitable.
- G. Back fill:
 - 1. Place backfill and fill materials in layers max. 8" in loose depth for material compacted by heavy compaction equipment, and max. 6" in loose depth for material compacted by hand-operated tampers.
 - 2. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content.
 - 3. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification.
 - 4. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

- H. Placement of Back fill:
 1. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations.
 2. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
- I. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below.
 1. Correct improperly compacted areas or lifts as directed by Architect if soil density tests indicate inadequate compaction.
- J. Rippable rock Placement:
 1. Ripple rock is considered structural fill and the contractor is required to place as needed to meet the requirements for placement of structural fill.
 2. If necessary the contractor shall reduce the size of the ripple rock to meet requirements for placement of structural fill.
- K. Percentage of Maximum Density Requirements: Compact soil to not less than following percentages of maximum density, in accordance with ASTM D 698:
 1. Under structures, building slabs and steps, structure footings and foundations, and pavements, compact top 12" of subgrade and each layer of backfill or fill material to 100% of standard proctor max. dry density. Soil placed below to the top 12", each layer of backfill or fill material shall be compacted to 98% of standard proctor max. dry density.
 2. Under walkways, curbs and other concrete structures compact top 12" of subgrade and each layer of backfill or fill material to 98% of standard proctor max. dry density.
 3. Under spillways, behind retaining walls, under storm drainage outfall structures and at earthen pond dams (both temporary and permanent) each layer of backfill or fill material to 98% of standard proctor max. dry density.
 4. Under lawn or unpaved areas, compact top 12" of subgrade and each layer of backfill or fill material to 90% of standard proctor max. dry density.
- L. Moisture Control:
 1. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material.
 2. Apply water in min. quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
 3. Remove and replace, or scarify and air dry, soil material too wet to permit compaction to specified density.
 4. Stockpile or spread soil material removed because it is too wet to permit compaction.
 - a. Assist drying by disking, harrowing, or pulverizing until moisture content reduced to satisfactory value.

3.06 EXCAVATION FOR STRUCTURES

- A. Conform to elevations and dimensions shown within tolerance of ± 0.10 foot, and extending sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.
- B. Excavations for footings and foundations:
 1. Do not disturb bottom of excavation.
 2. Excavate by hand to final grade just before concrete reinforcement placed.
 3. Trim bottoms to required lines and grades to leave solid base to receive other work.
 4. Do not allow water to accumulate in bottom of footings and foundations.
- C. Compaction of Excavated Areas: Upon completion of footing excavation, loosen exposed soil at footing bottom, and compact to 100% of soil's Standard Proctor maximum dry density.
 1. Compaction to take place prior to placing of reinforcing steel.

- D. Maintenance of Excavations:
 1. Clean Footing excavations by removing all foreign materials, loose earth, earth clods or stones.
 2. Remove water softened soil and replace with concrete or structural fill. See dewatering requirements

3.07 EXCAVATION FOR PAVEMENTS

- A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.
- B. Contractor to excavate until good subbase is obtained.
- C. Contractor to add additional graded base course where needed to obtain stabilization.

3.08 TRENCH EXCAVATION FOR PIPES AND CONDUIT

- A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and min. of 6" to 9" of clearance on both sides of pipe or conduit.
- B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil.
 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
 2. Do not allow trench excavations to undermine or disturb footings or footing excavations.
- C. Where "rock" encountered, carry excavation 6" below required elevation and backfill with 6" layer of crushed stone or gravel prior to installation of pipe.
- D. For pipes or conduit less than 6" nominal size, and for flat-bottomed, multiple-duct conduit units, do not excavate beyond indicated depths.
 1. Hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.
- E. For pipes and equipment 6" or larger nominal size, shape bottom of trench to fit bottom of pipe for 90° (bottom 1/4 of circumference).
 1. Fill depressions with tamped sand backfill.
 2. At each pipe joint, dig bell holes to relieve pipe bell of loads to ensure continuous bearing of pipe barrel on bearing surface.

3.09 COLD WEATHER PROTECTION

- A. Protect excavation bottoms against freezing when atmospheric temperature less than 35°F.

3.10 BACKFILL AND FILL

- A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.
- B. Under grassed areas, use satisfactory excavated or borrow material.
- C. Under walks and pavements, use "subbase" material, satisfactory excavated or borrow material, or combination.
- D. Under building slabs, use "structural fill" material to within 4" of underside of slab. From this point upward use "drainage fill"
- E. Under piping and conduit and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.
 1. Shape excavation bottom to fit bottom 90° of cylinder.

- F. Backfill trenches with concrete where trench excavations pass within 18" of column or wall footings and are carried below bottom of such footings or pass under wall footings; place concrete to level of bottom of adjacent footing.
 - 1. Do not backfill trenches until tests and inspections made and backfilling authorized by Architect.
 - 2. Use care in backfilling to avoid damage or displacement of pipe systems.
 - 3. Except as otherwise indicated, top of all piping and conduit 2'-0" min. below finish grade unless encased in concrete.
 - 4. Where required, concrete encasement to consist of min. of 4" thick concrete base slab placed prior to installation of piping or conduit and min. 4" thick concrete encasement (sides and top) placed after installation and testing of piping or conduit.
 - a. Concrete specified in Division 3.
- G. Backfill excavations as promptly as work permits, but not until completion of following:
 - 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 - 2. Inspection, testing, approval, and recording locations of underground utilities performed and recorded.
 - 3. Removal of concrete formwork.
 - 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
 - 5. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of structure or utilities, or leave in place if required.
 - 6. Removal of trash and debris from excavation.
 - 7. Permanent or temporary horizontal bracing in place on horizontally supported walls.

3.11 GRADING

- A. General:
 - 1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas.
 - 2. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations indicated, or between such points and existing grades.
- B. Grading Outside Building Lines:
 - 1. Grade areas adjacent to building lines to drain away from structures and to prevent ponding.
 - 2. Finish surfaces free from irregular surface changes and as follows:
- C. Lawn or Unpaved Areas: Finish areas to receive topsoil to within max. 0.10 foot above or below required subgrade elevations.
- D. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface max. 0.10 foot above or below required subgrade elevation.
- E. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface max. 0.10 foot above or below required subgrade elevation. When Department of Transportation funding is being used, contractor to grade pavement per DOT standards.
- F. Grading Surface of Fill Under Building Slabs:
 - 1. Grade smooth and even, free of voids, compacted as specified, and to required elevation.
 - 2. Provide final grades within tolerance of 1/2" when tested with 10 foot straightedge.
- G. Compaction: After grading, compact subgrade surfaces to depth and indicated percentage of maximum or relative density for each area classification.

3.12 FINISHED GRADING

- A. General:
 - 1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas.
 - 2. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations indicated, or between such points and existing grades.

- B. Grading Outside Building Lines:
1. Grade areas adjacent to building lines to drain away from structures and to prevent ponding of water at or near perimeter of building.
 2. Contractor to remove any material necessary to obtain finish grade 1'-0" below Finish floor.
 3. Unless noted otherwise, slope finished grade away building 8" in 10'-0".
 4. Finish surfaces free from irregular surface changes and as follows:
- C. Distribution of Top Soil:
1. See Section 02920 – Lawns and Grassing for more information and details concerning topsoil placement.
 2. Topsoil shall be screened mechanically to remove roots, sticks and rocks prior to placement.
 3. Distribute stock-piled top soil uniformly across site to a minimum thickness of 4".
 4. Provide additional top soil necessary to obtain thickness specified.
 5. Grade smooth and even, free of voids, compacted as specified, and to required elevation.
 6. Provide final grades within tolerance of 1/2" when tested with 10 foot straightedge.
- D. Compaction: After grading, compact subgrade surfaces to depth and indicated percentage of maximum or relative density for each area classification.
- E. Temporary Grassing: Apply temporary grassing to all disturbed area and as specified in Section 02370 Erosion, Sedimentation and Pollution Control Plan.

3.13 PAVEMENT SUBBASE COURSE

- A. General:
1. Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support pavement base course.
 2. Contractor to meet all Department of Transportation standards and requirements for installing subbase.
- B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.
- C. Shoulders:
- ~~1.~~ Place shoulders along edges of subbase course to prevent lateral movement.
 2. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer.
 3. Compact and roll at least 12" width of shoulder simultaneous with compaction and rolling of each layer of subbase course.
- D. Placing:
1. Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness.
 2. Maintain optimum moisture content for compacting subbase material during placement operations.
 3. When compacted subbase course indicated to be 6" thick or less, place material in single layer.
 4. When indicated more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.14 PAVEMENT BASE:

- A. Pavement base course specified in Section 02743; Bituminous Concrete Paving.
- B. The thickness of the pavement and base course specified in Section 02743 or shown on drawings. If not indicated, contractor shall assume for purposes of this section the following thicknesses:
1. DOT Pavement (at State Highways): 3" Asphalt; 12" Base
 2. Light Duty Pavement (Car Traffic): 2" Asphalt; 6" Base.
 3. Heavy Duty Pavement (Bus and Service Drives): 2" Asphalt; 8" Base.

3.15 BUILDING SLAB DRAINAGE COURSE

- A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.
 - 1. Drainage course to be minimum of 4" deep unless noted otherwise.
- B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness.
 - 1. Maintain optimum moisture content for compacting material during placement operations.
 - 2. When compacted drainage course indicated 6" thick or less, place material in single layer.
 - 3. Compact drainage course with small vibratory base plate or static compactor.

3.16 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work performed.
- B. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method), as applicable.
 - 1. Field density tests may also be performed by nuclear method in accordance with ASTM D 2922, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556.
 - 2. In conjunction with each density calibration check, check calibration curves furnished with moisture gages in accordance with ASTM D 3017.
 - 3. If field tests performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by Architect.
 - 4. Density of Soil In-Place, Drive Cylinder Method, ASTM D 2937.
- C. Building Subgrade Area Testing:
 - 1. Subgrade and Structural Fill:
 - a. 1 Test per 3500 S.F. per lift, minimum 5 per lift.
 - 2. Wall footing Subgrade:
 - a. 1 Test per 75 lineal foot of footing; minimum of three.
 - b. Perform both Auger and penetrometer tests at each location.
 - 3. Column Footing Subgrade:
 - a. 1 Test for every third footing.
 - b. Perform both auger and penetrometer tests.
- D. Paved Area Testing:
 - 1. Subgrade and Structural Fill: 1 Test per 2500 S.F. per lift, minimum two per lift.
 - 2. Base Course: 1 Test per 2500 S.F., minimum two.
 - 3. Bituminous Concrete: As required in Section 02743.
- E. Foundation Wall / Retaining Wall:
 - 1. Backfill: Perform field density tests 1 Test per 3500 S.F. per lift, minimum 2 per lift.
 - 2. Wall Footing: 1 Test per 75 lineal foot of footing; minimum of three.
- F. If in opinion of Architect, based on testing service reports and inspection, subgrade or fills placed are below specified density, perform additional compaction and testing until specified density obtained.
- G. Failure to meet the testing requirements may result in additional testing using alternative testing techniques at no additional cost as directed by Architect.

3.17 EROSION CONTROL

- A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction and Section 02370 – Erosion, Sedimentation and Pollution Control Plan.

3.18 MAINTENANCE

- A. Protection of Graded Areas:
 - 1. Protect newly graded areas from traffic and erosion.
 - 2. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- D. Settling: Where settling measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment.
 - 1. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.19 EXCESS SOIL AND WASTE MATERIALS

- A. Removal to Designated Areas on Owner's Property:
 - 1. Transport acceptable excess structural fill and topsoil to designated soil storage areas on Owner's property. ALL excess soil on site is property of the owner and shall remain onsite.
 - 2. Stockpile soil or spread as directed by Architect.
- B. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.

3.20 UNSUITABLE MATERIAL

- A. In the event existing areas of soil cannot be compacted to densities described herein, the contractor shall immediately notify the Architect.
 - 1. Soil classified as unsuitable due to excessive moisture resulting from improper dewatering practices shall be removed and replaced by the contractor at no cost to the contract.
- B. If, in the opinion of the Geo-technical laboratory engineer, Civil engineer, and Architect, the soil is unsuitable and cannot be compacted to the specified densities, the soil shall be removed and replaced with satisfactory material on a unit cost basis, through the issuance of a change order.
 - 1. Unit Costs shall be included on Contractor's Proposal Form, Section "B". Unit cost for removal and replacement of soil shall include all costs necessary to obtain, place and compact soil to required densities, including, but not limited to:
 - a. All materials, labor, equipment, taxes, permits, insurance, bonds, overhead and profit.
 - b. Removal and disposal of unsuitable materials.
 - c. Borrow, placement and compaction of fill.
 - d. Additional soil testing required.
 - e. Survey cost for verification of quantities.
 - 2. Quantities of Materials: Material quantities used to determine payment on the unit-cost basis shall be determined through a mathematical calculation of cross sectional area of soil removed.
 - a. A separate calculation for replacement materials shall not be performed. It shall be assumed that the replacement material quantity equals the removal quantity.

3. Quantity of material removed and replaced shall be verified by a Georgia Licensed Surveyor, retained by the contractor.
 - a. The cost for the surveyor's services to be included in the unit cost.
- C. Soil removal and replacement shall be observed by the Geo Technical Laboratory's and Architect's representatives.

END OF SECTION 02300

SECTION 02319

ROCK EXCAVATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes, but not necessarily limited to, the following:
 - 1. The work includes excavation and placement to rock materials in areas designated on the Drawings or as directed by Architect/Engineer.
 - 2. The work includes the reduction of all rock materials encountered in the course of the work to sizes and gradations suitable for placement in rock-fill or riprap.
- B. The contractor's base bid shall include the removal of a certain quantity of rock as defined herein. Should the actual quantity of rock encountered differ from the allowance contained in this section, the contractors contract shall be adjusted, either up or down, based on the a cost obtained by multiplying the actual quantity of rock less the allowance by the unit cost contained in the contractor's bid proposal.
- C. Quantity of rock removal to be included in the contractor's base bid:
 - 1. Refer to Section 01210- Allowances
- D. Related work described elsewhere:
 - 1. Quality Control Services; Section 01450.
 - 2. Demolition, Clearing and Grubbing; Section 02225.
 - 3. Earthwork; Section 02300.
 - 4. Trenching; Section 02321.

1.03 INSURANCE CERTIFICATES

- A. General: Contractors performing blasting activities to be insured in accordance with the provisions of this section.
 - 1. General liability Insurance coverage: \$2,000,000
 - 2. Fire damage: \$1,000,000
 - 3. Automotive: \$1,000,000
 - 4. Submit prior to commencement of blasting activities, five copies of contractors insurance certificate.

1.04 NOTIFICATIONS

- A. The contractor shall notify utility location service at 1-800-282-7411 before any excavations are done.
- B. If necessary contractor to employ locator to determine the location of utilities with 1000 feet of excavation.
- C. Contractor to give 72-hour notice to residents, property owners and utility companies with 0.5 miles of blasting center point prior to beginning verbally and in writing.
- D. If Gas, telephone duct bank or fiber optics is located within blasting area, a representative of each utility company must be present during all blasting. Contractor to pay any charges associated with this requirement.
- E. Submit prior to commencement of blasting activities, five copies of contractors notification letters.

1.05 UNIT COSTS

- A. Unit Cost for Rock Removal to be included in the contractors base proposal form

1.06 DEFINITIONS

- A. Rock: For the purposes of this section rock shall be defined as follows:
1. Mass Rock Excavation: Any material that cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a draw bar pull rated at not less than 120,000 pounds (Caterpillar D-9N or equivalent) or by a Caterpillar 973 front-end loader or equivalent.
 2. Trench Rock Excavation: Any material, which cannot be excavated with a backhoe having a bucket curling force rated at not less than 42,000 pounds (Caterpillar Model 235C or equivalent).
 3. Rippable Rock: Any material that does not meet the requirements of mass rock or trench rock excavation shall be considered rippable rock. Rippable rock is considered to be general earthwork as structural fill. Removal of rippable rock shall be included as part of the base bid and shall not apply to any allowance.
 4. General: Material that can be excavated without continuous drilling and blasting will not be classified as Rock Excavation. Material not classified as rock, in accordance with definitions contained herein shall be excavated in accordance with Section 02300, Earthwork.
- B. Unauthorized excavation: Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect; unauthorized excavation, as well as remedial work directed by Architect, made at Contractor's expense.
1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation.
 2. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect/Engineer.
 3. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect/Engineer.
- C. Rippable rock Placement: refer to Section 02300, Earthwork
1. Ripple rock is considered structural fill and the contractor is required to place as needed to meet the requirements for placement of structural fill.
 2. If necessary the contractor shall reduce the size of the ripple rock to meet requirements for placement of structural fill
- D. Additional Excavation:
1. When excavation has reached required subgrade elevations, notify Architect/Engineer, who will make inspection of conditions.
 2. If Architect/Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Architect/Engineer.
 3. Contract Sum may be adjusted by an appropriate Contract Modification.
 4. Removal of unsuitable material and its replacement as directed will be paid on a unit cost basis. Unit costs shall be in accordance with prices submitted on proposal form, Section B.

1.07 PROJECT CONDITIONS

- A. Report available for Contractor's review at Architect's office.
- B. Data on indicated subsurface conditions not intended as representations or warranties of accuracy or continuity between soil borings.
- C. It is expressly understood that Owner not responsible for interpretations or conclusions drawn therefrom by Contractor.
- D. Data made available only for convenience of Contractor.
- E. Additional test borings and other exploratory operations may be performed by Contractor, at Contractor's option; however, no change in the Contract Sum authorized for such additional exploration.

1.08 USE OF EXPLOSIVES

- A. Provide licensed, experienced workmen to perform blasting.
- B. Prior to Blasting a blasting plan shall be developed by the contractor identifying what devices are being used, where and when blasting will take place. Additionally, any special conditions (such as an existing facility) will be addressed in this plan. Five copies of blasting plan are to be submitted to architect/engineer 1 week prior to blasting.
- C. When the use of explosives is necessary for the prosecution of the work, Contractor shall exercise the utmost care not to endanger life or property, and shall obey all state, federal, and other governmental regulations applying to transportation, storage, use, and control such explosives. Contractor shall be completely responsible for any and all damage resulting from the transportation, storage, use, and control of explosives in the prosecution of the work by him, his agents or employees; and shall hold Owner and Architect/Engineer harmless from all claims of damages resulting in any manner therefrom.
- D. Contractor shall notify each public utility owner having structures or other installations, above or below ground, near the site of the work of his intention to use explosives. Such notice shall be given sufficiently in advance to enable the utility owners to take such steps that they may deem necessary to protect their property from injury. Such notice shall not relieve Contractor of responsibility for all damage resulting from his blasting operations.
- E. All explosives shall be stored securely in compliance with all laws and ordinances, and all such storage places shall be clearly marked "DANGEROUS EXPLOSIVE". Explosives and detonators shall be stored in separate storage facilities in separate areas.
- F. In all cases where the transport, storage, or use of explosives is undertaken, such activities shall be control and directed by fully qualified representatives of the Contractor.
- G. Whenever electrical detonators are used, all radio transmitters shall be turned off when in a radius of 500 feet. No blasting supplies shall be transported in vehicles with two-way radio unless the transmitter is turned off, or extra shielding precautions are taken. Appropriate signs shall be placed so as to give ample warning to anyone driving a vehicle equipped for two-way radio. Electrical detonators will not be used within 500 feet of a railroad.
- H. If the Contractor repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the Architect/Engineer may direct the Contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.

1.09 PAYMENT

- A. If rock is measured for payment on a unit cost basis, the following will apply.
- B. Payment for rock excavation shall be on the basis of material excavated measured as hereinafter specified. The Unit Price for rock excavation shall be inclusive of all work required. Included are measurement, drilling, blasting, loading, transporting, and manipulation of material as necessary to meet the technical specifications.
- C. Where rock is found in layers underlain by material meeting "common excavation" classification, payment on the basis of rock excavation measured from the uppermost rock surface will be made if rock drill reenters a rock formation in less than ten feet. Otherwise, the underlying layer will be considered "common excavation".

1.10 MEASUREMENT FOR PAYMENT

- A. Measurement for Payment: All rock to be excavated shall be measured for payment by one of the methods which follow.
 - 1. Primary method - of measurement of rock is to be by cross-sections after hard rock surface is uncovered and confirmed by Architect/Engineer.

2. Overburden - Contractor may elect to drill through overburden and decomposed rock to load and shoot hard rock. Procedure shall be observed by Architect/Engineer and bore hole measurements used to determine rock surface for payment. If overburden is left over rock additional requirements and surveying may be required. The requirements shall be determined by architect prior to blasting.
3. Trench Rock - may be measured by observation of hard rock surface in trench wall after excavation, if agreed to in advance by Architect/Engineer.
4. Measurement of trench rock will be from lower of subgrade or rock surface. Rock excavation above subgrade will not be classified as trench rock, regardless of method of excavation.
5. Boulders encountered in excavations that require stockpiling, drilling, blasting and placement in rock fill areas will be measured for payment as "rock excavation". Boulders will be measured for payment in stockpile by average end area of cross-sections. No deduction from the volume of "common excavation" that yielded the boulders will be made.
6. Measurement for payment for rock excavation will yield only the quantities of excavation required to reach the limits of rock excavation specified in Paragraph 3.01-A. Overbreakage will not be included in payment measurement.

PART 2 - PRODUCTS

2.01 ROCK MATERIALS

- A. Rock fill material shall consist of well-graded quarry run shot rock containing rocks up to 4 inches largest dimension. Rock fill material shall contain at least 30% sand fines.
- B. Riprap required for construction shall be obtained from on site rock excavations or commercial sources.
 1. Dumped stone riprap shall be shot quarry rock. Production of dumped stone riprap requires removal of oversized fragments.
 2. Stone for dumped riprap shall be processed in such a manner to produce quarry run material including rock fines. The largest piece of material shall have a volume not to exceed 2 cubic feet, weigh as at least 125 pounds, and shall comprise above 35% of the mass. The remainder of the material shall be well-graded down to the finest sizes. No less than 5% nor more than 25% rock fines will be allowed. Rock fines are defined as material passing a No. 4 sieve.
 3. Processed (surge) stone will not be accepted for use as riprap.
- C. Stabilization Stone.
 1. Commercially produced surge stone.
 2. Stabilization stone obtained from on site rock excavations shall be shot rock. The largest pieces of material shall have volume not to exceed 2 cubic feet. Sufficient small rock pieces shall be present to form a dense and stable blanket when placed in a layer 2 feet thick over unstable subgrade. Oversized fragments shall be removed.

PART 3 - EXCAVATION

3.01 ROCK EXCAVATION

- A. Limits of Rock Excavation: Limits are minimum dimensions to which any part of rock will be allowed. Rock Excavation quantities for payment will be computed on the basis of the specified limits. Payment will not be made for excavation beyond the limits:
 1. Beneath pavements, excavate to 12 inches beneath base course.
 2. Beneath structures, excavate 24 inches beneath finished floor elevation.
 3. In future development areas, excavate 24 inches below grades shown.
 4. In backslopes and shoulders, excavate 12 inches below grades shown.

5. In utility or storm sewer trenches, excavate 12 inches beneath utility or pipe and to vertical planes which pass 12 inches beyond nominal outside dimension of utility or pipe.
 - a. Vertical plans of trench shall extend from trench bottom to existing ground surface.
 - b. In places where utility or storm sewer piping is less than 12" in diameter the maximum trench width for payment shall be 36" in width.

B. Unauthorized Rock Excavation:

1. Unauthorized Rock Excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction or Owner.
2. Unauthorized Rock Excavation shall be backfilled and compacted with fill material or special backfill, as directed by Owner.

C. Overbreakage: Overbreakage rock shall be removed in any situation where instability of subgrade would result in its remaining in place.

1. All overbreakage rock shall be removed from building and permissible building areas.
2. Beneath pavements, overbreakage rock shall be removed to the depth specified as permissible for rock fill placement.
3. Required subgrades in overbreakage areas shall be restored by placement of compacted earth fill.

D. Removal of Rock: Dispose of rock off site that is surplus or not suitable for use as rip rap or backfill.

E. Non-Blast Rock: No blasting will be permitted within existing Utility right-of-way or easements without permission from utility owner. Permission shall be obtained in writing from the utility company prior to beginning of work. Rock must be removed by jackhammer, hydraulic splitting or similar methods approved by Utility Company.

3.02 EMBANKMENT AND BACKFILL CONSTRUCTION

A. Embankments:

1. Rock fill may be used in embankment areas that meet the following limitations:
 - a. More than 20 feet outside permissible building lines.
 - b. More than 4 feet beneath paving base course.
 - c. Outside of the area surrounding storm drains as defined by a horizontal plane passing 5 feet beneath an above the pipe, and vertical planes passing 5 feet either side of the pipe.
 - d. Limits for sanitary sewers are same as storm drains, except rock fill may not be placed above them.
2. Rock fill may be placed in layers not exceeding 36 inches.
3. Rock fill shall be placed in embankments from the bottom upward. In no case shall earth fill material be buried underneath rock fill.
4. The area within 5 feet of underground utilities shall have no rocks larger than 4 inches in largest dimension placed by filling.
5. Rock fill may be placed within 3 feet of the top of box culverts.
6. Engineer may allow boulders encountered in excavations to be placed in designated embankments without reduction in size. Compaction of soil adjacent to each boulder is required. Excavation and placement of boulders by this method will be considered common excavation.

B. Rock Slopes:

1. Rock slopes, if shown on the Drawings, shall be constructed of quarry-run shot rock from continuous formation. Shot or unshot boulders shall not be used in rock slopes.
2. Rock slopes shall be manipulated to form a uniform slope plane.

C. Compaction:

1. Rock fill shall be compacted by passes of heavy equipment or by drum type vibrating compactors as required to achieve the equivalency of 95% Standard Proctor compaction, in the opinion of Architect/Engineer, or by whatever appropriate compaction test employed.

3.03 RIPRAP PLACEMENT

- A. Stone dumped riprap shall be manipulated into place to form a uniform surface to the thickness shown on the plans. The thickness tolerance for the course shall be minus 6 inches and plus 12 inches.
- B. Riprap shall be handled in a manner to prevent segregation. The finished cross-section of riprap shall form a dense stable layer of stone.

3.04 STABILIZATION STONE PLACEMENT

- A. Stabilization Stone shall be placed on the subgrade and manipulated to form a dense layer.
- B. Unless otherwise shown on the plans, required thickness of "stabilization stone" layer shall be 2 feet with tolerance plus 12 inches and minus 6 inches. Thickness may be modified by Architect/Engineer.

END SECTION 02319

SECTION 02321**TRENCHING****PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of trenching shown on drawings.
- B. System work includes excavation, trenching and backfilling for, but is not limited to, following:
 - 1. Sanitary sewer system components.
 - 2. Natural and LP Gas system components.
 - 3. Storm sewer system components.
 - 4. Water lines and system components.
 - 5. Underground electrical lines
 - 6. Other cables as noted.
- C. The contractor's base bid shall include the removal of a certain quantity of soil as defined herein. Should the actual quantity of soil encountered differ from the allowance contained in this section, the contractors contract shall be adjusted, either up or down, based on the a cost obtained by multiplying the actual quantity of soil less the allowance by the unit cost contained in the contractor's bid proposal.
- D. Quantity of Soil removal to be included in the contractor's base bid:
 - 1. Refer to Section 01210 - Allowances
- E. Related work described elsewhere:
 - 1. Quality Control Services; Section 01450.
 - 2. Demolition, Clearing and Grubbing; Section 02225.
 - 3. Earthwork; Section 02300.
- F. Related work required under this section includes:
 - 1. Cap off or seal discontinued or abandoned utilities; remove portions, which occur within graded or excavated areas.
 - 2. Dewatering of excavations.
 - 3. Installation of required erosion control and sedimentation devices.

1.03 QUALITY ASSURANCE

- A. All work to be performed in accordance with applicable provisions of the Southern Standard Building Code, OSHA Safety Requirements, State and Local Ordinances and other authorities having jurisdiction.
- B. All Construction shall comply with the Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, subpart P, revised July 1, 1995.
- C. If local authorities have standard specifications for pavement removal and replacement, do work in accordance with those specifications.

- D. Testing: Initial testing of fill material shall be performed by testing laboratory retained by the contractor. Testing shall comply with provisions of Section 01450, Quality Control.
 - 1. The contractor shall coordinate required testing with testing laboratory.
 - 2. Tests required for each 1'-0" of compacted lifts, at no greater than 50'-0" along length of trench.
 - 3. Do not place succeeding layer of backfill soil until previous layer meets compaction requirements.

1.04 PROTECTION

- A. Contractor shall contact the Utilities Protection Inc. "Call Before you Dig" at 1-800-282-7411 prior to beginning any work. Contractor to post dig numbers in Job site trailer.
- B. Protect bench marks and existing structures, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic; install and maintain proper bridging, planking and cants to provide access to building.
- C. Protect excavations by shoring, bracing, underpinning, or by other methods required to prevent cave-ins or loose dirt from falling into excavations.
 - 1. Methods and procedures utilized shall conform to, as a minimum, the requirements of OSHA and other governing authorities having jurisdiction.
- D. Underpin or otherwise support adjacent structure(s), including service lines and pipe chases, to prevent damage by excavation work.
- E. Notify Architect of any unexpected sub-surface conditions and discontinue work in area until Architect provides notification to resume work.

PART 2 - PRODUCTS

2.01 BED AND FILL MATERIALS

- A. Gravel: Angular (pit run) crushed graded stone shall be angular, 1/4" to 1-1/2"; free from shale, clay friable materials and debris. Soil Types GW, and GP.
- B. Pea Gravel: Clean natural stone; free from clay, shale and organic matter; 1/4" to 1/2" size.
- C. Sand: Clean Natural River or bank sand; free from silt, clay, loam, friable, or soluble materials, and organic matter. Sand shall be coarse sands and gravels with maximum particle size of 1-1/2" including variously graded sands and gravels. Soil Types SW, and SP.
- D. Sub-soil: Free from roots, rock larger than 3" in size and building debris, and approved by testing laboratory for structural fill.
- E. Fill under landscaped areas:
 - 1. Free of alkali, salt, and petroleum products.
 - 2. Use sub-soil excavated from site only if conforming to specified requirements.
- F. Portland Cement: ASTM C 150-89.

PART 3 - EXECUTION

3.01 EXCAVATION

- A. General:
 - 1. Perform all excavation of every description and of whatever sub-stances encountered, to depths indicated on drawings or as otherwise specified.

2. During excavation, pile material suitable for backfilling in orderly manner sufficient distance from banks of trench to avoid overloading and prevent slides or cave-ins.
- B. Remove and waste all excavated materials not required or suitable for backfill.
1. All Unsuitable material must be properly disposed of in a manner acceptable to Architect/ Engineer and to local jurisdiction.
 2. All Unsuitable material must be properly disposed in a manner that will not adversely affect the environment.
 3. Do such grading as may be necessary to prevent surface water from flowing into trenches or other excavations, and remove any water accumulating therein by pumping or by other approved methods.
 4. Do such sheeting and shoring necessary for protection of work and for safety of personnel.
- C. Trench Excavation:
1. Provide trenches of min. necessary width for proper laying of pipe.
 2. Excavate trenches to depths required in order to lay sewer (sanitary and storm) to the grades and elevations shown on the plans and to lay water lines so that a minimum four (4) feet cover will be achieved over the water line.
 3. Unless otherwise indicated on drawings, accurately grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its entire length, except for portions of pipe sections where necessary to excavate for bell holes and for proper sealing of pipe joints.
 - a. Dig bell holes and depressions for joints after trench bottom graded and only of such length, depth and width required for properly making particular type of joint, so that pipe rests on prepared bottom for nearly its full length as applicable.
 - b. Except where rock encountered, take care not to excavate below depths indicated.
 - c. Where rock excavation required, excavate to min. overdepth of 8" below trench depth indicated on drawings or specified.
 - d. Backfill overdepths in rock excavation and unauthorized overdepths with loose, granular, moist earth, thoroughly tamped.
 4. Where required by the class of embedment to contain a special bedding, take care not to over excavate beyond the trench bottom. Place the required material for the bedding to the required compaction.
 5. Where wet or unstable soil incapable of properly supporting pipe, as determined by Architect, encountered in bottom of trench, remove such soil and dewater to depth required and backfill trench to proper grade with a foundation of course sand, fine gravel, or other suitable material, as hereinafter specified.
- D. Sanitary Sewers:
1. Provide width of trench, at and below 1 foot over top of pipe, such that clear space between barrel of pipe and trench wall is max. 8" on either side of pipe.
 2. Width of trench above that level may be wide as necessary for sheeting and bracing and proper performance of work.
 3. Round bottom of trench so that at least bottom quadrant of pipe rests firmly on bedding material for nearly full length of barrel as proper jointing operations permit.
 4. If bedding is to be specially placed then place bedding material, compact and shape material to receive pipe.
 5. Perform this part of excavation manually, only few feet in advance of pipe laying by men skilled in this type work.
- E. Storm Sewers:
1. Do not make width of trenches for drainage pipe greater than necessary to permit satisfactory jointing and thorough tamping of bedding material around pipe.
 2. Prepare bedding surface to provide firm foundation of uniform density through entire length of culvert or storm sewer.
 3. Carefully shape and round bottom of trench to shape of lowest 1/4 of outside circular portion of pipe for its entire length.
 4. If type of pipe requires special bedding and haunching prepare trench in same manner as for sanitary sewer.

- F. Water supply, fire and distribution lines:
1. Except in cases where water lines must be graded, as indicated on plans
 2. Avoid high points with necessity of placing air release and vacuum valves
 3. Provide trenches for water lines of depth to provide min. cover over top of pipe of three (3) feet from existing ground surface or indicated finish grade, whichever lower, and avoid interference of water lines with other utilities.
 4. Provide thrust blocks as indicated or to meet local ordinances and requirements
- G. Electrical Ducts or Cables:
1. Provide trenches for cables or ducts of depth to provide min. 2' of cover over finished grade.
 2. Cut trenches for cables to an overdepth of not less than 3".
 3. Use select backfill material for not less than 3" bedding and 3" backfill over cable.
- H. Excavation for Appurtenances:
1. Make sufficient excavation for manholes and similar structure to leave at least 12" in clear between their outer surfaces and embankment or timber which may be used to hold and protect banks.
 2. Consider any overdepth excavation below such appurtenances that has not been directed by Architect as unauthorized and fill with sand, gravel or concrete as directed, and at expense of Contractor.
- I. Excavation Dewatering: Keep trenches dry at all times.
1. Trenching operations below the water table are considered general earthwork operation. See Section 02010 Geotechnical Data for approximate elevation of water table.
 2. Provide necessary equipment including pumps, piping and temporary drains sufficient to handle both surface and subsurface water.
 3. Maintain equipment for duration of trench exposure to elements.
- J. Do not discharge drainage water lines into municipal sewers without municipal approval; ensure water discharge does not contain silt held in suspension.
- K. Direct surface drainage away from excavated areas.
- L. Control grading in and adjacent to excavations to prevent water running into excavated areas or onto adjacent properties or public thoroughfares.
- M. Furnish and operate suitable pumps on 24 hour basis to keep excavations free of water until services placed and backfilling completed.

3.02 PIPE BEDDING

- A. General: Pipe shall be installed in trenches with Class A, B, C, or D pipe bedding.
1. Rigid Pipes shall include Ductile Iron pipe, Reinforced Concrete Pipe and Steel Metal pipes with or without coatings.
 2. Flexible Pipe shall include Aluminum, Copper, PVC and HDPE.
- B. Bedding Classifications:
1. Class A: Shall be Concrete Cradle or Concrete Cap with Granular bedding. Locations to be specified on the drawing.
 2. Class B:
 - a. Standard: shall be granular materials $\frac{1}{4}$ of the outside diameter of the pipe with a minimum of 4" being placed below the pipe and continuing to the spring line of the pipe.
 - b. Modified: Shall be granular materials placed 6" below the pipe and continuing to 6" above the top of the pipe.
 3. Class C: Shall be granular materials $\frac{1}{4}$ of the outside diameter of the pipe with a minimum of 6" being placed below the pipe and continuing $\frac{1}{4}$ of the outside diameter of the pipe above the bottom of the pipe.

4. Class D: Shall be existing soil material with an area excavated for bell of the pipe. This bedding only allowed in dry earth trenched. If trench becomes wet. A minimum of Class B bedding shall be used.
5. Pipe Encasement: Shall be a minimum of 6" of concrete located on all sided measured from the outside diameter of the pipe. Locations to be specified on the drawing.

C. Description of Embedding Materials:

1. General: All embedding material shall be classified by Geotechnical Engineer prior to beginning.
2. Class I: Shall be angular, ¼" to 1-1/2" graded stone including a number of fill materials including coral, slag, crushed stone and crushed shells.
3. Class II: Shall be coarse sands and gravels with maximum particle size of 1-1/2" including variously graded sands and gravels. Soil Types GW, GP, SW, and SP.
4. Class III: Shall be fine sands and clayey gravels including fine sands, sand clay mixture and gravel clay mixtures. Soil Types GM, GC, SM, and SC.
5. Class IV: This may only be used with approval from Geotechnical Engineer and Architect.
6. Class V: Shall not be used.

D. Bedding Classification & Embedding Materials Required

1. General: Contractor shall install pipe with correct bedding as indicated.
2. Water System & Fire water Piping (rigid and flexible): The following bedding is allowed:
 - a. Class A : Shall be Concrete, Class I & Class II materials
 - b. Class B or Class B modified : Shall be Class I & Class II materials
 - c. Class B or Class B Modified as required by local authority.
3. Sewer System Piping (rigid and flexible): The following bedding is allowed:
 - a. Class A : shall be Concrete, Class I & Class II materials
 - b. Class B or Class B modified : shall be Class I & Class II materials
 - c. Class B or Class B Modified as required by local authority.
4. Storm Drainage Piping (flexible): The following bedding is allowed:
 - a. Class A : shall be Concrete, Class I & Class II materials
 - b. Class B or Class B modified : shall be Class I & Class II materials
 - c. Class B or Class B Modified as required by local authority.
5. Storm Drainage Piping (rigid): The following bedding is allowed:
 - a. Class A : shall be Concrete, Class I & Class II materials
 - b. Class B or Class B modified : shall be Class I & Class II materials
 - c. Class D: Shall be Class I, Class II, Class III or Class IV(with approval)
6. All other Utility Piping (rigid and flexible) Located outside the building: The following bedding is allowed:
 - a. Class A : shall be Concrete, Class I & Class II materials
 - b. Class B or Class B modified : shall be Class I & Class II materials
 - c. Class D: Shall be Class I, Class II, or Class III materials

- E. Bedding Material : Bedding material under and around the pipe shall be placed in six (6)-inch layers and compacted by rodding, spading or with approved vibratory equipment to obtain not less than 98% standard proctor as determined by ASTM Method D698.

3.03 BACKFILLING

- A. General: Do not backfill trenches until all required pressure tests are performed and until systems, as installed, conform to requirements specified in the several sections covering installation of various utilities.

- B. Backfill materials may consist of the following soil types Class I, Class II, or Class III embedding materials or other approved materials.
- C. Contractor shall carefully backfill trenches with approved materials for backfilling. Materials shall be free from large clods of earth or stones and deposited in 6" layers and thoroughly and carefully compact until the following densities are obtained:
 - 1. Areas under structures: 100% standard proctor (ASTM D698).
 - 2. Areas under walks and pavement: 98% standard proctor (ASTM D698).
 - 3. Areas under lawns: 95% standard proctor (ASTM D698) up to the top 12" which shall be compacted to 90% standard proctor (ASTM D698).
- D. Take care with specially coated pipe not to damage coating.
 - 1. Place remainder of backfill material in trench in 6" layers and tamp.
- E. Settling backfill with water permitted, and a requirement when so directed by Architect.
- F. Reopen improperly backfilled trenches, or trenches where settlement occurs, or where tests indicate noncompliance with densities specified, to depth required for proper compaction, then refill and compact, with surface restored to required grade and compaction, mounded over and smoothed off.
- G. Backfill open trenches across roadways or other areas to be paved as specified above, except backfill entire trench depth in 6" layers, moisten and compact each layer to density of 98% of standard proctor test, so that paving of area can proceed immediately after backfilling completed.
- H. Grade ground to reasonable uniformity along all other portions of trenches and leave mounding over trenches in uniform and neat condition, to satisfaction of Architect.

3.04 TESTING

- A. Test for Displacement of Pipe Lines: See Specific Specifications sections for additional testing.
 - 1. Pipe Lines shall be checked by Architect to determine whether any displacement of pipe occurred, after trench backfilled to 2' above pipe and tamped as specified.
 - 2. Light flashed between manholes, or, if manholes not yet constructed, between locations of manholes, by means of flashlight or by reflecting sunlight with mirror.
 - 3. If illuminated interior of pipe lines shows poor alignment, displaced pipe, or any other defects, remedy defects designated by Architect at Contractor's expense.
- B. Test for Gradient (slope) of Pipe lines:
 - 1. Contractor to retain a licensed land surveyor to verify and record gradient (slope) of pipes at 100'-0" intervals and invert elevations at each change in direction and connection with structures.

3.05 PIPE ENCASEMENT

- A. General
- B. Water Lines shall be encased in concrete when water and sewer lines cross with one of the following conditions occurring.
 - 1. Water and sewer are less than 18 inches vertical separation
 - 2. Water and sewer are less than 10 feet horizontal separation
 - 3. Water lines cross beneath sewer lines at any depth

3.06 STEEL CASING & JACK AND BORE

A. General:

1. Contractor to install steel casing on all PVC water and sewer lines under paving.
2. Jack and bore water and sewer lines crossing under existing public right-of-ways or where indicated on drawings.
3. Steel Sleeves should be a minimum of 6" larger than line size specified.
4. Contractor to install steel sleeves, jack and bore a minimum of 10' beyond the edge of pavement.
5. See specific utility specification section for more information regarding jack and bore.

3.07 PROTECTION OR REMOVAL OF UTILITY LINES

- A. General: Protect existing utility lines shown on drawings, or locations of which are made known to Contractor prior to excavation and that are to be retained, or utility lines constructed during excavation operations, from damage during excavation and backfilling; if damaged, repair at Contractor's expense.
- B. Existing Utility Lines to be retained: Repair damaged lines that not shown on drawings, or locations of which not known to Contractor in sufficient time to avoid damage, if inadvertently damaged during excavation.
 1. Adjustment in payment made in accordance with General Conditions of Contract.
- C. Utility Lines to be removed: Notify Architect in ample time for necessary measures to be taken to prevent interruption of service.

3.08 PAVEMENT REMOVAL AND REPLACEMENT

- A. Removal: Where necessary to cut existing pavement, curbs and gutters, walks, drives, other, make cut with neat, parallel straight lines, min. 2' wider than trench width on each side of trench.
- B. Replacement:
 1. Replace pavement, curbs and gutters, walks and drives of same cross section as original, except when otherwise detailed on plans, using materials same as original construction.
 2. Backfill open trenches across roadways or other areas to be paved as specified above, except backfill entire trench depth in 6" layers, moisten and compact each layer to density of 100% of standard proctor test, so that paving of area can proceed immediately after backfilling completed.
- C. Temporary Surfaces:
 1. Use temporary road surface of gravel or crushed stone, as approved.
 2. Maintain one-way traffic at all times and street must be fully opened to traffic quickly as possible.
 3. Completely remove temporary materials and dispose of when permanent pavement replaced.

END OF SECTION 02321

SECTION 02370**EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN****PART I - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings (specifically the soil erosion site plan and accompanying detail sheets); and General Provisions of Contract, Including General, Supplemental General Conditions, and Division 1 apply to work of this Section.
- B. Allowances, Section 01210

1.02 PROJECT INFORMATION

- A. Site Location: 1250 Cross Plains Trail, Dalton, GA 30721
- B. Site Description: Site consisted of Existing buildings including foundations and utilities.
- C. Scope of Site Work to be Completed: Construction of a new additions.
- D. Site Vicinity Map: Located at the end of this Section.

1.03 REFERENCED STANDARDS

- A. Following requirements made part of these specifications by reference.
 - 1. 2000 edition of "Manual for Erosion and Sediment Control in Georgia" or most recent edition, copies of which available from State Soil and Water Conservation Commission.
 - 2. Standard Details of the Department of Transportation, State of Georgia:
 - a. Construction Details for Erosion and Sedimentation Control April 1989, Rev. 4/24/89.
 - b. Temporary Silt Fence and Baled Straw Erosion Control Checks, October 1979, Rev. 1/8/82.
 - c. Silt Control Gates for Structures, August 1972, Rev. 7/17/87.
 - 3. "Authorization to Discharge Under the National Pollutant Discharge Elimination System Storm Water Discharges Associated with Construction Activity for Stand Alone Construction Projects", copies of which are available from the Georgia Environmental Protection Division, effective August 13, 2003.
- C. Contractor to obtain copy of above specifications and keep available on jobsite at all times during work of this Section.
 - 1. Copies available from Georgia Department of Transportation (404-656-5293), Georgia Environmental Protection Division and from State Soil and Water Conservation Commission.

1.04 QUALITY ASSURANCE:

- A. Installer Qualifications:
 - 1. An experienced installer who has completed Erosion, Sedimentation and Pollution Control Plans similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service-performance.
 - 2. The Contractor must disclose to the Architect, prior to project award, of all Georgia Environmental Protection Division, Army Corp of Engineers, and/or City/County/State government agencies' violations received in the last 5 years dealing with erosion and sediment control deficiencies and/or wetlands deficiencies concerning the Contractor and all sub-contractors.
 - 3. Contractor shall have a Qualified Personnel, as defined by Georgia EPD (below), on-site whenever construction activity occurs. After December 31, 2006, a qualified person means a person who has successfully completed the appropriate certification course approved by the state soil and water conservation commission. Contractor shall have at least a level 1A certification.

- B. Inspector Qualifications:
1. Contractor shall have a Qualified Personnel, as defined by Georgia EPD (below), on-site whenever construction activity occurs. According to the *Authorization to Discharge Under the NPDES Storm Water Discharges Associated with Construction Activity General Permit*, “Qualified Personnel” means a person who has successfully completed an erosion and sediment short control course eligible for continuing education units, or an equivalent course approved by EPD and the State Soil and Water Conservation Commission”. After December 31, 2006, a qualified person means a person who has successfully completed at least an inspection level 1A certification course and successfully passed the approved examination administered by the state soil and water conservation commission.
- C. Pre-installation conference conducted on site to comply with the requirements in Division 1.
1. Inspector Qualifications: Contractor shall have a Qualified Personnel, as defined by Georgia EPD (below), on-site whenever construction activity occurs. According to the *Authorization to Discharge Under the NPDES Storm Water Discharges Associated with Construction Activity General Permit*, “Qualified Personnel” means a person who has successfully completed an erosion and sediment control course eligible for continuing education units, or an equivalent course approved by EPD and the State Soil and Water Conservation Commission”

1.05 PERFORMANCE REQUIREMENTS

- A. Erosion control devices required for all earth areas disturbed by grading and or utility system installation operations.
- B. Extent of graded areas requiring erosion control indicated on drawings.
- C. Types of erosion control activities include, but not limited to:
1. Installation of erosion control devices.
 2. Implementation of Best Management Practices (BMPs).
 3. Application of temporary ground cover.
 4. Maintenance of erosion control devices for duration of contract. Where multiple phase contracts utilized scope of work to include maintenance of erosion control devices installed under previous contracts.
 5. Application of permanent ground cover.
 6. Removal of erosion control devices.
- D. Upon notification of Architect of non-compliance with this specification, contractor has 7 days to address and install additional erosion control devices as directed by the Architect or as may be required.
- E. Temporary Erosion Control Measures
1. Contractor shall be responsible for providing addition erosion control as needed to accommodate the construction method to prevent erosion from leaving the site.
 2. Contractor is responsible for installation, maintenance and/or repair and/or replacement of all temporary erosion control measures needed to accommodate contractors means and methods which shall include, but not limited to, the following:
 - A. Silt fence
 - B. Inlet protection
 - C. Temporary sediment ponds.
 - D. Down drains/Storm drainage
 3. Contractor is responsible for all additional costs associated with temporary erosion control measures.
 4. Contractor is required to submit additional erosion control measures for approval for sediment ponds and storm drainage for review by the Architect and or review agency.

- F. Contractor is responsible for maintenance and/or repair and/or replacement of all erosion control items which shall include, but not limited to, the following:
1. Existing erosion practices already installed under separate contract.
 2. Downed silt fence
 3. Washed out silt fence and rock
 4. Vandalism
 5. When silt overburdens structure.
 6. Erosion of earth or dam
 7. Damage due to abnormal weather conditions.

1.06 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for erosion control devices, this includes but is not limited to the following:
1. Copy of Certification with GASWCC number of Qualified Person(s)
 2. Erosion Control Matting and Blanketing
 3. Polyacrylamides
 4. Tackifiers and Binders
 5. Sediment Barriers
 6. Inlet Protection materials
 7. Downdrain structures
- B. NPDES Forms:
1. Contractor shall submit two, signed original. Notice of Intents (NOIs), with the owner and operators signatures, found in this Section, to the Architect two weeks prior to beginning construction.
 2. Contractor shall submit two, signed original Notice of Terminations (NOTs), with the owner and operators signatures, found in this Section, following the final inspection and prior to the final inspection sign-off by the Architect.
 3. Contractor shall submit to Architect in writing within 15 days of receiving the "Notice to Proceed" the name and phone number of the Qualified Person, defined in Section 1.05 paragraph B above, with proof of training (i.e. class certification and/or written verification.)
 4. Contractor shall submit a "Notice of Implementation" to the Architect, Found in this section, immediately after completing the installation of the initial best management practice devices.

PART II - PRODUCTS

2.01 MATERIALS

- A. General: all materials shall conform to applicable portions of referenced Specifications and Details.
1. Conform all work under this section with the "Manual for Erosion and Sediment Control in Georgia" and the "National Pollutant Discharge Elimination System Storm Water Discharges Associated with Construction Activity" permit. Contractor responsible for installing, continuously maintaining, and inspecting daily all erosion control devices until final acceptance of Project at which time Contractor remove such erosion control devices unless otherwise instructed by Architect.
 2. All materials must be on the Georgia D.O.T.'s "Qualified Products List", Georgia Soil erosion manual or be approved by the Architect.
- B. **Ds1** - Disturbed Area Stabilization (with mulching only):
1. Compressed and compacted bound bundles of wheat, oat, rye or other local hays free of weeds.
 2. Wood waste consisting of chips, sawdust, or bark.
 3. Polyethylene film.

4. Hydromulch
 - a. Composed of wood cellulose fiber and contain no germination or growth inhibiting factors.
 - b. Colored green to allow visual metering in application and properties evenly dispersed and suspended when agitated in water.
 - c. Add hydromulch water slurry in hydraulic seeder after proportionate quantities of seed, fertilizer and other materials introduced.
 - d. Hydromulch:
 - 1) Moisture Content: 9.9% + or - 3.0%
 - 2) Organic Matter: 99.2% + or - 0.8%
 - 3) Ash Content: 0.8% + or - 0.2%
 - 4) pH: 4.8% + or - 0.5%
 - e. Water Holding Capacity: Min. 1150 grams water /100 grams fiber

C. Ds2 – Disturbed Area Stabilization (with temporary seeding):

1. Lime: Natural limestone containing min. 85% total carbonates.
 - a. 95% or more pass 20 mesh sieves.
 - b. 55% pass 60 mesh sieve.
 - c. 40% pass 100 mesh sieve.
2. Fertilizer:
 - a. Dry or Hydro
 - b. Commercial grade manufactured in accord with Georgia Department of Agriculture Specifications and bearing approval label of State of Georgia.
 - c. Grade containing plant food elements determined by Laboratory analysis.
3. Grass Seed: Must be planted according to recommendations made in the "Manual for Erosion and Sediment Control in Georgia" or as approved by a Landscape Architect.
 - a. Ryegrass, Annual: (*Lolium Multiflorum*) - Containing min. 98% pure seed, with 90% min. germination and max. 0.5% weed seed.
 - b. Bermuda: 100% hulled common Bermuda grass (*Cynodon Dactylon*) containing min. 97% pure Bermuda, 85% min. germination and max. 1% weed seed.
 - c. All seed types listed in the "Manual for Erosion and Sediment Control in Georgia" or noted on design drawings.
 - d. Hydro Seed
 - 1) Ryegrass: 250 lbs./acre.
 - e. Bermuda: 175 lbs./acre.

D. Ds3 – Disturbed Area Stabilization (with permanent vegetation)

1. Lime: Natural limestone containing min. 85% total carbonates.
 - a. Dolomitic limestone shall be used in sandy plains and coastal soils.
 - b. Conventional equipment shall use ground limestone
 - 1) 95% or more pass 20 mesh sieves.
 - 2) 55% pass 60 mesh sieve.
 - 3) 25% pass 100 mesh sieve.
 - c. Hydraulic seeding: Finely ground limestone
 - 1) 98% or more pass 20 mesh sieves.
 - 2) 70% pass 100 mesh sieve.
2. Fertilizer:
 - a. Dry or Hydro
 - b. Commercial grade manufactured in accord with Georgia Department of Agriculture Specifications and bearing approval label of State of Georgia.
 - c. Grade containing plant food elements determined by Laboratory analysis.
3. Grass Seed: Must be planted according to recommendations made in the "Manual for Erosion and Sediment Control in Georgia", as noted on design drawings, or as approved by a Landscape Architect.
 - a. Ryegrass, Annual: (*Lolium Multiflorum*) - Containing min. 98% pure seed, with 90% min. germination and max. 0.5% weed seed.

- b. Bermuda: 100% hulled common Bermuda grass (*Cynodun Dactylon*) containing min. 97% pure Bermuda, 85% min. germination and max. 1% weed seed.
- c. Hydro Seed
 - 1) Ryegrass: 250 lbs./acre.
 - 2) Bermuda: 175 lbs./acre.

E. Ds4 – Disturbed Area Stabilization (with sodding)

- 1. Fertilizer:
 - a. Dry or Liquid
 - b. Commercial grade manufactured in accord with Georgia Department of Agriculture Specifications and bearing approval label of State of Georgia.
 - c. Grade containing plant food elements determined by Laboratory analysis.
- 2. Sod:
 - a. Certified sod.
 - b. Sod shall have been grown within a 50 mile radius of the project area.
 - c. Sod should be machine cut and contain ¾" of soil, not including shoots or tatch
 - d. Torn or uneven pads should be rejected.
- 3. Grass Type: Grass type shall be selected for the region consult the "Manual for Erosion and Sediment Control in Georgia"
 - a. Saint Augustine
 - b. Centipede
 - c. Zoysia
 - d. Bermudagrass

F. Mb – Erosion Control Matting and Blankets: A protective covering (blanket) or soil stabilization mat used to establish permanent vegetation on steep slopes, detention ponds, channels, or shorelines.

- 1. Permanent & Temporary Blankets:
 - a. Straw Blankets: used on slope stabilization, not for use in waterways
 - 1) Combination blankets of weed-free straw from agricultural crops formed into a blanket.
 - 2) Blankets with a top side of photodegradable plastic mesh with a maximum mesh size of 5/16 X 5/16 inch and sewn to the straw with biodegradable thread.
 - 3) Minimum thickness of 3/8 inch
 - 4) Minimum dry weight of 0.5 pounds per square yard
 - 5) Approved Products:
 - a) ECS Standard Straw
 - b) Greenfix America WS05B, WS072B
 - c) Verdyol Ero-Mat Standard, ERO-Mat High Velocity
 - d) Natural Straw Standard Blanket, High Velocity Blanket
 - b. Excelsior Blanket: Combination blankets of curled wood excelsior. Excelsior blankets can be used on slopes and waterways. Check manufacturer specifications for usability.
 - 1) Shall have clear markings indicating the top side of the blanket
 - 2) Blankets shall have photodegradable plastic mesh having a maximum mesh size of 1-1/2X3 inches
 - 3) Minimum thickness of ¼ inch
 - 4) Minimum dry weight of 0.8 pounds per square yard.
 - 5) Approved Products:
 - a) Curlex I, I Quickgrass, II, III-Hi-Velocity
 - b) ECS Standard Excelsior Mat, High Impact Excelsior Mat, High Velocity Straw Mat
 - c) EXCEL Regular (R-1), Superior (S-2), Super Duty (SD-3)
 - d) Verdyol Excelsior Standard, Excelsior High Velocity
 - e) Natural Wood Standard Blanket, High Velocity Blanket

- c. Coconut Fiber Blanket: Combination blanket made of coconut fiber. For use on waterway slopes.
 - 1) Shall have photodegradable plastic mesh on both sides of the blanket with maximum mesh size of 5/8 x 5/8 inch and sewn to the fiber with a breakdown resistant synthetic yarn.
 - 2) Minimum thickness of 1/4"
 - 3) Minimum dry weight of 0.5 pounds per square yard.
 - 4) Approved Products:
 - a) Greenfix America CF072 B, CF 072RR
 - b) North American Green C125
 - c) Landlok Bontera C2
 - d. Wood Fiber Blanket: Combination blanket made of wood fibers that do not possess or contain any growth or germination inhibiting factors. For use only on slopes.
 - 1) The blanket shall have a photodegradable plastic mesh size of 5/8 x 3/4 inches, securely bonded to the top of the mat.
 - 2) Minimum dry weight of 0.35 pounds
 - 3) Approved Products:
 - a) Futtera
 - b) Conwed 3000 Bonded Fiber Matrix
 - c) Soil Guard Bonded Fiber Matrix
- G. **Pm** – Polyacrylamide (PAM)
- 1. Only Anionic form of PAM is allowed. Cationic PAM is toxic and **NOT** allowed.
 - 2. Anionic PAM , in true form, shall have less than or equal to 0.05% acrylamide monomer by weight.
 - 3. Hydro and granular
 - 4. Contractor is to send site specific soil sample to the manufacturer. A site specific PAM is to be selected by manufacturer. Application rate is to be set by manufacturer based on project soil type.
 - 5. Approved Manufacturers:
 - a. Applied Polymer Systems, Inc.
 - b. HydroPAM
 - c. HydroGrass Technologies
- H. **Tb** – Tackifiers and Binders: Tackifiers/binders are used to anchor wood cellulose, wood pulp fibers, and other mulch materials applied with hydroseeding equipment.
- 1. Approved Tackifiers:
 - a. TACPAC GT
 - b. CONWED CON-TAC
 - c. Finn A500 Hydro-Stik
 - d. Hercules Soiloc-E
 - e. Terra Mulch Taking Agent III
 - f. RMB-plus
- I. **Cd** – Check Dam: Small temporary barrier, grade control structure, or dam constructed across a swale, drainage ditch, or area of concentrated flow.
- 1. **Cd-S** –Stone Check Dam:
 - a. Mechanical or hand placed
 - b. 2-10 inch stone designed to flow velocities
 - c. Set geotextile into subgrade soils prior to placing rock.
 - d. Approved Geotextiles (woven):
 - 1) Amoco CEF-1199, 2019
 - 2) Carthage 6%
 - 3) Contech C70/06
 - 4) GTF-400E
 - 5) Geotex 104 F
 - 6) Filterweave 403, 700
 - 7) TNS Advanced Technologies M706

- 8) US Fabrics 670
- 9) Terratex EP
- 2. **Cd-Hb** – Haybale Check Dam: Compressed and compacted bound bundles of wheat, oat, rye or other local hays free of weeds.

J. Ch – Channel Stabilization:

- 1. For Riprap and Concrete Lining woven geotextiles shall be placed between the soil and the lining. Approved Geotextiles:
 - a. Amoco CEF-1199, 2019
 - b. Carthage 6%
 - c. Contech C70/06
 - d. GTF-400E
 - e. Geotex 104 F
 - f. Filterweave 403, 700
 - g. TNS Advanced Technologies M706
 - h. US Fabrics 670
 - i. Terratex EP
- 2. **Ch-Rp** – Rock Riprap Lining
 - a. Rip-Rap Size shall be based on channel flow velocity during 25 year 24 hour storm.

Flow Velocity (ft./sec.)	N.S.A. No.	Size Inches			Filter Stone N.S.A. No.
		Max.	Avg.	Min.	
2.5	R-1	1-1/2	¾	No.8	FS-1
4.5	R-2	3	1-1/2	1	FS-1
6.5	R-3	6	3	2	FS-2
9.0	R-4	12	6	3	FS-2
11.5	R-5	18	9	5	FS-2
13.0	R-6	24	12	7	FS-3
14.5	R-7	30	15	12	FS-3

- 3. **Ch-C** – Concrete Lining
 - a. Design mix to produce standard-weight concrete consisting of portland cement, aggregate, air-entraining admixture and water to produce following properties:
 - 1) Compressive Strength: 3,000 psi, minimum at 28 days.
 - 2) Slump Range: 2” to 4”
 - 3) Air Content: 5% to 8%.

K. Co – Construction Exit

- 1. Aggregate Size will be National Stone Association R-2 (1.5 to 3.5 inch stone)
- 2. Approved Geotextiles (woven):
 - a. Amoco CEF-1199, 2019
 - b. Carthage 6%
 - c. Contech C70/06
 - d. GTF-400E
 - e. Geotex 104 F
 - f. Filterweave 403, 700
 - g. TNS Advanced Technologies M706
 - h. US Fabrics 670
 - i. Terratex EP

- L. **Dn1** – Temporary Down drain Structure: Shall be constructed of heavy duty, Flexible materials such as non-perforated, corrugated plastic pipe.
1. Pipe shall have a diameter sized for the volume of water and conform to AASHTO M-252-94
 2. Each drain shall have a tee or ‘L’ fitting attached to pipe at top of slope.
 3. Each drain shall have a tee or filter bag attached to pipe at bottom of slope.
 4. Pipe shall be anchored to slope using metal hold down stakes with a minimum spacing of 10’.
- M. **Dn2** – Permanent Down drain Structure: Shall be constructed of the following materials:
1. High Density Polyethylene, Corrugated Pipe: HDPE; ASTM F2306 & AASHTO M-294; smooth interior.
 - a. Fittings: Material to match pipe.
 - b. Provide gaskets to form watertight connections meeting ASTM D3212
 - c. Sizes 12” Thru 36”
 - d. non-perforated
 2. Each drain shall have a precast concrete headwall or storm structure attached to pipe at top of slope.
 3. Each drain shall have a precast concrete headwall and filter bag attached to pipe at bottom of slope.
 4. Pipe shall be buried under the slope a minimum of 2’-0” of earthen cover.
- N. **Fr** – Filter Ring
1. When utilized at inlets with diameters less than 12 inches, the filter ring shall be constructed of stone no smaller than 3-5 inches (15-30 lbs.)
 2. When utilized at pipes with diameters greater than 12 inches, the filter ring shall be constructed of stone no smaller than 10-15 inches (50-100 lbs)
- O. **Sd1** – Sediment Barrier
1. **Sd1-A** - Sediment Barrier, Type “A”
 - a. Fabric Height 36”
 - b. Trench Depth 6”
 - c. Fabric to be approved silt fence fabric as listed in the Georgia D.O.T. Qualified Products List #36
 - 1) Amoco CEF-2019
 - 2) Beltech 755 & 890
 - 3) Cady Bag Company 20-CSF 350/26
 - 4) LINQ Industrial Fabrics, Inc. GTF – 200 S
 - 5) Geotex 914SC, 915SC
 - 6) TNS Advanced Technologies TNSW101
 - 7) TerreTex GASF
 - 8) Willacoochee Industrial Fabrics, Inc. 1215 Silt Fence
 - d. Type "A": Fence support posts to be a min of 4’-0” long of material type indicated:
 - 1) Softwood: 3” diameter or 2x4.
 - 2) Oak 1.5” x 1.5”
 - 3) Steel 1.3 lb/ft. min
 2. **Sd1-B** - Sediment Barrier, Type “B”
 - a. Fabric Height 22”
 - b. Trench Depth 4”
 - c. Application: For use on light commercial projects of duration less than six months and where gradient is less than 3:1
 - d. Fabric to be approved silt fence fabric as listed in the Georgia D.O.T. Qualified Products List #36
 - 1) Amoco CEF-2019
 - 2) Beltech 755 & 890
 - 3) Cady Bag Company 20-CSF 350/26
 - 4) LINQ Industrial Fabrics, Inc. GTF – 200 S
 - 5) Geotex 914SC, 915SC
 - 6) TNS Advanced Technologies TNSW101
 - 7) TerreTex GASF
 - 8) Willacoochee Industrial Fabrics, Inc. 1215 Silt Fence

- e. Type "B": Fence support posts to be a min of 3'-0" long of material type indicated:
 - 1) Softwood: 3" diameter or 2x2.
 - 2) Oak 1.0" x 1.0"
 - 3) Steel 1.0 lb/ft. min
- 3. Sd1-C - Sediment Barrier, Type "C"**
 - a. Height 36"
 - b. Reinforcing: Woven wire reinforcing
 - c. Application: For use at all locations unless otherwise specified.
 - d. Fabric to be approved silt fence fabric as listed in the Georgia D.O.T. Qualified Products List #36
 - 1) Amoco Fabrics CEF-1198
 - 2) Beltech 768
 - 3) Carthage 15%
 - 4) LINQ Industrial Fabrics GTF-400EO
 - 5) Geotex 111
 - 6) Mirafi Filterweve 402
 - 7) TNS Advanced Technologies TNS M404
 - 8) Waltrich Plastic Corp. SF3600C
 - e. Type "C": Fence support posts to be a min of 4'-0" long of material type indicated:
 - 1) Steel 1.3 lb/ft. min
- P. Sd2 – Inlet Sediment Trap –**
 - 1. Sediment traps shall be constructed of material allowing
 - 2. **Sd2-F – Filter Ring**
 - a. Use fabric specified in Sd1-C above.
 - b. Cross braces shall be installed using treated 2 x 4's
 - c. Use Polyethylene formed covers with silt covers is allowed.
 - d. Placing silt fence fabric across grates is only allowed in areas designated by Architect or in final cleanup of the site. When this method is used the fabric shall be changed on a monthly basis.
 - 3. **Sd2-P – Pigs in a blanket**
 - a.
- Q. Sd3 – Temporary Sediment Basin**
 - 1. Principle Spillway
 - a. The metal gauge thickness shall comply with Georgia D.O.T. or NRCS specifications.
 - b. The riser and all pipe connections shall be completely water tight.
- R. St – Storm Drain Outlet Protection**
 - 1. Graded Rip-Rap: See **Ch-Rp**-Channel Stabilization Rip-Rap
 - 2. Geotextiles: See **Ch**-Channel Stabilization

PART III - EXECUTION

3.01 GENERAL

- A. Conform all work under this section with the "Manual for Erosion and Sediment Control in Georgia" and the "National Pollutant Discharge Elimination System Storm Water Discharges Associated with Construction Activity" permit. Contractor responsible for installing, continuously maintaining, and inspecting daily all erosion control devices until final acceptance of Project at which time Contractor remove such erosion control devices unless otherwise instructed by Architect.

- B. Contractor given written notice by Architect of any noncompliance with provisions of requirements contained herein.
 - 1. Such notice delivered to Contractor or his representative at job site deemed sufficient for this purpose.
 - 2. Absence of notification does not relieve Contractor of responsibility for compliance with requirements of these specifications.
 - 3. Contractor shall take immediate corrective action after receipt of notice.
 - 4. If Contractor does not, or refuses to correct noted deficiencies promptly, Architect may issue order stopping all or part of work until satisfactory corrective action taken.
 - 5. Time lost due to stop work orders not subject to claims for extension of time or excess costs or damages unless later determined that Contractor was in compliance.
 - 6. Contractor given written notice by Architect of any additional structures, procedures, sampling locations, or inspection points to be added to improve erosion control, as needed based on inspection, shall:
 - a. Complete the request within seven (7) days.
 - b. Update drawings to reflect the changes made.
- C. Contractor shall include under this contract maintenance of all erosion control devices until the Notice of Termination has been approved by the architect and submitted to the State of Georgia.

3.02 SEQUENCE OF EVENTS

- A. Best Management Practices (BMPs): Shall be implemented during construction activities from the commencement of construction to completion.
- B. Storm Drainage System: Install as much of permanent storm drainage system as practicable initially and divert surface water into system.
 - 1. Install remainder of storm drainage system soon as conditions allow.
 - 2. Maintain temporary sediment barriers around headwall and inlet drainage structures, utilizing silt fence and/or hay bales staked to ground for this purpose.
- C. Grading Operations:
 - 1. Schedule grading operations so ground surface disturbed for shortest possible time before permanent construction installed.
 - 2. Immediately place excavated materials into compacted areas.
 - 3. Maintain large areas flat as possible to minimize soil transport through surface flow.
- D. Method of Operations.
 - 1. The contractor shall install all additional BMP's that are required as a result of the methods used to construct the site.

3.03 PROTECTION METHODS

- A. Best Management Practices (BMPs): As a minimum, best management BMPs should include sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than those practices contained in the "Manual for Erosion and Sedimentation Control in Georgia" published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted, as well as the following:
 - 1. If turbidity producing materials present, hold in sedimentation ponds or grade to erosion control any surface drainage from cuts, fills, topsoil or other material stockpiles within construction limits, whether or not completed, or from borrow or waste disposal areas.
 - 2. Temporary erosion and sediment control measures including, but not limited to berms, dikes, drains, or sedimentation basins required to meet standards; provide and maintain until permanent drainage and erosion control facilities completed and operating.
 - 3. Stripping of vegetation, regading, and other development activities shall be conducted in such a manner so as to minimize erosion.
 - 4. Cut and fill operations shall be kept to a minimum.

5. Development plans must conform to topography and soil type, so as to create the lowest practicable erosion potential.
6. Whenever feasible, natural vegetation shall be retained, protected, and supplemented.
7. The disturbed area and the duration of exposure to erosive elements shall be kept to a practicable minimum.
8. Disturbed soil shall be stabilized as quickly as practicable.
9. Temporary vegetation or mulching shall be employed to protect exposed critical areas during development.
10. Permanent vegetation and structural erosion control measures shall be installed as soon as practicable.
11. To the extent necessary, sediment in run-off water shall be trapped by the use of debris basins, silt traps, or similar measures until the disturbed area is stabilized.
12. Adequate provisions shall be provided to minimize damage from surface water to the cut face of excavations or the sloping surfaces of fills.
13. Cuts and fills shall not endanger adjoining property.
14. Fills shall not encroach upon natural water courses or constructed channels in a manner so as to adversely affect on other property owners.
15. Grading equipment shall cross flowing streams by the means of bridges or culverts, except when such methods are not feasible, provided in any case that such crossings shall be kept to a minimum.
16. Provisions shall be provided for treatment or control of any source of sediments and adequate sedimentation control facilities to retain sediments on site or preclude sedimentation of adjacent waters beyond the levels specified in this permit.
17. No construction activities shall be constructed within a 25 foot buffer along the banks of all state waters, as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, except where the Director of the Georgia EPD (Environmental Protection Division) has determined to allow a variance that is at least as protective of natural resources and the environment, or where a drainage structure or a roadway drainage structure must be constructed, provided that adequate erosion control measures are incorporated in the project plans and specifications and are implemented.
18. No construction activities shall be conducted within a 50 foot buffer, as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, along the banks of any state waters classified as "trout streams" except when approval is granted by the Director of the Georgia EPD for alternate buffer requirements, or where roadway drainage structure must be constructed.
19. No construction activities shall be conducted within a buffer and a buffer shall remain in its natural, undisturbed, state of vegetation until all land-disturbing activities on the construction site are completed. Between the time final stabilization of the site is achieved and upon the submittal of a Notice of Termination, a buffer may be thinned or trimmed of vegetation as long as a protective vegetative cover remains to protect water quality and aquatic habitat and a natural canopy is left in sufficient quantity to keep shade on the stream bed.
20. Construct fills and waste areas by selective placement to eliminate silts and clays on surface that erode and contaminate adjacent waterways.

B. Bf - Buffer Zone

1. Buffer zones shall be 25' and maintained on all property lines unless otherwise indicated.
2. A 50' buffer shall be maintained from any wetland under the jurisdiction of the US Army Corps of Engineers or Waters of the State of Georgia.
3. Land disturbing activities shall not occur in the buffer zone.
4. If required, trees can be removed from the Buffer Zone using devices that do not disturb the soil. This is to be done only with the approval of the Architect.

3.04 INSTALLATION AND MAINTENANCE

A. Ds1 – Disturbed Area Stabilization (with mulching only)

1. Install mulch on all building pad areas left for more than seven (7) days.
2. Dry straw or hay shall be applied uniformly at a depth of 2 to 4 inches by hand or by mechanical equipment.
3. Straw or haymulch shall be anchored immediately after application.
 - a. Mulch can be pressed into the soil with a disk harrow using packer disk.
 - b. Mulch spread with special blower-type equipment may be anchored with emulsified asphalt, tackifiers

and/or binders.

4. Wood waste shall be applied at a depth of 2 to 3 inches.
5. Cutback asphalt shall be applied at 1200 gallons per acre.
6. Polyethylene film shall be secured over banks or stockpiled soil material for temporary protection.
7. Mulch shall be reapplied whenever ground cover is less than 90%.

B. Ds2 – Disturbed Area Stabilization (with temporary seeding)

1. Seed earth areas outside buildings, walks, and paving not to immediately receive permanent grass or landscape with temporary seed producing fast growing cover resistant to erosion.
2. All disturbed earth shall be seeded within 7 days of completion of land disturbing activities or when land disturbing activities are to be discontinued for longer than 2 weeks.
3. Apply hydromulch grass seeding at rate of 2000 pounds per acre on exposed earth areas where slope exceeds 8%.
4. Apply mulch to slopes exceeding one foot vertical in ten feet horizontal (1:10), unless otherwise noted.
5. Conform to temporary grassing and mulching Section 700, 'Standard Specifications, Construction of Roads and Bridges', GDOT, 1993 Edition.
6. Maintenance to include watering, refertilization, weeding, mowing, cleaning up and edging and repairs of washouts and gullies.
7. Mow grass to establish turf growth.
8. During establishment of grass, add moisture in upper 4" of soil in intervals and quantities to support continuing grass growth.

C. Ds3 – Disturbed Area Stabilization (with permanent vegetation)

1. [Refer to Section 02920 – “Lawns and Grassing”](#)

D. Ds4 – Disturbed Area Stabilization (with sodding)

1. [Refer to Section 02920 – “Lawns and Grassing”](#)

E. Du – Dust Control on Disturbed Areas

1. Contractor shall provide dust control at all times on the site. Contractor to provide water sources needed to manage dust. Contractor to bear all cost incurred from any local or state water restrictions.
2. Contractor maintain all excavations, embankments, stockpiles, haul roads, temporary and permanent access roads, plant sites, waste areas, borrow areas and other work areas within and without the project boundaries free from dust and minimize offsite transport of soil by wheels which causes hazard or nuisance to others.
3. Install temporarily surface on temporary or permanent graded access drives from adjacent paved public or private roads or rights-of-way.
 - a. Min. 6" graded aggregate surfacing from edge of paving to min. of 50 feet within site, min. 30'-0" wide.
 - b. Maintain throughout construction period and sprinkle to settle accumulated silt.
4. Approved methods of stabilization of areas beyond the 50' X 30' entrance road include:
 - a. Chemical Treatments.
 - b. Light bituminous coating.
 - c. Gravel surfacing.
 - d. Sprinkling:
 - (1) Repeat at such intervals to keep all parts of disturbed areas damp at all times.
 - (2) Contractor to maintain sufficient sprinkling equipment on site continuously.
 - e. Similar methods to control dust.

- F. **Mb** – Erosion Control Matting and Blankets: Provide slope mats where indicated. In addition to that shown on plans provide for all slopes with a gradient greater than 2.5:1 and all 3:1 or greater slopes with a vertical height of five (5) feet or greater.
1. Install permanent matting unless otherwise specified.
 2. Mat shall be designed for a velocity of 15 fps.
 3. All blanket and matting materials shall be on the Georgia D.O.T. Qualified Products List.
 4. Mat shall be installed parallel to the slope.
 5. Staples or stakes shall be used. Placed according to manufacturer specifications or every 20'-0" in all directions.
 - a. Temporary Blankets: U-shaped wire (11 gauge or greater) staples with legs at least 6 inches in length and a crown of one inch.
 - b. Permanent Matting: Sound wood stakes, 1x3 inches stock sawn in a triangular shape. Select stakes with 12-18" in length.
- G. **Pm** - Polyacrylamide (PAM):
1. PAM is to be installed according to manufacturer specifications on all disturbed areas.
 2. Only Anionic form of PAM is allowed. Cationic PAM is toxic and **NOT** allowed.
 3. Contractor to install PAM in all areas disturbed to reduce erosion.
 4. The contractor to apply PAM to the manufactures Specifications. Contractor shall reapply PAM in areas that are disturbed or become eroded during the entire length of the project.
 5. A 25' buffer shall be maintained from all streams and creeks.
 6. Mulch should be installed over all PAM.
 7. PAM can be applied with the seeding applications.
- H. **Cd** – Check Dam:
1. Construct temporary ditch checks of stone, sand or cement bagged, rip rap, or treated timber posts in all ditches and drainage areas on project site and along public right-of-way until site is stabilized.
 2. Toe of the upstream dam shall be at the same elevation as the top of the down stream dam.
 - a. Height of ditch checks: 24" max. to center.
 - b. Construct check dam min. 9" lower at center than outer edges.
 - c. Side slopes: 2:1 or flatter.
 3. Hay Bale Check Dam
 - a. Hay bales to be bound with wire or nylon
 - b. Embedded hay bale a minimum of 4" into ground
 - c. Install a minimum of two (2) re-bars, steal pickets, or 2x4 wooden stakes to stabilize bales.
 - d. Stabilizing posts shall be a minimum of 2' embedded into the ground
 - e. Stakes shall be inserted at angle parallel to the length of the haybale.
 4. Stone Check Dams
 - a. Construct dams using stones sized 2"-10"
 - b. Place Geotextile between rock and its soil base and abutments
 - (1) Shall be placed according to manufactures specifications.
 - (2) Must extend 5 feet beyond the downstream toes of the dam to prevent scour.
 5. Check dams are to be installed by the contractor in any channel (not in live streams) to reduce the flow of water.
 6. Remove sediment accumulation behind ditch checks when ponding capacity reduced by one-half and immediately prior to final acceptance.
- I. **Ch** – Channel Stabilization
1. Geotextiles shall be installed on all channels greater than 5' deep.
 2. Geotextiles shall be placed on a smooth graded surface in such a manner that it will not excessively stretch or tear upon placement of the overlying materials.

3. Spoil material resulting from clearing, grubbing and channel excavation shall be disposed of in a manner which will:
 - a. Not cause an increase in flood stage.
 - b. Minimize overbank wash.
 - c. Not cause an adverse effect on the environmental integrity of the area
 - d. Provide for the free flow of water between the channel and flood plain unless the valley routing and water surface profile are based on continuous dikes being installed.
 - e. Leave any right-of-way in the best condition feasible
 - f. Improve the aesthetic appearance of the site to the extent feasible.
 - g.
4. Channel linings shall be established or installed immediately after construction or as soon as weather conditions permit.
5. The foundation for structures shall be cleared of all undesirable materials prior to the installation
6. Earthfill shall be placed according to the installation requirements for sediment basin embankments (**Sd3**)
7. Vegetation shall be established on all disturbed areas immediately after construction.
8. Trees and other fallen natural vegetation not causing a deterrent to stream flow should be left for the purpose of habitat.

J. Co – Construction Exit

1. Contractor shall provide construction exits for each location where vehicles leave project site.
2. Contractor shall provide a minimum of one construction exit for each excess to the site.
3. Construction exits shall clean wheels to remove mud before entering public highway or street.
4. Contractor shall provide necessary construction signage when construction exit connects to a public right-of-way.
5. Contractor may be required to replace construction exit once existing is full of silt.
6. Construct construction exit as follows:
 - a. Pad thickness of pad: 6" min.
 - b. Pad width: Full width of entrance drive, min. 20'-0" at each drive
 - c. Pad length: 50'-0" min.
 - d. Lining: Geotextile under liner below pad. ASSHTO M-288-98
 - e. Stone size: ASTM D448, Size #1, 1-1/2" to 3" diameter max.
 - f. Maintain gravel entrance pad for duration of project.
 - g. Periodically add 2" top "dressing" to maintain effectiveness of gravel pad.
 - h. Sprinkle regularly to settle accumulated silt.

K. Di – Diversion

1. Contractor shall provide diversions wherever steeper slopes or abrupt changes in grade required.
2. Contractor shall construct diversion or berm at top of slope to cause surface water to flow along diversion to slope drains to control flow of water down slope.
 - a. Channel Cross-section should be trapezoidal or parabolic in shape.
 - b. Side slopes shall be 2:1 or flatter
 - c. Excavate narrow, deep channels on steep slopes and broad, shallow channels on gentle slopes.
 - d. Adequate outlets for drainage must be present (slope drains).
 - e. Stabilize channel and outlet with vegetation, riprap or pavement.
 - f. Contractor is to dispose of or stabilize unneeded excavated material.
 - g. Diversions constructed at 1.0% grad or steeper are required to have erosion control matting installed along the length and width of the diversion.
3. A diversion shall be constructed at the top of any slope over 8'-0" high and slope drains shall be installed to carry water to the base of the slope.
4. All trees, brush, stumps, obstructions, and other objectionable material shall be removed and disposed of so as not to interfere with the proper functioning of the diversion.
5. All earth removed and not needed in construction shall be spread or disposed of so that it will not interfere with the functioning of the diversion and will not get to waterways.

L. **Dn1** – Temporary Down drain Structure

1. Only provide Temporary down drains at the direction of the Architect.
2. Provide temporary drains to convey surface water down face slopes on all slopes with a gradient of 3:1 or greater and a vertical height of 10' or greater.
3. Construct slope drains of pipe. Ensure that the slope drains are water tight.
4. Provide slope drains with apron at their tops to anchor them and properly direct water into them.
5. Place stone or rubble at slope drain outlets to prevent scour at these points.
6. Contractor may be required to grade to divert water to slope drains.
7. Slightly slope the section of pipe under the dike toward its outlet. Place the drain slightly diagonally across the slope, extending the drain beyond the toe of the slope.
8. Hand tamp the soil under and around the entrance section in lifts not to exceed 6 inches.
9. Ensure the fill over the drain at the top of the slope has minimum dimensions of 1.5 ft. depth , 4 ft. top width, and 3:1 side slopes.
10. Curve the outlet uphill and adequately protect the outlet from erosion.

M. **Dn2** – Permanent Down drain Structure:

1. General:
 - a. Contractor shall Provide drains to convey surface water down face slopes on all slopes with a gradient of 2:1 or greater and a vertical height of 10' or greater.
 - b. Structures shall satisfy the standards and specifications set forth by the Georgia Department of Transportation.
 - c. Structures shall be placed every 100' along the top of the slope. A minimum of two structures shall be provided for each slope.
 - d. Swales shall be constructed to carry water to the structures.
2. Piped Down drains
 - a. Down drains shall be sized to handle the amount of water to convey. Minimum size of Pipe is 12" in diameter.
 - b. Pipe shall of all same material. Only use manufactured joints provided by manufacturer
 - c. Pipe shall have a minimum of 2'0" cover over the pipe.
 - d. Concrete headwalls are required to be placed.
3. Paved Flumes:
 - a. The paved flume cross-section may be parabolic, rectangular or trapezoidal.
 - b. At bottom of flume riprap or an energy diffusing structure shall be installed to prevent scouring.

N. **Fr** – Filter Ring:

1. Contractor shall provide temporary stone barrier constructed at storm drain inlets and pond outlets.
2. Filter rings shall be used in conjunction with other sediment control measures. The filter ring shall surround all sides of the structure.
3. Stone shall be placed uniformly. Mixture of stone sizes shall be used.
4. Filter ring shall be placed 8-10' from structure.
5. Sediment removal shall occur once sediment covers one-half of structure.

O. **Rd** – Rock Filter Dam:

1. Contractor shall provide a permanent or temporary stone filter dam installed across small streams or drainage ways.
2. Geotextiles shall be used as a separator between stone and base.
3. The center of the dam shall be no less than 6 inches lower than the lowest side.
4. Sediment shall be removed when it reaches a depth of one-half of the original height of the dam.
5. Silt shall be removed from and disposed at an approved landfill.

P. **Rt** – Retrofitting: Detention Pond

1. Contractor shall provide a retrofit devise for each permanent storm water detention pond.
2. The device or structure shall be placed in front of a permanent storm water detention pond outlet structure to serve as a temporary sediment filter.

3. Contractor shall keep device clear of trash and debris.
4. Contractor shall install a treated 4 x 4 post indicating the cleanout depth on post.
5. Sediment shall be removed when one-third of the sediment storage capacity has been lost.
6. When the basin area is to remain after construction, contractor shall:
 - a. Clean all drainage devices and remove retrofit
 - b. Pump the pond dry (must use silt removing device on the pumping device)
 - c. Remove silt at bottom of pond and grade to proper elevations.
 - d. Grade areas where washing or erosion has occurred
 - e. Stabilize areas where washing or erosion has occurred.
 - f. Grass any additional disturbed areas not stabilized.

Q. Sd1 – Sediment Barrier: Silt fencing

1. Construct silt fencing in accordance with applicable regulations and details.
2. Contractor shall construct silt fences at toe of embankments or perimeter of all disturbed earth areas, located to interrupt silt transport conveyed by overland surface drainage run off from disturbed areas. Additional silt fence is required as shown on plans
3. Remove, redistribute and compact sediment accumulated behind silt fences immediately prior to beginning temporary grassing.
4. Install proper fabric and post according to specifications in Section 2.01” Materials”
5. Secure filter fabric to posts using wire ties, cord, wire staples or nails.
 - a. Overlap ends of fabric minimum 18”.
 - b. Extend bottom of fabric into ground
 - c. Trench fabric in a minimum of 12”, Backfill and compact.
6. All earth removed and not needed in construction shall be spread or disposed of so that it will not interfere with the functioning of the silt fence and will not get to waterways.
7. Sediment shall be removed once it has accumulated to one-half the original height of the barrier.
8. Filter fabric shall be replaced whenever it has deteriorated to such an extent that the effectiveness of the fabric is reduced or when visible tears or imperfections can be seen in the fabric.
9. Contractor shall be prepared to replace the entire quantity of silt fence every six months during the length of construction.

R. Sd2 – Inlet Sediment Trap:

1. All new and existing inlets shall have inlet protection or sediment traps. Inlet Barriers shall consist of filter fabric, baffle box, or “pigs in a blanket”. Contractor shall install barriers immediately after new structures are in place. Contractor shall install barriers on existing structure prior to any work beginning.
2. Filter Fabric
 - a. Type “C” fencing using steel post and wire mesh.
 - b. Stakes shall be spaced evenly around the perimeter of the inlet at a minimum of 3 feet apart and driven into the ground approximately 18” deep.
 - c. The fabric shall be entrenched 12 inches and backfilled with crushed stone or compacted soil.
 - d. Fabric ends must be overlapped a minimum of 18 inches or wrapped together around post to provide a continuous fabric barrier
3. Filter Fabric used during stabilization
 - a. When stabilization activities occur filter fabric shall be placed under all grate inlets in between the grate inlet and frame.
 - b. This can only be done during construction at the approval of the Architect.
 - c. The filter fabric shall be replaced on a monthly basis.
4. Baffle Box
 - a. Constructed of 2”x4” boards with maximum of 1” spacing or weep holes 2 inches in diameter.
 - b. Gravel shall be placed outside the box to a depth of 4”.
 - c. Wrap box with type C filter fabric.

5. Curb Filters (pigs-in-a-blanket)
 - a. Install after graded aggregate base and or asphalt pavement installation
 - b. Wrap 8" concrete block in filter fabric and span across catch basin inlet.
 - c. Leave 4" gap between filter and inlet.
 6. Polyethylene Structures.
 - a. Reusable structures are allowed for new and existing structures.
 - b. Structures must have new filter fabric.
 - c. Structures must be anchors so they do not move or float.
 7. Maintenance:
 - a. All traps shall be inspected daily
 - b. Sediment shall be removed when the sediment has accumulated to one-half the height of the trap.
 - c. Sediment shall be removed from curb inlet immediately
 - d. Any sediment which washes into inlet shall be removed immediately at the expense of the contractor.
 - e. Sediment removed shall be properly disposed of a minimum of 100 yards away.
 - f. Contractor shall be prepared to replace the entire silt fence every six months during the length of construction.
- S. **Sd3** – Temporary Sediment Basin & Detention Ponds
1. Fill material:
 - a. Shall be approved by a geotechnical engineer for use in a pond.
 - b. Must be clean mineral soil free of roots, woody vegetation, oversized stones, rocks or other objectionable material.
 - c. Area for fill material shall be scarified prior to placement
 - d. Fill material shall be placed in six inch thick continuous lifts.
 - e. Compaction shall be 95% proctor
 - f. The embankment shall be constructed to an elevation 5% higher than the design height to allow for settlement.
 2. Principal Spillway.
 - a. The riser shall be securely attached to the pipe or pipe stub by full circumference welded connection.
 - b. All connections shall be water tight.
 - c. Pervious materials such as sand and gravel shall not be used as backfill around the pipe or anti-seep collar.
 - d. A trash rack and anti-vortes device shall be securely installed on top of the riser.
 3. Emergency Spillway
 - a. Shall be constructed of rip rap
 - b. Shall be placed in undisturbed soil.
 4. Slopes inside and outside of pond shall be stabilized with erosion stabilizing mat.
 5. Vegetation: Stabilize the embankment and all other disturbed areas with temporary or permanent vegetation.
 6. All sediment basins shall be surrounded by fencing meeting state and local requirements with signs warning the public of hazards.
 7. Contractor shall install a treated 4 x 4 post indicating the cleanout depth on post.
 8. Sediment & Silt shall be removed when one-third of the sediment storage capacity has been lost.
 9. Silt shall be removed from and disposed at an approved landfill.
 10. When the basin area is to remain after construction, contractor shall:
 - a. Clean all drainage devices
 - b. Pump the pond dry (must use silt removing devise on the pumping devise)
 - c. Remove silt at bottom of pond and grade to elevations.
 - d. Grade areas where washing or erosion has occurred
 - e. Stabilize areas where washing or erosion has occurred.
 - f. Grass any additional areas not stabilized.
 - g. Install erosion mat to newly grassed areas.

11. When the basin area is to be removed after construction, contractor shall:
 - a. Remove all drainage devices.
 - b. Pump the pond dry (Must use silt removing devise on the pumping devise)
 - c. Remove silt at bottom of pond.
 - d. Backfill and grade (Refer to Earthwork section for placement of soil)
 - e. Stabilize area.

T. **St** – Storm Drain Outlet Protection:

1. Contractor shall provide outlet protection where indicated and required.
2. At each outlet provide outlet protection as follows:
 - a. Riprap: Min. 10 Cubic yards Type 3 DOT Rip Rap
 - b. Liner: ASSHTO M-288 (type 1)
 - c. Minimum thickness of rip-rap should be 1.5 times the maximum stone diameter.
 - d. Maintenance: Maintain until grass is established

U. **Su** – Surface Roughening

1. Contractor to provide surface roughening for all slopes.
2. Grooves may be made with any appropriate implement which can be safely operated on the slope and which will not cause undue compaction.
3. Suggested implements include discs, tillers, spring harrows, and the teeth on a front-end loader bucket.
4. Grooves shall not be less than 3 inches deep nor further than 15 inches apart.
5. Roughening with tracked machinery on clayed soils is not allowed
6. Tracking shall be done by operating up and down the slope to leave horizontal depressions in the soil. As few passes as the machinery as possible should be made to minimize compaction.

V. **Tp** – Topsoiling

1. Topsoil should be friable and loamy, free of debris, objectionable weeds and stones and contain no toxic substance.
2. pH range of 5.0- 7.5.
3. Subgrade shall be loosed by discing or scarifying to a depth at least 3 inches prior to dumping and spreading topsoil.
4. Contractor redistribute existing topsoil across all areas of site where not indicated covered by building, pavement or other improvement.
5. Topsoil currently stock piled on site; redistribute as to provide a minimum average depth of top soil of 4".
6. Determine thickness of topsoil available. If thickness less than 4" provide additional top soil necessary to achieve an average min. thickness of 4".
7. Topsoil shall be mechanically screened to remove organic material prior to placement.

3.05 CONCRETE WASHOUT AREAS

A. Washout Areas

1. Contractor shall provide Washout areas for each location where concrete vehicles leave project site.
2. Contractor shall provide a minimum of one washout area 10' x 10' at the site.
3. Washout areas shall be for disposing of excess concrete, mortar and other similar products.
4. Contractor shall provide sign indicating washout areas.
5. Contractor shall cleanout wash areas as needed during construction.

B. Washout area shall be removed after construction, contractor shall:

1. Pump the pond dry (Must use silt removing devise on the pumping devise)
2. Remove concrete silt at bottom of pond
3. Dispose of material in approved landfill.
4. Backfill and grade (Refer to Earthwork section for placement of soil)
5. Stabilize area.

3.06 PRELIMINARY CLEAN UP

- A. Before final inspection, clean paved areas soiled or stained by execution of this work
 - 1. Clean by sweeping or washing, and remove defacement or stains.
- B. Remove construction equipment, excess materials and tools, and any debris resultant from work.

3.07 REMOVAL OF DEVICES

- A. Removal of Temporary Barriers and Silt Controls:
 - 1. Erosion control devices shall remain in location and function until one of the following has occurred:
 - a. A permanent device has been installed to replace the function of the temporary device and the permanent device is operational.
 - b. The contractor has reached 95% stabilization and submitted a N.O.T.
 - c. The N.O.T. has been submitted to the State of Georgia EPD by the Architect.
 - 2. Remove erosion control devices installed under this contract and any erosion devices left from previous phases of work.

3.08 FINAL CLEAN UP

- A. Upon removal of erosion control devices and systems Contractor restore site to original condition.
 - 1. Remove construction equipment, excess materials and tools, and any debris resultant from work.
 - 2. Contractor is responsible for removing any erosion practices left from this contract and previous contracts.

3.09 CONDITIONS UPON ACCEPTANCE

- A. Following conditions for acceptance apply:
 - 1. No erosion to exist; free site of ruts, crevices or other defects.
 - 2. Silt fences in good condition, vertical, straight, and free of accumulation of silt.
 - 3. Temporary Grass: 80% coverage.
 - 4. Submittal to the Architect of two signed Notice of Terminations (NOTs) found in this Section.

3.10 Schedule: The construction schedule at the end of this document is a preliminary schedule developed by the architect. The development of this schedule does not relieve the operator/contractor from developing a construction schedule. Upon completion of said schedule, the operator/contractor shall replace the architect's schedule in this Section with the developed schedule.

3.11 Forms: All sites greater than 1 acre must complete the forms on the following pages:

PLAN CERTIFICATIONS

Registered Professional Certification: “I certify that the permittee’s Erosion, Sedimentation and Pollution Control Plan (Section 02370) provides for an appropriate and comprehensive system of best management practices required by the Georgia Water Quality Control Act and the document “Manual for Erosion and Sediment Control in Georgia,” and that the designed system of best management practices meets the design requirements contained in the General NPDES Permit No. GAR 100000.”

(Note: The Architect has the engineers signed original document and is available upon request.)

Owner Certification: As the owner of the property in which the work as described in Section 01110 of this document my signature below signifies the following statements: “I certify under penalty of law that this document (Section 02370) and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

Signature

(Note: The Architect has the owner signed original document and is available upon request.)

Date



For Official Use Only

NOTICE OF INTENT

VERSION 2008

State of Georgia
Department of Natural Resources
Environmental Protection Division

For Coverage Under the 2008 Re-Issuance of the NPDES General Permits
To Discharge Storm Water Associated With Construction Activity

PRIMARY PERMITTEE

NOTICE OF INTENT (Check Only One):

- Initial Notification (New Facility/Construction Site)
- Re-Issuance Notification (Existing Facility/Construction Site)
- Change of Information (Applicable only if the NOI was submitted after August 1, 2008)

COVERAGE DESIRED (Check Only One):

- GAR100001 - Stand Alone
- GAR100002 - Infrastructure
- GAR100003 - Common Development

I. SITE/OWNER/OPERATOR INFORMATION

Project Construction Site Name: _____

GPS Location of Construction Exit (*degrees/minutes/seconds*):

Latitude _____° _____' _____" Longitude _____° _____' _____"

Construction Site Street Address: _____

City (*applicable if the site is located within the jurisdictional boundaries of the municipality*): _____

County: _____

Common Development Name (*applicable only to General NPDES Permit No. GAR100003*): _____

Owner's Name: _____ Phone: _____

Address: _____ City: _____ State: _____ Zip Code: _____

Duly Authorized Representative (*optional*): _____ Phone: _____

Operator's Name (*optional*): _____ Phone: _____

Address: _____ City: _____ State: _____ Zip Code: _____

Facility/Construction Site Contact: _____ Phone: _____

II. CONSTRUCTION SITE ACTIVITY INFORMATION

Start Date (month/date/year): ____ / ____ / ____ Completion Date (month/date/year): ____ / ____ / ____

Estimated Disturbed Acreage (acres, to the nearest tenth (1/10th) acre): _____

Does the Erosion, Sedimentation and Pollution Control Plan (Plan) provide for disturbing more than 50 acres at any one time for each individual permittee (i.e., primary, secondary or tertiary permittees), or more than 50 contiguous acres total at any one time ? (Check Only One):

- YES
- NO
- N/A - if the Plan was submitted prior to the effective date of the General NPDES Permit No. GAR100001 and No. GAR100003 for Stand Alone and Common Development construction activities.
- N/A – if construction activities are covered under the General NPDES Permit No. GAR100002 for Infrastructure construction projects.

Construction Activity Type: Commercial Industrial Municipal
 Linear Utility Residential

Number of Secondary Permittees (applicable only to General NPDES Permit No. GAR100003): _____

III. RECEIVING WATER INFORMATION

A. Name of Initial Receiving Water(s): _____

- Trout Stream Warm Water Fisheries Stream

B. Name of MS4 Owner/Operator (if applicable): _____

Name of Receiving Water(s): _____

- Trout Stream Warm Water Fisheries Stream

C. Sampling of Receiving Stream(s): Trout Stream Warm Water Fisheries Stream

D. Sampling of Outfall(s): Trout Stream Warm Water Fisheries Stream

Number of Sampling Outfalls: _____ Construction Site Size (acres): _____

Appendix B NTU Value: _____ Surface Water Drainage Area (square miles): _____

Does the facility/construction site discharge storm water into an Impaired Stream Segment, or within one (1) linear mile upstream of and within the same watershed as, any portion of an Impaired Stream Segment identified as “not supporting” its designated use(s), as shown on Georgia’s 2008 and subsequent “305(b)/303(d) List Documents (Final)” listed for the criteria violated, “Bio F” (Impaired Fish Community) and/or “Bio M” (Impaired Macroinvertebrate Community), within Category 4a, 4b or 5, and the potential cause is either “NP” (nonpoint source) or “UR” (urban runoff) ? (Check Only One):

- YES, Name of Impaired Stream Segment(s): _____
- NO
- N/A – if the NOI was submitted within 90 days after the effective date of the General NPDES Permit No. GAR100001 and No. GAR100003 for Stand Alone and Common Development construction activities.

- N/A – if the NOI was submitted prior to January 1, 2009 for the General NPDES Permit No. GAR100002 for Infrastructure construction activities.

Does the facility/construction site discharge storm water into an Impaired Stream Segment where a Total Maximum Daily Load (TMDL) Implementation Plan for “sediment” was finalized at least six (6) months prior to the submittal of the NOI ? (Check Only One):

- YES, Name of Impaired Stream Segment(s): _____
- NO
- N/A – if the NOI was submitted within 90 days after the effective date of the General NPDES Permit No. GAR100001 and No. GAR100003 for Stand Alone and Common Development construction activities.
- N/A – if the NOI was submitted prior to January 1, 2009 for the General NPDES Permit No. GAR100002 for Infrastructure construction activities.

IV. ATTACHMENTS (Applicable Only to New Facilities/Construction Sites)

Indicate if the items listed below are attached to this Notice of Intent:

- _____ Location map identifying the receiving water(s), outfall(s) or combination thereof to be monitored
- _____ Erosion, Sedimentation and Pollution Control Plan (if the project is greater than 50 acres regardless of the existence of a certified Local Issuing Authority in the jurisdiction OR if the project is in a jurisdiction where there is no certified Local Issuing Authority regulating that project regardless of acreage).
- _____ Written authorization from the appropriate EPD District Office if the Plan disturbs more than 50 acres at any one time for each individual permittee (i.e., primary, secondary or tertiary permittees), or more than 50 contiguous acres total at any one time (applicable only to General NPDES Permits No. GAR100001 and No. GAR100003).
- _____ List of known secondary permittees (applicable only to General NPDES Permit No. GAR100003).
- _____ Schedule for the timing of the major construction activities.

V. CERTIFICATIONS (Owner or Operator or Both to Initial as Applicable)

_____ I certify that the receiving water(s) or the outfall(s) or a combination of receiving water(s) and outfall(s) will be monitored in accordance with the Erosion, Sedimentation and Pollution Control Plan.

_____ I certify that the Erosion, Sedimentation and Pollution Control Plan (Plan) has been prepared in accordance with Part IV of the General NPDES Permit No. GAR100001, No. GAR100002 or No. GAR100003, the Plan will be implemented, and that such Plan will provide for compliance with this permit.

_____ I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that certified personnel properly gather and evaluate the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Owner's Printed Name: _____

Title: _____

Signature: _____

Date: _____

Operator's Printed Name: _____

Title: _____

Signature: _____

Date: _____

INSTRUCTIONS

NOTICE OF INTENT - PRIMARY PERMITTEE

For Coverage Under the 2008 Re-Issuance of the NPDES General Permits To Discharge Storm Water Associated With Construction Activity

Please print or type the Notice of Intent (NOI) form.. Any NOI that contains illegible or incomplete information will not be accepted, will be returned and the construction site will not be granted Permit coverage. All information requested on the NOI must be submitted in order for the NOI to be valid. Any information requested on the NOI that is not applicable to the primary permittee or to the construction site must be marked "N/A." Please do not leave any sections blank in the NOI.

Who must file a Notice of Intent Form - The Owner and/or Operator of a facility/construction site that has a discharge of storm water where construction activities occur must apply for a National Pollutant Discharge Elimination System (NPDES) Permit. The Georgia Environmental Protection Division (EPD) re-issued the General NPDES Permits for Storm Water Discharges Associated with Construction Activity on August 1, 2008. The Permits are available for review at the EPD District Offices and on the EPD website, www.gaepd.org. It is highly recommended that the permittees read and understand the terms and conditions of the Permits prior to submitting a NOI. Please contact the appropriate EPD District Office as listed on the following pages for assistance in completing the NOI.

Where to file a Notice of Intent Form - The NOI and the attachments, as applicable, must be submitted to the appropriate EPD District Office as listed on the following pages. Please submit only the first three pages of this document with the applicable attachments.

Section I - Site/Owner/Operator Information

The construction site name and location information (i.e., GPS location of construction exit, street address, city, county) must be sufficient to accurately locate the construction site. If the construction site does not have a street address, please provide sufficient information to accurately locate the construction site. If additional space is needed, attach the location information to the NOI.

A duly authorized representative may be either a named individual or any individual occupying a named position that the primary permittee has authorized to sign all reports, certification statements, or other information requested by EPD.

The facility/construction site contact is the person who the primary permittee has assigned the responsibility for the daily on-site operational control.

Please do not leave any blanks in this section. Any information requested on the NOI that is not applicable to the primary permittee or to the construction site must be mark "N/A."

Section II – Construction Site Activity Information

For construction activities that began prior to the effective date of the Permits, the start date (*month/date/year*) must be the actual start date of construction activities.

Estimated disturbed acreage is the total number of acres, *to the nearest tenth (1/10th) acre*, that will be disturbed by the primary permittee and all secondary permittees.

Please do not leave any blanks in this section. Any information requested on the NOI that is not applicable to the primary permittee or to the construction site must be mark "N/A."

Section III - Receiving Water Information

If the facility/construction site discharges storm water directly or indirectly to the receiving water(s), and not through a municipal separate storm sewer system (MS4), enter the name of the receiving water(s) and indicate whether the water(s) is a trout stream or a warm water fisheries stream. Attach a written description and location map identifying the receiving water(s).

If the facility/construction site discharges storm water to a municipal separate storm sewer system (MS4), enter the name of the owner/operator of the MS4 (e.g., city name or county name) and the name of the receiving water(s) at the point of discharge from the MS4. A MS4 is defined as a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) that is owned and/or operated by a city or county which is designed or used for collecting or conveying storm water. It may be necessary to contact the city or county that owns and/or operates the MS4 to determine the name of the receiving water(s). Indicate whether the receiving water(s) is a trout stream or a warm water fisheries stream. Attach a written description and location map identifying the receiving water(s).

Any permittee who intends to obtain coverage under the Permits for storm water discharges associated with construction activity into an Impaired Stream Segment, or within one (1) linear mile upstream of and within the same watershed as, any portion of an Impaired Stream Segment identified as “not supporting” its designated use(s), as shown on Georgia’s 2008 and subsequent “305(b)/303(d) List Documents (Final)” at the time of NOI submittal, must satisfy the requirements of Part III.C. of the Permits if the Impaired Stream Segment has been listed for criteria violated, “Bio F” (Impaired Fish Community) and/or “Bio M” (Impaired Macroinvertebrate Community), within Category 4a, 4b or 5, and the potential cause is either “NP” (nonpoint source) or “UR” (urban runoff). Those discharges that are located within one (1) linear mile of an Impaired Stream Segment, but are not located within the watershed of any portion of that stream segment, are excluded from this requirement. Georgia’s 2008 and subsequent 305(b)/303(d) List Documents (Final)” can be viewed on the EPD website, www.gaepd.org/Documents/305b.html.

If a Total Maximum Daily Load (TMDL) Implementation Plan for sediment has been finalized at least six (6) months prior to the permittee’s submittal of the NOI, the Erosion, Sedimentation and Pollution Control Plan (Plan) must address any site-specific conditions or requirements included in the TMDL Implementation Plan that are applicable to the permittee’s discharge(s) to the Impaired Stream Segment within the timeframe specified in the TMDL Implementation Plan. If the TMDL Implementation Plan establishes a specific numeric wasteload allocation that applies to an permittee’s discharge(s) to the Impaired Stream Segment, then the permittee must incorporate that allocation into the Erosion, Sedimentation and Pollution Control Plan and implement all necessary measures to meet that allocation. A list of TMDL Implementation Plans can be viewed on the EPD website, www.gaepd.org.

Please do not leave any blanks in this section. Any information requested on the NOI that is not applicable to the primary permittee or to the construction site must be mark “N/A.”

Section V – Certifications

The owner and/or operator must sign the Notice of Intent and initial the certification statements on the lines provided. Federal and State statutes provide specific requirements as to who is authorized to sign the Notice of Intent forms. A Notice of Intent form signed by an unauthorized person will not be valid. Please be aware that Federal and State statutes provide for severe penalties for submitting false information on this Notice of Intent form. Federal and State regulations require that the Notice of Intent form be signed as follows:

- For a corporation, by a responsible corporate officer;
- For a partnership or sole proprietorship, by a general partner or the proprietor; and
- For a municipality, State, Federal or other public facility, by either a principal executive officer or ranking elected official.

GEORGIA EPD DISTRICT OFFICES

All required correspondence, including but not limited to Notices of Intent, Notices of Termination, Erosion, Sedimentation and Pollution Control Plans, certifications and any other reports shall be sent to the following EPD District Offices:

A. For facilities/construction sites located in the following counties: Bibb, Bleckley, Chattahoochee, Crawford, Dooly, Harris, Houston, Jones, Lamar, Macon, Marion, Meriwether, Monroe, Muscogee, Peach, Pike, Pulaski, Schley, Talbot, Taylor, Troup, Twiggs, Upson

Information shall be submitted to: West Central District Office
Georgia Environmental Protection Division
2640 Shurling Drive
Macon, GA 31211-3576
(478) 751-6612

B. For facilities/construction sites located in the following counties: Burke, Columbia, Emanuel, Glascock, Jefferson, Jenkins, Johnson, Laurens, McDuffie, Montgomery, Richmond, Screven, Treutlen, Warren, Washington, Wheeler, Wilkinson

Information shall be submitted to: East Central District Office
Georgia Environmental Protection Division
1885-A Tobacco Road
Augusta, GA 30906-8825
(706) 792-7744

C. For facilities/construction sites located in the following counties: Baldwin, Banks, Barrow, Butts, Clarke, Elbert, Franklin, Greene, Hall, Hancock, Hart, Jackson, Jasper, Lincoln, Madison, Morgan, Newton, Oconee, Oglethorpe, Putnam, Stephens, Taliaferro, Walton, Wilkes

Information shall be submitted to: Northeast District Office
Georgia Environmental Protection Division
745 Gaines School Road
Athens, GA 30605-3129
(706) 369-6376

D. For facilities/construction sites located in the following counties: Carroll, Clayton, Coweta, DeKalb, Douglas, Fayette, Fulton, Gwinnett, Heard, Henry, Rockdale, Spalding

Information shall be submitted to: Mountain District - Atlanta Satellite
Georgia Environmental Protection Division
4244 International Parkway, Suite 114
Atlanta, GA 30354-3906
(404) 362-2671

E. For facilities/construction sites located in the following counties: Bartow, Catoosa, Chattooga, Cherokee, Cobb, Dade, Dawson, Fannin, Floyd, Forsyth, Gilmer, Gordon, Habersham, Haralson, Lumpkin, Murray, Paulding, Pickens, Polk, Rabun, Towns, Union, Walker, White, Whitfield

Information shall be submitted to: Mountain District - Cartersville Office
Georgia Environmental Protection Division
P.O. Box 3250
Cartersville, GA 30120-1705
(770) 387-4900

F. For facilities/construction sites located in the following counties: Appling, Atkinson, Bacon, Brantley, Bryan, Bulloch, Camden, Candler, Charlton, Chatham, Clinch, Coffee, Effingham, Evans, Glynn, Jeff Davis, Liberty, Long, McIntosh, Pierce, Tattnall, Toombs, Ware, Wayne

Information shall be submitted to: Coastal District - Brunswick Office
Georgia Environmental Protection Division
One Conservation Way
Brunswick, GA 31520-8687
(912) 264-7284

G. For facilities/construction sites located in the following counties: Baker, Ben Hill, Berrien, Brooks, Calhoun, Clay, Colquitt, Cook, Crisp, Decatur, Dodge, Dougherty, Early, Echols, Grady, Irwin, Lanier, Lee, Lowndes, Miller, Mitchell, Quitman, Randolph, Seminole, Stewart, Sumter, Telfair, Terrell, Thomas, Tift, Turner, Webster, Wilcox, Worth

Information shall be submitted to: Southwest District Office
Georgia Environmental Protection Division
2024 Newton Road
Albany, GA 31701-3576
(229) 430-4144



For Official Use Only

NOTICE OF TERMINATION

VERSION 2008

State of Georgia
Department of Natural Resources
Environmental Protection Division

To Cease Coverage Under the NPDES General Permits

a. To Discharge Storm Water Associated With Construction Activity

I. PERMIT TYPE (Check Only One):

- GAR100001 - Stand Alone
- GAR100002 – Infrastructure
- GAR100003 - Common Development

02II. SITE / PERMITTEE INFORMATION

Project Construction Site Name: _____

GPS Location of Construction Exit (degrees/minutes/seconds):

Latitude _____° _____' _____" Longitude _____° _____' _____"

Construction Site Location (information must be sufficient to accurately locate the construction site):

Subdivision Name (if applicable): _____ Lot Number(s) (if applicable): _____

Common Development Name (applicable only to General NPDES Permit No. GAR100003):

Construction Site Street Address: _____

City (applicable if the site is located within the jurisdictional boundaries of the city): _____

County: _____

Owner's Name: _____ Phone: _____

Address: _____ City: _____ State: _____ Zip Code: _____

Duly Authorized Representative (optional): _____ Phone: _____

Operator's Name (optional): _____ Phone: _____

Address: _____ City: _____ State: _____ Zip Code: _____

Facility/Construction Site Contact: _____ Phone: _____

TYPE OF PERMITTEE (Check Only One and Complete):

Primary Permittee

Primary Permittee's Name: _____ Phone: _____

Address: _____ City: _____ State: _____ Zip Code: _____

_____ **Attached to this Notice of Termination** - Listing of the legal name, complete address and telephone number for each secondary permittee at the site for which this NOT is submitted (applicable only to General NPDES Permit No. GAR100003).

_____ **Attached to this Notice of Termination** - Listing of the legal name, complete address and telephone number for the legal title holders for each remaining undeveloped lot(s) at the site for which this NOT is submitted (applicable only to General NPDES Permit No. GAR100003).

Secondary Permittee (applicable only to General NPDES Permit No. GAR100003)

Primary Permittee's Name: _____ Phone: _____

Address: _____ City: _____ State: _____ Zip Code: _____

Tertiary Permittee (applicable only to General NPDES Permit No. GAR100003)

Primary Permittee's Name (optional): _____ Phone: _____

Address: _____ City: _____ State: _____ Zip Code: _____

03III. SITE ACTIVITY INFORMATION

Start Date (month/date/year): ____ / ____ / ____ Completion Date (month/date/year): ____ / ____ / ____

Disturbed Acreage: _____

Check Only One:

- Construction Activity Ceased and Final Stabilization Completed
- No Longer Owner and/or Operator of Facility/Construction Site

Construction Activity Type: Commercial Industrial Municipal
 Linear Utility Residential

Name of Initial Receiving Water(s): _____

Name of MS4 Owner/Operator (if applicable): _____

Name of Receiving Water(s): _____

IV. CERTIFICATIONS (Owner or Operator or Both to Initial as Applicable)

_____ I certify under penalty of law that either: (a) all storm water discharges associated with construction activity from the portion of the construction activity where I was an Owner or Operator have ceased or have been eliminated; (b) all storm water discharges associated with construction activity from the identified site that are authorized by General NPDES Permit number indicated in Section I of this form have ceased; (c) I am no longer an Owner or Operator at the construction site and a new Owner or Operator has assumed operational control for those portions of the construction site where I previously had ownership or operational control; and/or if I am a primary permittee filing this Notice of Termination under Part VI.A.2. of General NPDES Permit No. GAR100003, I will notify by written correspondence with return receipt certified mail (or similar service) to the subsequent legal title holder of each remaining lot(s) that these lot Owners or Operators will become tertiary permittees for purposes of General NPDES Permit No. GAR100003. I understand that by submitting this Notice of Termination, that I am no longer authorized to discharge storm water associated with construction activity by the general permit, and that discharging pollutants in storm water associated with construction activity to waters of Georgia is unlawful under the Georgia Water Quality Control Act and the Clean Water Act where the discharge is not authorized by a NPDES permit.

_____ I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that certified personnel properly gather and evaluate the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Owner's Printed Name: _____ Title: _____

Signature: _____ Date: _____

Operator's Printed Name: _____ Title: _____

Signature: _____ Date: _____

INSTRUCTIONS

a. NOTICE OF TERMINATION

NPDES General Permits for Storm Water Discharges Associated With Construction Activity

Please print or type the Notice of Termination (NOT) form. Any NOT that contains illegible or incomplete information will not be accepted and will be returned. All information requested on the NOT must be submitted in order for the NOT to be a valid. Any information requested on the NOT that is not applicable to the owner and/or operator or the construction site must be marked "N/A." Please do not leave any sections blank in the NOT.

Who must file a Notice of Termination (NOT) Form - When the facility/construction site has undergone final stabilization and all storm water discharges from construction activities that are authorized by the NPDES General Permits have ceased or when the Owner and/or Operator of the site changes, the permittee of the facility/construction site must submit a Notice of Termination.

Final Stabilization means that all soil disturbing activities at the site have been completed, and that for unpaved areas and areas not covered by permanent structures and areas located outside the waste disposal limits of a landfill cell that has been certified by EPD for waste disposal, 100% of the soil surface is uniformly covered in permanent vegetation with a density of 70% or greater, or equivalent permanent stabilization measures (such as the use of rip rap, gabions, permanent mulches or geotextiles) have been used. Permanent vegetation shall consist of: planted trees, shrubs, perennial vines; a crop of perennial vegetation appropriate for the time of year and region; or a crop of annual vegetation and a seeding of target crop perennials appropriate for the region. Final stabilization applies to each phase of construction.

Where to file NOT Forms - The NOT and attachments, as applicable, must be submitted to the appropriate EPD District Office as listed on the following pages. Please submit only the first three pages of this document with the applicable attachments.

1) Section I - Permit Type

Indicate the NPDES General Permit number (i.e., No. GAR100001, No. GAR100002, or No. GAR100003) for which this form is being submitted.

2) Section II - Site / Permittee Information

The construction site name and location information (i.e., GPS location of construction exit, street address, city, county) must be sufficient to accurately locate the construction site. If the construction site does not have a street address, please provide sufficient information to accurately locate the construction site. If additional space is needed, attach the location information to the NOT.

A duly authorized representative may be either a named individual or any individual occupying a named position that the permittee has authorized to sign all reports, certification statements, or other information requested by EPD.

The facility/construction site contact is the person who the permittee has assigned the responsibility for the daily on-site operational control.

Please do not leave any blanks in this section. Any information requested on the NOT that is not applicable to the permittee or to the construction site must be marked "N/A."

Section III - Site Activity Information

Indicate by marking the appropriate box why this NOT has been submitted: (1) the facility/construction site has undergone final stabilization and all storm water discharges from construction activities that are authorized by the NPDES General Permits have ceased or (2) the Owner and/or Operator of the site have changed.

Mark the appropriate boxes to indicate the types of construction activities that were conducted at the facility/construction site.

Please do not leave any blanks in this section. Any information requested on the NOT that is not applicable to the permittee or to the construction site must be marked "N/A."

Section IV - Certifications

The owner and/or operator must sign the Notice of Termination and initial the certification statements on the lines provided. Federal and State statutes provide specific requirements as to who is authorized to sign the Notice of Termination forms. A Notice of Termination form signed by an unauthorized person will not be valid. Please be aware that Federal and State statutes provide for severe penalties for submitting false information on this Notice of Termination form. Federal and State regulations require that the Notice of Termination form be signed as follows:

- For a corporation, by a responsible corporate officer;
- For a partnership or sole proprietorship, by a general partner or the proprietor; and
- For a municipality, State, Federal or other public facility, by either a principal executive officer or ranking elected official.

GEORGIA EPD DISTRICT OFFICES

All required correspondence, including but not limited to Notices of Intent, Notices of Termination, Erosion, Sedimentation and Pollution Control Plans, certifications and any other reports shall be sent to the following EPD District Offices:

A. For facilities/construction sites located in the following counties: Bibb, Bleckley, Chattahoochee, Crawford, Dooly, Harris, Houston, Jones, Lamar, Macon, Marion, Meriwether, Monroe, Muscogee, Peach, Pike, Pulaski, Schley, Talbot, Taylor, Troup, Twiggs, Upson

Information shall be submitted to: West Central District Office
Georgia Environmental Protection Division
2640 Shurling Drive
Macon, GA 31211-3576
(478) 751-6612

B. For facilities/construction sites located in the following counties: Burke, Columbia, Emanuel, Glascock, Jefferson, Jenkins, Johnson, Laurens, McDuffie, Montgomery, Richmond, Screven, Treutlen, Warren, Washington, Wheeler, Wilkinson

Information shall be submitted to: East Central District Office
Georgia Environmental Protection Division
1885-A Tobacco Road
Augusta, GA 30906-8825
(706) 792-7744

C. For facilities/construction sites located in the following counties: Baldwin, Banks, Barrow, Butts, Clarke, Elbert, Franklin, Greene, Hall, Hancock, Hart, Jackson, Jasper, Lincoln, Madison, Morgan, Newton, Oconee, Oglethorpe, Putnam, Stephens, Taliaferro, Walton, Wilkes

Information shall be submitted to: Northeast District Office
Georgia Environmental Protection Division
745 Gaines School Road
Athens, GA 30605-3129
(706) 369-6376

D. For facilities/construction sites located in the following counties: Carroll, Clayton, Coweta, DeKalb, Douglas, Fayette, Fulton, Gwinnett, Heard, Henry, Rockdale, Spalding

Information shall be submitted to: Mountain District - Atlanta Satellite
Georgia Environmental Protection Division
4244 International Parkway, Suite 114
Atlanta, GA 30354-3906
(404) 362-2671

E. For facilities/construction sites located in the following counties: Bartow, Catoosa, Chattooga, Cherokee, Cobb, Dade, Dawson, Fannin, Floyd, Forsyth, Gilmer, Gordon, Habersham, Haralson, Lumpkin, Murray, Paulding, Pickens, Polk, Rabun, Towns, Union, Walker, White, Whitfield

Information shall be submitted to: Mountain District - Cartersville Office
Georgia Environmental Protection Division
P.O. Box 3250
Cartersville, GA 30120-1705
(770) 387-4900

F. For facilities/construction sites located in the following counties: Appling, Atkinson, Bacon, Brantley, Bryan, Bulloch, Camden, Candler, Charlton, Chatham, Clinch, Coffee, Effingham, Evans, Glynn, Jeff Davis, Liberty, Long, McIntosh, Pierce, Tattnall, Toombs, Ware, Wayne

Information shall be submitted to: Coastal District - Brunswick Office
Georgia Environmental Protection Division
One Conservation Way
Brunswick, GA 31520-8687
(912) 264-7284

G. For facilities/construction sites located in the following counties: Baker, Ben Hill, Berrien, Brooks, Calhoun, Clay, Colquitt, Cook, Crisp, Decatur, Dodge, Dougherty, Early, Echols, Grady, Irwin, Lanier, Lee, Lowndes, Miller, Mitchell, Quitman, Randolph, Seminole, Stewart, Sumter, Telfair, Terrell, Thomas, Tift, Turner, Webster, Wilcox, Worth

Information shall be submitted to: Southwest District Office
Georgia Environmental Protection Division
2024 Newton Road
Albany, GA 31701-3576
(229) 430-4144

NOTICE OF IMPLEMENTATION

PROJECT: _____

CONTRACTOR: _____

DATE: _____

This Notice of Implementation is for _____ from
(Project Name)

_____ to James W. Buckley & Associates. Notifying the
(Contractor)

completion of the installation of the initial erosion and sediment control best management devices. These devices have been installed properly and have been inspected by

_____ with _____. The site is ready for
(Name) (Contractor)

inspection by James W. Buckley & Associates. I am aware that any deficiencies reported by James W. Buckley & Associates are to be corrected within seven (7) days of receiving the inspection report.

Contractor

Date Notification
Received by
James W. Buckley & Associates

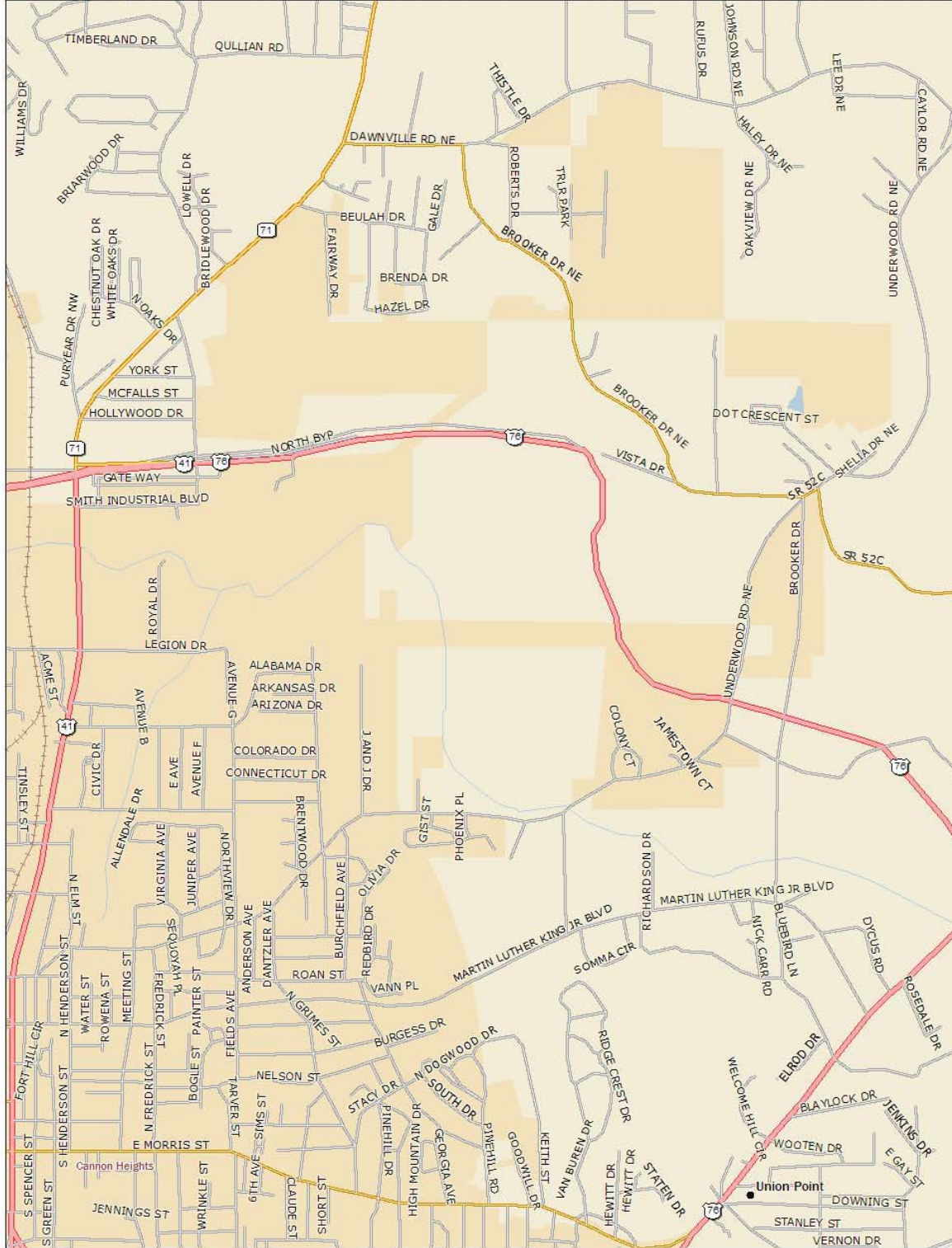
Name

GASWCC Certification Number

Date



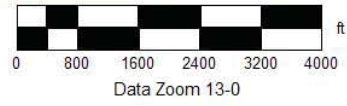
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www.delorme.com



END OF SECTION 02370

SECTION 02375

COMPREHENSIVE MONITORING PROGRAM

PART I - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings (specifically the soil erosion site plan and accompanying detail sheets); and General Provisions of Contract; Including General; Supplemental General Conditions; and Division 1; apply to work of this Section.
- B. Erosion, Sedimentation and Pollution Control Plan in Section 02370.

1.02 SUMMARY

- A. Work required under this contract: Contractor is not responsible for implementation of this section. Contractor shall participate in all requirements of this section.
- B. Work in other contracts: Implementation and management of the Comprehensive Monitoring Program.
- C. See Section 02370 for site information.

1.03 REFERENCED STANDARDS

- A. Test Procedures established in 40 CFR Part 136
- B. The Guidance document titled “NPDES Storm Water Sampling Guidance Document, EPA 833-B-92-001”
- C. “Authorization to Discharge Under the National Pollutant Discharge Elimination System Storm Water Discharges Associated with Construction Activity”, copies of which are available from the Georgia Environmental Protection Division, effective August 1, 2008.

1.04 WORK INCLUDED

- A. Sampling of storm water discharges at designated outfalls for turbidity in N.T.U. (Nephelometric Turbidity Units). (NOT IN CONTRACT)
- B. Daily monitoring of rainfall amounts in the “Daily Rain Gauge Log” found in this document or to be kept in the contractor’s daily log.
- C. Daily inspection of erosion control devices listed in the “Daily Inspection Log” found in this document or to be kept in the contractor’s daily log.

1.05 SAMPLING CONTRACTOR

- A. Sampling of storm water outfalls will be conducted by the following sampling contractor:
 - James W. Buckley & Associates, Inc.
 - Attn: Joseph Stuckey
 - 114 North Green St.
 - P.O. Box 727
 - Swainsboro, GA 30401

 - Phone: (478) 237-6467
 - Fax: (478) 237-3197

1.06 SUBMITTALS

- A. Contractor submit erosion and sediment control plan and narrative to Agency having jurisdiction.
 - 1. Design plan in accordance with applicable regulations, showing locations and types samples taken. (NOT IN CONTRACT)
 - 2. Contractor shall submit to the Architect two original signed "Plan Certifications" pages, as found at the end of this document, one week prior to beginning work.
 - 3. Contractor shall submit a minimum of one (1) Level 1A certifications for personnel to be responsible for the jobsite. Additional certifications can be submitted. ONLY submit contractors that will be working directly on this site.

- B. By the 5th of the month the Storm Water Sampling Contractor is required to have the storm water sampling analysis report from the approved lab to the Architect.

- C. The Architect will review the analysis and submit to the state agency corresponding to the county the site is located in:
 - 1. Baldwin, Bibb, Bleckley, Crawford, Dooly, Harris, Houston, Jones, Lamar, Macon, Marion, Meriwether, Monroe, Muscogee, Peach, Pike, Pulaski, Schley, Talbot, Taylor, Troop, Twiggs, Upson, Washington, Wheeler, Wilcox, Wilkinson shall submit to:

West Central District Office
Georgia Environmental Protection Division
2640 Shurling Drive
Macon, GA 31211
Phone: (478) 751-6612

 - 2. Baldwin, Banks, Barrow, Butts, Clarke, Elbert, Franklin, Greene, Hall, Hancock, Hart Jackson, Jasper, Lincoln, Madison, Morgan, Newton, Oconee, Oglethorpe, Putnam, Stephens, Taliaferro, Walton, Wilkes shall submit to:

Northeast Georgia Regional Office
Georgia Environmental Protection Division
745 Gaines School Road
Athens, GA 30605
Phone: (706)-369-6376

 - 3. Bartow, Butts, Carroll, Catoosa, Chattooga, Cherokee, Cobb, Dade, Dawson, Douglas, Fannin, Floyd, Forsyth, Fulton, Gilmer, Gordon, Habersham, Haralson, Lumpkin, Murray, Paulding, Pickens, Polk, Rabun, Towns, Union Walker, White, Whitfield shall submit to:

Mountain District Office
Georgia Environmental Protection Division
P.O. Box 3250
Cartersville, GA 30120
(770) 387-4900

 - 4. Clayton, Coweta, DeKalb, Fayette, Gwinnett, Heard, Henry, Rockdale, Spalding shall submit to:

Mountain District-Atlanta Office
Georgia Environmental Protection Division
Suite 114
4244 International Parkway
Atlanta, GA 30354
Phone: (404) 362-2671

5. Appling, Atkinson, Bacon, Brantley, Bryan, Bulloch, Camden, Candler, Charlton, Chatham, Clinch, Coffee, Effingham, Evans, Glynn, Jeff Davis, Liberty, Long, McIntosh, Pierce, Tattnall, Toombs, Ware, Wayne shall submit to:

Coastal District Office
Georgia Environmental Protection Division
400 Commerce Center Drive
Brunswick, GA 31523-8251
(912) 264-7284

6. Baker, Ben Hill, Berrien, Brooks, Calhoun, Chattahoochee, Clay, Colquitt, Cook, Crisp, Decatur, Dodge, Dougherty, Early, Echols, Grady, Irwin, Lanier, Lee, Lowndes, Miller, Mitchell, Quitman, Randolph, Seminole, Stewart, Sumter, Telfair, Terrell, Thomas, Tift, Turner, Webster, Wilcox, Worth shall submit to:

Southwest Georgia Regional Office
Georgia Environmental Protection Division
2024 Newton Road
Albany, GA 31701-3576
(912) 430-4144

7. Burke, Columbia, Emanuel, Glascock, Jefferson, Jenkins, Johnson, Laurens, McDuffie, Montgomery, Richmond, Screven, Treutlen, Warren, Washington, Wheeler, Wilkinson.

East Central District Office
Georgia Environmental Protection Division
1885-A Tobacco Road
Augusta, GA 30906-8825
(706) 792-7744

1.07 Quality Assurance

- A. The Owner is responsible for obtaining a Sampling Contractor.
- B. The Contractor is responsible for coordinating construction activities with the Sampling Contractor: Sampling Contractor is listed in section 1.05 (A).
 - 1. Contractor shall ensure that Construction Activities do not interfere with Sampling Activities. Coordinate any interference with Sampling Contractor.
 - 2. Contractor shall ensure that Sampling Contractor is notified when Sampling Event occurs.

PART II - PRODUCTS

2.01 MATERIALS

- A. Owner shall supply all materials required for storm water sampling.
- B. The Contractor shall have a rain gauge on site at all times.

PART III - EXECUTION

3.01 GENERAL

- A. Conform all work under this section with the "Manual for Erosion and Sediment Control in Georgia" and the "National Pollutant Discharge Elimination System Storm Water Discharges Associated with Construction Activity" permit.

3.02 NOTICE OF INTENT AND TERMINATION

- A. General
 - 1. The correct forms from the current NPDES permit shall be used.
 - 2. Sampling Contractor shall submit form in accordance with the permit.
- B. Notice of Intent
 - 1. Contractor cannot begin construction activities until 15 day after Notice of Intent has been filed.
 - 2. Contractor to provide any information necessary to complete notice of intent forms.
- C. Notice of Termination
 - 1. Contractor shall continue to provide sampling services until Architect and Sampling Contractor has filed Notice of Termination.
 - 2. Notice of termination cannot be filed until permanent grassing has been successfully established in accordance with the requirements established in Section 2920 Lawns and Grassing.

3.03 NOTICE OF IMPLEMENTATION

- A. Notice of Implementation is required prior to beginning any construction activity.
- B. Requirements of Notice of Implementation
 - 1. Contractor shall install erosion control practices in accordance with the initial stage I plan. Until initial erosion measures are installed no other work may occur except those items necessary to install item shown on the Stage I plan.
 - 2. Once initial practices are installed written notification is required by the contractor to inform the designer that the initial measures are implemented. The designer then has seven (7) working days to inspect the initial controls.
 - 3. If installation of measures is found acceptable the designer or his representative with sign and date the plans.
 - 4. A written Notice of Implementation will be produced within three (3) working day of the inspection. Once the indicating the initial measures have been installed according to the drawing.

3.04 EROSION, SEDIMENTATION AND POLLUTION CONTROL PLANS

- A. The contractor shall keep a set of the approved plans on the site for erosion inspections only. Changes to the erosion plan shall be marked on this plan only.
- B. Only the designer or his representative can make changes to plans. The Contractor, Sampling Contractor, or Owner cannot make revisions to the approved erosion drawings.
- C. Contractor and Sampling contractor shall report any recurring issues or suggestions of additional measures to the designer. Only the designer and his representative can make changes to the approved erosion and sedimentation plan.

3.05 SAMPLING (NOT IN CONTRACT)

- A. Location: Storm water sampling will occur at outfall locations, and within the proposed project site.
- B. Storm water samples will be taken by a grab sample.
 - 1. The samples should be taken from the horizontal and vertical center of the storm water outfall channel
 - 2. Care should be taken to avoid stirring the bottom sediments in the outfall storm water channel.
 - 3. The sampling container should be held so that the opening faces upstream.
 - 4. The samples should be kept free from floating debris.
- C. All samples will be analyzed for turbidity in N.T.U.
- D. The Architect reserves the right to request additional sampling parameters when observations made during field inspections merit additional sampling.

3.06 SAMPLE DELIVERY REQUIREMENTS (NOT IN CONTRACT)

- A. Samples shall be submitted to an approved lab within 24 hours of collection.
- B. The temperature of the sample shall meet the approved labs requirements for submittal.
- C. A Chain of Custody, supplied by the lab, shall accompany samples to the lab.
- D. The Chain of Custody shall include a written description of any observations of events that occurred during the sampling that may have affected the sampling results in any way.

3.07 REQUIRED STORM WATER SAMPLING EVENTS

- A. Sampling shall occur for the following events.
 1. For each area of the site that discharges to a receiving stream, the first rain event that reaches or exceeds 0.5 inch and allows for monitoring during normal business hours* (Monday thru Friday, 8:00 AM to 5:00 PM and Saturday 8:00 AM to 5:00 PM, excluding all non-working Federal holidays, when construction activity is being conducted by the primary permittee) that occurs after all clearing and grubbing operations have been completed in the drainage area of the location selected as the sampling location;
 2. In addition to (1) above, for each area of the site that discharges to a receiving stream, the first rain event that reaches or exceeds 0.5 inch and allows for monitoring during normal business hours* that occurs either 90 days after the first sampling event or after all mass grading operations have been completed in the drainage area of the location selected as the sampling location, whichever comes first;
 3. At the time of sampling performed pursuant to (1) and (2) above, if BMPs are found to be properly designed, installed and maintained, no further action is required. If BMPs in any area of the site that discharges to a receiving stream are not properly designed, installed and maintained, corrective action shall be defined and implemented within two (2) business days, and turbidity samples shall be taken from discharges from that area of the site for each subsequent rain event that reaches or exceeds 0.5 inch during normal business hours* until the selected turbidity standard is attained, or until post-storm event inspections determine that BMPs are properly designed, installed and maintained; and
 4. Existing construction activities, i.e., those that are occurring on or before the effective date of this permit, that have met the sampling required by (1) above shall sample in accordance with (2). Those existing construction activities that have met the sampling required by (2) above shall not be required to conduct additional sampling other than as required by (3) above.
 5. The sampling contractor may choose to meet the requirements of (1) and (2) above by collecting turbidity samples from any rain event that reaches or exceeds 0.5 inch and allows for monitoring at any time of the day or week.
- B. **Non-storm water discharges.** Except for flows from fire fighting activities, sources of non-storm water listed in the permit that are combined with storm water discharges associated with construction activity must be identified in the Plan. The Plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.
- C. Additional samples may be taken once every 6 months a 0.5 inch rainfall during normal business hours shall be sampled as deemed necessary by the sampling contractor.

3.08 SAMPLING REQUIREMENTS

- A. The Architect will review all samples on an individual basis.
- B. The Contractor must inform the Architect of any activities that occurred during the time of the sampling that may affect the sampling in any manner. This should be placed on or with the Chain of Custody.

3.09 RAINFALL MONITORING (IN CONTRACT)

- A. A rain gauge shall be kept on site by the Contractor and monitored on a daily basis.
 - 1. Record rainfall amounts at the beginning of the work day.
 - 2. Record rainfall amounts at the end of the work day.
 - 3. Empty the rain gauge after recording the rainfall amount.
- B. The rain gauge log found in this Section shall be used for recording data.
- C. The rain gauge logs shall remain on site until completion.
- D. The rain gauge logs shall be made available at the request of the Architect or State/County/City/Federal inspector.

3.10 DAILY INSPECTIONS(IN CONTRACT)

- A. A daily inspection log is found in this Section shall be used for documenting inspections. A Contractor's daily log book can be used for daily inspections when the Contractor labels the inspection as "Daily Erosion Control Inspection".
- B. The daily inspection log shall be used for any of the following inspections:
 - 1. Each day the Operator/Contractor is responsible for site inspection.
 - 2. The contractor shall inspect the site and notify the Architect within 24 hours of the end of a storm that is 0.5 inches when either of the two below conditions occurs.
 - a. Disturbed areas of the primary permittee's construction site have not undergone final stabilization.
 - b. Areas used for storage materials that are exposed to precipitation have not undergone final stabilization.

3.11 RECORDS RETENTION (IN CONTRACT)

- A. Records of all items pertain to storm water monitoring and National Pollutant Discharge Elimination System Storm Water Discharges shall be kept both on project site and at the contractor main or regional offices. These records are to be available at the request of local or state authorities and Architect upon request.
- B. Item to be included in records, but not limited to the following:
 - 1. Land Disturbance Permit
 - 2. Erosion checklist (if not included in documents)
 - 3. Copy of Fee Form and checks
 - 4. Notice of Intent.
 - 5. Weekly inspections from sampling contractor.
 - 6. Monthly in sections from sampling contractor.
 - 7. Rainfall Information (provided by contractor)
 - 8. Comprehensive monitoring plan (specification section 02370 & 02375)
 - 9. Notice Of Implementation
 - 10. Letter of Implementation from Architect.
 - 11. Approved Erosion & Sedimentation Control Plans
 - 12. Any revisions made to the erosion plans.
 - 13. Any previous violations.
- C. It is the contractor's responsibility to request documents listed above. The Owner, Architect or sampling contractor shall not be responsible for items missing from the records.

3.12 SAMPLING BY CONTRACTOR (IN CONTRACT)

- A. Contractor shall be responsible for all costs associated with storm water sampling and NPDES inspections once the project has exceeded the calendar days established in the bid proposal. All change orders shall include costs for sampling.
- B. Contractor shall be required to continue sampling services with sampling contractor as previously established by the owner.

3.13 GOVERNMENTAL INSPECTIONS

- A. Scheduled Inspections - Contractor shall notify Owner, Architect and Sampling Contractor of any scheduled inspections by the local issuing authority or Georgia Environmental Protection Division.
- B. Unscheduled Inspections – Contractor shall notify Owner, Architect and Sampling Contractor immediately after an inspection is made by the local issuing authority or Georgia Environmental Protection Division. Additionally, the contractor shall provide any documentation resulting from the inspection from local issuing authority or Georgia Environmental Protection Division.

PLAN CERTIFICATIONS

Registered Professional Certification: “I certify that the permittee’s Comprehensive Monitoring Program provides for the monitoring of the receiving water(s) or the monitoring of the storm water outfalls and is expected to meet the monitoring requirements contained in the General NPDES Permit No.GAR 100000.”

Operator/Contractor Certification: “I certify that the receiving water(s) or outfall(s) or a combination of receiving water(s) and outfall(s) will be monitored in accordance with this Comprehensive Monitoring Program.”

Signature

(Note: The Architect has the owner signed original document and is available upon request.)

Date

RAIN GAUGE LOG

(Sample: Contractor may develop his own as long as information is consistent with this log)

DATE	INSPECTED BY BY:	MORNING		EVENING		SAMPLES TAKEN
		TIME	RAIN (IN.)	TIME	RAIN (IN.)	

Location/Item		Clear of Un-Wanted Debris	Status of Storm Water	Observations	Actions Needed?
	Slope Inspection				
	Pipe outfall Inspection				
	State Water				
Silt Fence					
	East Side				
	South Side				
	West Side				
	North Side				
	Temporary Grassing				
	Permanent Grassing				
	Material Storage Areas				
	Oil Product Storage Areas				
	Retention Pond				
	Construction Entrance / Exit				

END OF SECTION 02375

SECTION 02513

FIRE WATER DISTRIBUTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Extent of fire water systems work indicated on drawings and schedules, and by requirements of this Section.
- B. Fire Water Distribution system work includes, but not limited to:
 - 1. Installation of water line piping including bends and tees.
 - 2. Installation of Fire Hydrants, valves, indicator posts
 - 3. Installation of meter, backflows

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Section 02300, "Earthwork".
- C. Section 02321, "Trenching".
- D. Section 02514, "Site Water Distribution"
- E. Refer to Division-3 sections for concrete work required for fire water systems; not work of this Section.
- F. Refer to Division-13 section "Wet-Pipe Fire Suppression System" for interior building systems including sprinklers and standpipes; not work of this Section.

1.03 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Firms regularly engaged in manufacture of fire water system's materials of types, materials, and sizes required, whose products in satisfactory use in similar service for min. of 5 years.
- B. Installer's Qualifications: Firm with min. of 5 years of successful installation experience on projects with fire water work similar to that required for Project.
- C. Codes and Standards:
 - 1. NFPA Compliance: Install fire water systems in accordance with NFPA 24 "Standard for Installation of Private Fire Service Mains and Their Appurtenances".
 - 2. Local Fire Department/Marshal Regulations: Comply with governing regulations pertaining to hydrants, including hose unit threading and similar matching of connections.
 - 3. UL Compliance: Provide fire hydrants that comply with UL 246 "Hydrants for Fire-Protection Service", and listed by UL.
 - 4. Plumbing Code: Comply with applicable portions of Local and Standard Plumbing Code pertaining to selection and installation of materials for fire water system.
- D. Referenced Standards:
 - 1. National Fire Protection Association (NFPA): Comply with NFPA 24 "Standard for Outside Protection."

2. American Society for Testing and Materials (ASTM):
 - a. A 48/A 48M: Grey Iron Castings
 - b. A 126 Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 - c. A 197/A 197M Cupola Malleable Iron
 - d. A 307 Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
 - e. A 377 Standard Index of Specifications for Ductile-Iron Pressure Pipe
 - f. A 506 Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled
 - g. A 536: Ductile Iron Castings
 - h. A 575 Steel Bars, Carbon, Merchant Quality, M-Grades
 - i. D 1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (PVC).
 - j. D 1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 120.
 - k. D 2241 Poly (vinyl Chloride) (PVC) and Plastic Pipe (SDR-PR).
 - l. D 2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

3. American Water Works Association (AWWA):
 - a. C 110 Ductile-Iron and Gray-Iron Fittings for Water
 - b. C 111 Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
 - c. C 151 Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids
 - d. C 200 Steel Water Pipe 6 In. (150 mm) and Larger
 - e. C 203 Coal-Tar Protective Coatings & Linings for Steel Water Pipelines, Enamel Applied
 - f. C 205 Cement Mortar Protective Lining and Coating for Steel Water Pipe, 4 In. or Larger
 - g. C 206 Field Welding of Steel Water Pipe
 - h. C 208 Dimensions for Fabricated Steel Water Pipe Fittings
 - i. C 500 Gate Valves - 3" through 48".
 - j. C 502 Dry Barrel Fire Hydrants
 - k. C 600 Installation of Ductile Iron Water Mains and Their Appurtenances
 - l. C 601 Disinfecting Water Mains.
 - m. C 502 Fire Hydrants for Ordinary Water Works Service.
 - n. C 900 Polyvinyl Chloride (PVC) Pressure Pipe, 4" through 12" for Water.
 - o. M 11 Steel Pipe – Design and Installation
 - p. M 17 Installation, Field Testing, and Maintenance of Fire Hydrants
 - q. M 23 PVC Pipe -- Design and Installation.
 - r. M 41 Ductile Iron Pipe and Fittings

- E. Certification of Back Flow Prevention Devices: Contractor arrange for testing of flow prevention devices by licensed testing laboratory.
 1. As part of close out documents provide certification, issued by testing laboratory, that back flow prevention devices installed and functioning correctly.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for fire water system materials and products.

- B. Shop Drawings: Submit for fire water systems.
 1. Show piping materials, size, locations, and elevations.
 2. Include details of underground structures, connections, thrust blocks, and anchors.
 3. Show interface and spatial relationship between piping and proximate structures.

- C. Record Drawings: At project closeout, submit record drawings of installed fire water system piping and products, in accordance with requirements of Division 1.

- D. Maintenance Data:
 1. Submit maintenance data and parts lists for fire water system materials and products.
 2. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver pipe to job site with type and class identified.
- B. Deliver fittings to job site with type and class identified.
- C. Deliver joint materials in manufacturer's unopened containers with mixing and application instructions printed thereon.
- D. Protect products from damage.

PART 2 - PRODUCTS

2.01 IDENTIFICATION

- A. Underground-Type Plastic Line Marker:
 1. Manufacturer's standard permanent, bright-colored, continuous-printed inert polyethylene plastic tape, intended for direct-burial service; min. of 6" wide x 4 mils thick.
 2. Provide blue tape with black printing reading "CAUTION WATER LINE BURIED BELOW" every 16" to 36".
 3. Tape shall have a tensile strength of 2,800 psi.
- B. Tracer Wire:
 1. Tracer Wire shall be a minimum of 12 gauge solid copper wire.
 2. Wire shall run full length of pipe and stub up at each structure. Structures to include fire hydrants, valves, backflows, check valves and meters.
 3. Wire shall be continuous. When wire must be sliced the splice shall be done at a structure.

2.02 PIPES AND PIPE FITTINGS

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities indicated.
 1. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements.
 2. Provide materials and products complying with NFPA 24 and AWWA standards where applicable.
 3. Provide sizes and types matching piping and equipment connections; provide fittings of materials, which match pipe materials used in fire water piping systems.
 4. Where more than one type of materials or products indicated, selection Installer's option.
- B. Piping: Provide pipes of one of following materials, of weight/class indicated.
 1. Ductile Iron Pipe :
 - a. Pipe: Shall Conform to ASTM A377 and M41 for thickness Class 52. Additional thickness may be required by deep cover in accordance with M41 and ASTM A377, Table 12 for type 2 laying conditions.
 - b. Fittings: Shall Be mechanical joints in accordance with ANSI/AWWA C-110/ A21.10 cement lined, with rubber gaskets conforming to AWWA C111 with a working pressure of 250 p.s.i.
 - c. Lock Joints: Shall conform to ANSI/AWWA C-151/A21.51 and shall be bolted or boltless type suitable for a working pressure of 150 p.s.i.

- d. Pipe should be cut using saw or abrasive wheel. No cutting by burning allowed.
2. Polyvinyl Chloride Pipe:
 - a. AWWA C900, Class 150; bell and spigot with rubber sealing ring.
 - b. Fittings: Ductile-iron complying with AWWA C110, cement lined with rubber gaskets conforming to AWWA C111.
 3. Steel Pipe:
 - a. AWWA C200 for 6" and larger; with cement-mortar lining conforming to AWWA C205; and coal-tar enamel protective coating, AWWA C203.
 - b. Fittings: Steel water pipe fittings, AWWA C208; welded joints, AWWA C206.

2.03 PIPING STRAINERS

- A. Contractor shall provide Pipe Line Strainers at each meter location
- B. Provide as indicated, UL-listed, 175 psi working pressure, Y-type or basket type, with ends to suit piping connections.
- C. Manufacturer: Subject to compliance with requirements, provide pipe line strainers of one of following:
 1. "Automatic" Sprinkler Corp. of America; Div. A-T-O Inc.
 2. Cleveland Gear Co.; Sub of Vesper Corp.
 3. Grinnell Fire Protection Systems Co., Inc.
 4. Hersey Products Inc.; Hersey Div.
 5. Mueller Steam Specialty; Div. of Core Industries Inc.
 6. Neptune Water Meter Co.
 7. Rockwell International Corp.; Municipal & Utility Div.
 8. Rockwood Systems Corp.
 9. Zurn Industries Inc.; Fluid Handling Div.

2.04 METERS

- A. General:
 1. Provide meter type required by Local Authority having jurisdiction.
 2. Contractor shall pay all cost associated with meter installation from local water authority.
 3. Each meter shall require a vault for installation.
- B. Compound-Type Meters: Provide as indicated, compound-type meters, UL-listed, 175 psi working pressure, with accuracy of $\pm 3\%$ for rated flow. All meters 3" and larger shall have a bypass.
- C. Compound-Type Manufactures:
 1. Badger Meter Inc.
 2. Hersey Products Inc.
 3. Neptune Water Meter Co.; Sub. of Neptune International Corp.
 4. Rockwell International Corp.; Municipal & Utility Div.
- D. Detector-Type Meters: Provide as indicated, detector-type meters, UL-listed, 175 psi working pressure, with disc meter bypass.

2.05 CROSS CONNECTION CONTROL ASSEMBLIES (BACK FLOW DEVICES)

- A. Consist of: Backflow prevention device manufactured in full conformance with standards established by American Water Works Association entitled AWWA C510 Standards for Reduced Pressure Principals Devices and Double Check Valve Backflow Prevention Devices and completely comply with laboratory and field performance specifications of Foundation for Cross Connection Control and Hydraulic Research of University of Southern California.
1. Ductile iron Grade 65-45-12 with Fusion epoxy coated internal and external AWWA C550-90
 2. Internal Check – Stainless steel
 3. Trim: Bronze
 4. Elastomer
 - a. Double Check - EPDM
 - b. Reduced Pressure - Nitrile
 5. Spring: Stainless steel
 6. Max. Working Pressure: 175psi (12.1 bar)
 7. Hydrostatic Test Press: 350psi (24.1 bar)
 8. Temperature Range: 32°F to 140°F (0°C to 60°C)
 9. The assembly shall include same size valves located on either side of the backflow prevention assemblies. Four test cocks shall be appropriately located on the assembly for testing and certification.
 10. End Connections:
 - a. Threaded connections, all bronze construction for sizes of 2 inches and smaller
 - b. Flanged connections, galvanized cast-iron or epoxy coated cast-iron construction for sizes large than 2 inches. ANSI B16.1 Class 125
 11. Shutoff Valves:
 - a. For backflows 4" and larger - OS&Y resilient wedge gate valves meeting AWWA C509
 - b. For backflow smaller than 4" - NRS resilient wedge gate valves meeting AWWA C509
- B. Model and size approved by governing Local Authority, or if no local authority available, meet governing State Authority.
1. Equip assembly AWWA C506 Backflow Preventor
 2. The nominal size of the backflow prevention device shall be equal to or greater than the size of the purchased meter. For example, a 25mm (1") meter shall have a 25mm (1") or larger backflow device.
 3. Water lines 8" or larger provide : Double Check Backflow device with bypass and detector meter
 4. Water lines 2" to 6" Provide a Double check Backflow Device
 - a. Include two check valves and relief device arranged to discharge to atmosphere.
 - b. Cycling not allowed when fluctuation in piping pressure occurs.
 - c. Automatically maintain low pressure zone to positively prevent continuous discharge of relief device.
 - d. Design so that any moving part replaced without removing backflow preventer.
 5. Reduced pressure backflow prevention shall be required for all locations identifies in AWWA M14 Table 4-1.
- C. Certificate of Full Approval or Current Certificate of Approval:
1. Furnish for each design, size and make of backflow preventer provided.
 2. Certificate from Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, and attest that design, size, and make of backflow preventer satisfactorily passes complete sequence of performance tests and evaluations for respective level of approval
 3. Certificate of Provisional Approval not acceptable in lieu of above.
- D. Anti-Freeze Device:
1. Provide for each backflow preventor
 2. Activated by ambient air temperature.
 3. Factory set anti-freeze devices to begin to open at 35°F air temperature, to fully open at 29°F air temperature, and to fully close at 37°F air temperature.

4. Provide strainer furnished by anti-freeze device manufacturer.
5. Min. flow at full open position: 8 gpm at 60 psi.
6. Install so that discharge flow spills without any build-up of ice to block discharge from anti-freeze device.
7. Provide nonferrous metal plate painted yellow with black lettering with words "DO NOT CLOSE VALVE" in conspicuous location adjacent to each anti-freeze device.
8. Self-contained thermally-actuated valve operated by material having proper temperature and volume relationship to open and close valve.
 - a. All bronze with stainless steel springs and Buna-S poppet.
 - b. Equip valve with over-temperature spring to protect thermal system and poppet from damage due to high temperatures.
 - a) If thermal system fails, valve to open.

E. Available Manufacturer: Subject to compliance with requirements, provide backflow prevention of one of following:

1. Watts
2. Febco
3. Ames
4. Zurn

2.06 VALVES

A. Gate Valves:

1. Provide UL-listed, 175 psi working pressure for 12" and smaller, 150 psi for sizes larger than 12".
2. Provide threaded, flanged, hub, or other end configurations to suit size of valve and piping connection.
3. Provide inside screw type for use with indicator post, iron body bronze mounted, non-rising stem, solid wedge disc.

B. Indicator Posts:

1. Provide UL listed, designed for use with underground gate valves to provide aboveground means for operating valves and indicating position of valves.
2. Provide telescopic barrel type with indicating target, intended for use with gate valves 4" through 14", with operating wrench.
3. Posts being used in association with the fire sprinkler system shall be electronically monitored. Coordinate electronic monitoring with sprinkler contractor.

C. Butterfly Valves:

1. Provide UL-listed, 175 psi working pressure for 2" through 12", 150 psi for sizes larger than 12". Provide gear actuator and position indicator.

D. Check Valves:

1. Provide UL-listed, 175 psi working pressure for 2" through 12", 150 psi for sizes larger than 12".
2. Provide swing type, iron body bronze mounted with metal-to-metal or rubber-faced checks.
3. Provide threaded, flanged, or hub end, to suit size and piping connections.

E. Detector Check Valves:

1. Provide UL-listed, 175 psi working pressure.
2. Provide iron or brass bodied with weighted clapper and provisions for connection of by-pass meter around check.

F. Valve Boxes

1. Provide Valve Boxes for each valve located underground.
2. Valve Boxes shall be grey iron, 30,000 PSI
3. Fixed or Screw Type are allowed
4. Provide ASTM A 48/A 48M: Grey Iron Castings

- G. Manufacturer: Subject to compliance with requirements, provide products of one of following:
1. Gate Valves:

<ol style="list-style-type: none"> a. American Valve Mfg. Corp. b. American-Darling Valve; Div. of American Cast Iron Pipe Co. c. Clow Corp.; Valve Div. d. Fairbanks Co. 	<ol style="list-style-type: none"> e. Kennedy Valve; Div. ITT Grinnell Valve Co., Inc. f. Stockham Valves & Fittings Inc. g. United Brass Works Inc. h. United States Pipe and Foundry Co. i. Waterous Co. j. Mueller Co.
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 2. Indicator Posts:

<ol style="list-style-type: none"> a. American-Darling Valve; Div. of American Cast Iron Pipe Co. b. Clow Corp.; Valve Div. c. Eddy-Iowa; Div. Clow Corp. d. Fairbanks Co. e. Grinnell Fire Protection Systems Co., Inc. 	<ol style="list-style-type: none"> f. Kennedy Valve; Div. ITT Grinnell Valve Co., Inc. g. Mueller Co. h. Standard Fire Protection Co. i. Stockham Valves & Fittings Inc. j. United States Pipe and Foundry Co. k. Waterous Co. l. Mueller Co.
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 3. Butterfly Valves:

<ol style="list-style-type: none"> a. Demco; Div. of Cooper Industries Inc. b. ITT Grinnell; Div. ITT Industries of Canada Ltd. c. Kennedy Valve; Div. ITT Grinnell Valve Co., Inc. 	<ol style="list-style-type: none"> d. Keystone Valve; Div. Keystone International Inc. e. Nibco Inc. f. Powell (Wm.) Co. g. Pratt (Henry) Co. h. Tomoe Valve Co. Ltd. i. Mueller Co
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 4. Check Valves:

<ol style="list-style-type: none"> a. American-Darling Valve; Div. American Cast Iron Pipe Co. b. Clow Corp.; Valve Corp. c. Fairbanks Co. d. Kennedy Valve; Div. of ITT Grinnell Valve Co., Inc. 	<ol style="list-style-type: none"> f. Mueller Co. g. Nibco Inc. h. Stockham Valves & Fittings Inc. i. Walworth Co. j. Waterous Co.
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 5. Detector Check Valves:

<ol style="list-style-type: none"> a. Ames Co. Inc. b. Central Sprinkler Corp. c. Firematic Sprinkler Devices Inc. d. Globe Fire Equipment Co. e. Hersey Products Inc. 	<ol style="list-style-type: none"> f. Kennedy Valve; Div. ITT Grinnell Valve Co., Inc. g. Mueller Co. h. Reliable Automatic Sprinkler Co., Inc. i. Viking Corp. j. Mueller Co.
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2.07 FIRE HYDRANTS

- A. General: Provide cast-iron body fire hydrants, compression type, opening against pressure and closing with pressure, base valve design, 150 psi working pressure, with 1/4" gage tapping and bronze plug in standpipe.
1. In accordance with AWWA C502.
 2. Provide stems with 0" ring seals.

- B. Construction: In accordance with following:
1. Permit withdrawal of internal working parts without disturbing the barrel or casing.
 2. Plugged barrel drains in manner that hydrants made self-draining at future date without excavating.
 3. Valve, when shut, tight when upper portion of barrel broken off.
 4. Valve opening min. five (5) inches dia. with net area of waterway at smallest part, with valves wide open min.120% of valve opening.
 5. Tested by manufacturer to hydrostatic pressure of 300 psi with valve in both open and closed positions.
- C. Features: Provide following:
1. Size: 5-1/4" valve opening.
 2. Direction to Open Hydrant: Counterclockwise (left); direction of opening cast on head of hydrant in form of arrow with the word "OPEN" adjacent to arrow.
 3. Size and Shape of Operating and Cap Nuts: Pentagon 1-1/2" point to flat.
 4. Hose Nozzles: Two each bronze nozzles, 2-1/2" I.D. National Standard Thread, with cap and chain; cap nuts to match operating stem nuts.
 5. Pumper Nozzles: One each bronze nozzles, 4-1/2" I.D. (unless otherwise dictated by local authorities) National Standard Thread, with cap and chain.
 6. Depth of Trench: 5'-0"; where greater trench depths encountered, apply extensions or deeper bury hydrants.
 7. Connection to Main: 6" mechanical joint.
 8. Hydrant Color: Conform with local requirements.
 9. Furnish one each adjustable seat wrench for hydrants furnished, with wrench adjustment range to fit all hydrants installed.
- D. Available Manufacturer: Subject to compliance with requirements, provide fire hydrants of one of following:
1. Dresser M&H Style 129
 2. American Darling MK73
 3. Mueller Centurin

2.08 FIRE DEPARTMENT CONNECTION

- A. General : Provide exposed fire department connection at the building or as shown on the drawings.
1. Unit shall be brass and UL Listed and Fire Marshall approved.
 2. The unit can be back or angle outlet.
 3. Provide a metal sign not less than 24" square indicating the FDC
 4. Post shall be painted red

2.09 ACCESSORIES:

- A. Anchorages:
1. Provide anchorages for tees, wyes, crosses, plugs, caps, bends, valves, and hydrants.
 2. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages.
- B. Clamps, Straps, and Washers: Steel, ASTM A 506.
- C. Rods: Steel, ASTM A 575.
- D. Rod Couplings: Malleable-iron, ASTM A 197.
- E. Bolts: Steel, ASTM A 307.
- F. Cast-Iron Washers: Gray-iron, ASTM A 126.

G. Thrust Blocks: Concrete, 3,000 psi.

2.10 METER AND BACKFLOW VAULTS:

A. General

1. Every Meter and Backflow shall have a vault.
2. Vaults shall be
 - a. For 2" and smaller provide HDPE Vault box
 - b. For Larger than 2" vault shall be Precast or concrete block construction.
3. Vaults shall meet requirements of local regulatory agencies
4. Meter and Backflow shall be placed in separate vaults.
5. Reduced pressure backflows and locations with high water tables shall have vaults above ground. All others shall be constructed in the ground with a minimum of 6" above ground and a maximum of 12". Soil shall be placed to drain water away from vault.
6. Above ground vaults:
 - a. Shall have brick exterior. Brick to be selected by architect.
 - b. Provide openings with grates for ventilation and holes for drainage.
7. Construct vault of dimension indicated. If details are not provided, construct vault with a minimum of 2' clearance around meter or backflow and valves.
8. Vault shall have manhole step or access ladder into vault.
9. A drain or drainage system shall be installed to prevent water from accumulating in vault
10. All Access doors shall be aluminum cast flush with the concrete lid. Minimum opening size is 3' x 3'.
11. Provide cast or ductile sleeves and waterproof sleeve seals for pipe entry and exit.
12. All piping in vaults shall be ductile iron pipe

B. Precast Vault

1. Provide valve pits indicated, constructed of poured-in-place or precast concrete. Lid shall be 6" minimum thickness of concrete with reinforcement.
2. Bottom of pit shall be concrete with drain holes or 8" of stone.
3. Enclosures shall be rated for no less 5,000 pounds over a 10" x 10" area and be designed and tested to temperatures of -50°F. Material compressive strength should be no less than 11,000 p.s.i. Covers shall have a minimum co-efficient of friction of .5. Boxes shall be stackable for extra depth. Enclosures may also be constructed of reinforced concrete block or poured concrete construction.

C. Concrete Block Vault

1. Concrete block or CMU construction shall be 8" standard block with slit-face CMU block for the top three (3) courses.
2. A footing not less than 2' -0" wide and 2' -0' deep with #5 rebar reinforcing shall be provided. Footing shall extend perimeter of wall.
3. All cells shall be grout filled and vault shall be water proof.
4. Steel Reinforcing shall be placed in block cells 16" on centers.
5. Lid shall be 6" minimum thickness of concrete with reinforcement.
6. Bottom of pit shall be concrete with 8" of crushed stone.

D. Coatings:

1. All structures located partially or wholly below the water table shall have water proof protective coating: One of the following coatings shall be provided:
 - a. Coal tar epoxy coating.
 - b. Cementitious Crystalline
2. Coal Tar Epoxy Coating
 - a. All interior and exterior surfaces shall have a factory applied coal tar epoxy coating.
 - b. Concrete shall be cleans and free of dust, curing compound, oil and other foreign matter.
 - c. The coating shall be factory applied in two coats to achieve dry film thickness of 10 mils per coat.

3. Cementitious Crystalline
 - a. Cementitious Crystalline shall be added to concrete to provide a waterproof barrier.
 - b. Amount added shall be determined by manufacturer.
 - c. Cementitious Crystalline shall change appearance of concrete to indicate the structure has the waterproofing additive. The concrete is typically has a pink color.

E. HDPE Vaults

1. For meters and Backflow devices 2" and smaller
2. Vault shall be a minimum size and loading :
 - a. Backflow - 24"x 48" ; with a static loading 10,400 lbs/sf.
 - b. Water meter – 15" x 25" with a static loading 350 lbs/sf.
3. Minimum depth of 24" and maximum depth of 30" to top of assembly
4. Lid shall be Polymer Concrete with Hex head bolt down
5. Color shall be Grey or Black

PART 3 - EXECUTION

3.01 GENERAL

- A. Install in accordance with requirements and regulations of governmental authorities having jurisdiction except where additional or more stringent requirements are specified or referenced herein or on drawings.
- B. Utility System Trenching: Conform to Section 02321 except where more stringent or additional requirements are specified herein.

3.02 INSPECTION

- A. Examine areas and conditions under which potable water system's materials and products installed.
- B. Do not proceed with work until unsatisfactory conditions corrected in manner acceptable to Installer.

3.03 INSTALLATION OF IDENTIFICATION

- A. General: During back-filling/top-soiling of underground fire water piping systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade.

3.04 INSTALLATION OF PIPE AND PIPE FITTINGS

- A. Ductile-Iron Pipe: In accordance with AWWA C600 "Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances".
- B. Polyvinyl Chloride Pipe: In accordance with manufacturer's installation instructions.
- C. Concrete Pipe: In accordance with American Concrete Pipe Association "Concrete Pipe Handbook".
- D. Steel Pipe: In accordance with AWWA M11 "Steel Pipe - Design and Installation".
- E. Depth of Cover: Provide min. depth of cover over underground piping in accordance with NFPA 24, Figure A-8-11 "Recommended Depth of Cover Above Top of Underground Yard Mains".

3.05 DUCTILE IRON PIPE: (Required Locations whether indicated on drawings or not)

- A. Ductile Iron sewer pipe is required for Water Lines:
 1. Lines have less than three (3) feet of cover.
 2. When lines cross under sanitary or storm line.
 3. When line crosses sanitary or storm sewer line with less than two (2) feet of clearance between the two.
 4. When line passes laterally within one (1) foot of sanitary or storm drainage structure.
 5. When line is covered by sixteen (16) feet of fill or more.
 6. In wet or unstable soil conditions where bedding is difficult.
 7. When lines are located under concrete or asphalt pavement

3.06 INSTALLATION OF PIPING SPECIALTIES

- A. Pipe Line Strainers: As indicated, with valved blowoff piped to drain.

3.07 INSTALLATION OF METERS

- A. General: As indicated with shutoff valve on either side of meter and valved bypass full line size.

3.08 INSTALLATION OF VALVES

- A. General:
 1. Install valves as indicated.
 2. Provide post indicator for control valves.
- B. Control Valves:
 1. Install post indicator valve at each connection into building.
 2. Locate post indicator valves a min. of 40' from building outside wall, or as indicated.
- C. Shutoff Valves: Install shutoff valve ahead of each hydrant.
- D. All valves boxes shall have a concrete pad around. Precast Donuts are **NOT** allowed. Concrete shall be 3000 psi
- E. All valves located below grade are required to have concrete markers placed 2 feet behind each valve. The marker shall be a minimum of 3" square and 48" long. Markers shall be placed in ground with a minimum of 18" being exposed.

3.09 INSTALLATION OF HYDRANTS

- A. General: Install fire hydrants in accordance with AWWA M17 "Installation, Operation, and Maintenance of Fire Hydrants".
- B. Location: Min. of 40'-0" from building outside wall, or as indicated.
- C. Orientation: Set hydrants so that pumper steamer nozzle faces paved portion of road and at right angles to street.
- D. Installation:
 1. Install plumb, not deviating from true vertical by more than 3/16" per foot.
 2. Place base of hydrant at grade; after final grading and redistribution of top soil completed, adjust heights as necessary.
 3. Install hydrant at a height of 18" Maximum from ground to the center of the fire department connections.

3.09 FIRE DEPARTMENT CONNECTION

- A. General: Fire department connection shall be installed in accordance with NFPA 13 requirements.
 - 1. All exposed metal shall be painted red except the bass head.
 - 2. Metal sign shall be mounted on post.
 - 3. Line from building to FDC shall be ductile iron pipe.

3.10 PROTECTION OF WATER SUPPLY PIPES

- A. Horizontal Separation
 - 1. Lay water mains min. 10 feet horizontally from any existing or proposed sanitary sewer or force main.
 - 2. Measure distance from edge to edge
 - 3. Where not practical to maintain 10 foot separation, such deviation may allow installation of water main, sanitary sewer or force main closer, provided that water main in separate trench or on undisturbed earth shelf located on side of sanitary sewer or force main and at elevation so that bottom of water main min. 18" above top of sewer or force main.
- B. Crossings:
 - 1. Lay water mains crossing sanitary sewers and force mains to provide min. vertical distance of 18" between outside of water main and outside of sanitary sewer or force main; this to occur where water main above or below sanitary sewer or force main.
 - 2. Arrange crossing so that water main joints equidistant and far as possible from sanitary sewer or force main joints.
 - 3. Where water main crosses under sanitary sewer or forced main, provide adequate structural support for sanitary sewer or force main to prevent damage to water main.
- C. Special Conditions: Pipe Encasement
 - 1. General When impossible to obtain proper horizontal and vertical separation stipulated above. Contractor shall construct water line of ductile iron pipe material and pressure test to assure water tightness prior to backfilling.
 - 2. Water Lines shall be encased in concrete when water and sewer lines cross with one of the following conditions occurring.
 - a. Water and sewer are less than 18 inches vertical separation
 - b. Water and sewer are less than 10 feet horizontal separation
 - c. Water lines cross beneath sewer lines at any depth.

3.10 THRUST RESTRAINT

- A. Provide thrust restraint for all plugs, caps, hydrants, bends and tees by either thrust blocking or restrained joints as follows.
 - 1. Thrust Blocking:
 - a. Provide all plugs, caps, bend 11-1/4 degrees or greater and tees with thrust blocking in accordance with Trust Block Details.
 - b. Bear blocking directly against undisturbed trench wall, and make with concrete having min. compressive strength of 3,000 psi.
 - c. Arrange blocking so it will not interfere with reworking joints should such work become necessary.

3.11 CROSS CONNECTION INSTALLATION

- A. General:
 - 1. Backflow Preventers shall be installed with a minimum clearance of 12" (300mm) between port and floor or grade.
 - 2. Assembly be installed where easily accessible for testing and maintenance and must be protected from

- freezing.
3. Assembly Larger than 4" should have support blocks under assembly to prevent flange damage

B. Reduced Pressure Backflow preventers:

1. Shall be installed in vault with insulation and heat
2. Assembly shall be installed where any discharge will not be objectionable and can be positively drained away.

3.12 FIELD QUALITY CONTROL

A. General:

1. Conduct tests in accordance with AWWA and NFPA standards.
2. Conduct piping tests before joints covered, and after thrust blocks sufficiently hardened.
3. Fill pipeline 24-hrs. prior to testing, and apply test pressure to stabilize system.
4. Use only potable water.
5. Increase pressure in 50 psi increments and inspect each joint between increments.
6. Tests are to be conducted and approved by County Inspector.

B. Hydrostatic Tests of Watertight Joints:

1. Provide all equipment and perform all work in connection with the tests.
 - a. Contractor obtain test pump assembly complete with gauge and measuring device.
2. Pressure test all pipe by hydrostatic test pressure of fifty pounds per square inch in excess of pipe class (200 psi test pressure for Class 150 pipe), continuously for two hour period.
3. Fill each section tested with water, taking care to expel all air from pipes; tap pipe at high points to vent air.
4. Apply required pressure, as measured at point of lowest elevation for min. 2 hours and examine all pipe, fittings, valves, hydrants, and joints for defects.
 - a. Make all leaking joints watertight.
5. Determine leaking with pipe under hydrostatic test pressure.
6. No pipe installation accepted unless and until leakage meets the requirements of AWWA C 600, section 13.7; see Diagram No. 1 for the Schematic of the test equipment.
7. Conduct leakage test at test pressure for two hour period.
8. Requirements of this specification satisfied if line leakage for 2 hour test does not exceed allowable loss calculated using Table 1, AWWA C 600.
 - a. The maximum leakage allowed will be ten (10) gallons per inch diameter per mile per day.
9. Gauges: Standard pressure type with min. 5" dia. dial, and pressure range not over 50% of max. required test pressure.
10. Provide and maintain gauge test stand with laboratory calibrated test gauge at site.
 - a. Check all gauges used in work against test gauge whenever requested by Owner's representative.
11. Water for Testing
 - a. Prior to receiving water for hydrostatic testing, the Contractor shall notify the Local Water and Sewer Department that he desires water for testing and disinfection. A temporary fill line shall be extended from an existing active water main to the water main being filled. This line shall be equipped with a meter and a backflow prevention device as specified herein. The Water and Sewer Department shall provide an inspector to operate all active water valves and witness tests and disinfection procedures. The Contractor shall not operate active water valves under any circumstances.
 - b. Water used in testing shall be paid for by the Contractor at the standard rate as established by the Water and Sewer Department. The amount shall be calculated by determining the capacities of the lines installed and being tested or as read from the meter on the temporary fill line.

3.13 CLEANING AND STERILIZATION

A. General:

1. Clean pipe before laying and keep clean until accepted in completed work.

2. Disinfection of Fire Water Distribution System: Flush pipe system with clean potable water until no dirty water appears at point of outlet.
3. Disinfection of Water Mains: Flush and disinfect in accordance with AWWA C601 "Standard for Disinfecting Water Mains".
4. The Local Water and Sewer Department shall be notified 24 hours before filling lines for disinfection.

B. Fire Water Distribution System: Chlorinate entire system and test samples approved by Local Health Department or other agency having jurisdiction.

1. Apply chlorine by following methods:
 - a. Liquid chlorine gas feed, or calcium hypochlorite and water mixture.
 - b. Apply chlorinating agent at beginning of section adjacent to feeder connection and inject through corporation cock, hydrant or connection ensuring treatment of entire line
 - (1) Feed water into new line with chlorine applied in amounts to produce min. dosage of 50 ppm in all parts of system.
 - (2) Tread mains previously filled to concentrated dosage at intervals along line and retain for min. 24 hours.
 - (3) Chlorinate lines so that min. chlorine residual of 25 ppm remains in water after 24 hour standing in line per AWWA 601-81, Section 7.
 - c. During chlorination process operate all valves and accessories.
 - d. After chlorination, flush water from line at its extremities until replacement water tests equal, chemically and bacteriologically, those of permanent supply source.

C. Liquid Chlorine:

1. Apply chlorine gas-water mixture by means of solution fed chlorinating device; see AWWA C 601.
2. Feed chlorine gas directly from chlorine cylinder equipped with device for regulating rate of flow and effective diffusion of gas within pipe.
3. Equipment used subject to approval of Architect.

D. Operating Tests:

1. Open and close all valves and hydrants under system water pressure.
2. Check dry barrel hydrants for proper drainage.
3. For systems with fire pumps, run pumps during operating tests.

3.14 ADJUSTING AND CLEANING

A. Flushing:

1. Flush underground mains and lead-in connections to sprinkler risers before connection made to sprinklers, standpipes, or other fire protection system piping.
2. Flush at flow rate not less than that indicated in NFPA 24, or at hydraulically calculated water demand rate of system, whichever greater.

3.15 FINAL CLEAN-UP

- A. Valve Boxes shall be clean and free of concrete and accessible.
- B. All exposed cast steel, steel lids shall be painted black.
- C. All aluminum shall be cleaned and free of mud and dirt.
- D. Fire Hydrants, Fire department connections and indicator posts shall be painted prior to final inspection the color determined by local water authority. Fire hydrants shall only be painted with painted supplied by manufacturer. If color not specified by local issuing authority, contractor shall use red.
- E. Concrete valve markers shall be installed at all valve locations.

END OF SECTION 02513

SECTION 02514

SITE WATER DISTRIBUTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Extent of Site water systems work indicated on drawings and schedules, and by requirements of this Section.
- B. Fire Water Distribution system work includes, but not limited to:
 - 1. Installation of water line piping including bends and tees.
 - 2. Installation of Fire Hydrants, valves, indicator posts
 - 3. Installation of meter, backflows

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Section 02300, "Earthwork".
- C. Section 02321, "Trenching".
- D. Section 02514, "Site Water Distribution"
- E. Refer to Division-3 sections for concrete work required for fire water systems; not work of this Section.
- F. Refer to Division-13 section "Wet-Pipe Fire Suppression System" for interior building systems including sprinklers and standpipes; not work of this Section.

1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of site water distribution systems materials and products, of types and sizes required, whose products in satisfactory use in similar service for min. 5 years.
- B. Installer's Qualifications: Firm with min. 5 years of successful installation experience on projects with site water distribution piping work similar to work of this Project.
- C. Local Regulations: Comply with local Municipal and County Health department regulations pertaining to connections to existing public water supply, cross connection control policies and metering.
 - 1. Comply with most current version of Development Standards for Design and Installation of Water and Sewerage Systems for local water system.
- D. Applicable Codes:
 - 1. Plumbing Code Compliance: Comply with applicable portions of Standard Plumbing Code pertaining to selection and installation of site water distribution system materials and products.
 - 2. Water Purveyor Compliance: Comply with requirements of Purveyor supplying water to Project, obtain required permits and inspections.
- E. Certification of Back Flow Prevention Devices: Contractor arrange testing of back flow prevention devices by licensed testing laboratory.
 - 1. At project close out, provide certification, issued by testing laboratory, that back flow prevention devices installed and functioning correctly.

F. Referenced Standards:

1. National Fire Protection Association (NFPA): Comply with NFPA 24 "Standard for Outside Protection."
2. American Society for Testing and Materials (ASTM):
 - a. A 48/A 48M: Grey Iron Castings
 - b. A 126 Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 - c. A 197/A 197M Cupola Malleable Iron
 - d. A 307 Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
 - e. A 377 Ductile-Iron Pressure Pipe
 - f. A 506 Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled
 - g. A 536: Ductile Iron Castings
 - h. A 575 Steel Bars, Carbon, Merchant Quality, M-Grades
 - i. D 1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (PVC).
 - j. D 1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 120.
 - k. D 2241 Poly (vinyl Chloride) (PVC) and Plastic Pipe (SDR-PR).
 - l. D 2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - m. B 16 Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
 - n. B 88 Seamless Copper Water Tube
 - o. D 1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly Vinyl Chloride (PVC).
 - p. D 1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 120.
 - q. D 2241 Poly (vinyl Chloride) (PVC) and Plastic Pipe (SDR-PR).
 - r. D 2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - s. D 3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
 - t. F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe
3. American Water Works Association (AWWA):
 - a. C 110 Ductile-Iron and Gray-Iron Fittings for Water
 - b. C 111 Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
 - c. C 151 Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids
 - d. C 200 Steel Water Pipe 6 In. (150 mm) and Larger
 - e. C 203 Coal-Tar Protective Coatings & Linings for Steel Water Pipelines, Enamel Applied
 - f. C 205 Cement Mortar Protective Lining and Coating for Steel Water Pipe, 4 In. or Larger
 - g. C 206 Field Welding of Steel Water Pipe
 - h. C 207 Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In.
 - i. C 208 Dimensions for Fabricated Steel Water Pipe Fittings
 - j. C 214 Tape Coating Systems for the Exterior of Steel Water Pipelines.
 - k. C 500 Gate Valves - 3" through 48".
 - l. C 601 Disinfecting Water Mains.
 - m. C 502 Fire Hydrants for Ordinary Water Works Service.
 - n. C 508 Swing Check Valves for Waterworks Services, 2 In. (50mm) through 24 In.
 - o. C 510 Double Check Valve Backflow Prevention Assembly
 - p. C 600 Installation of Ductile Iron Water Mains and Their Appurenances
 - q. C 900 Polyvinyl Chloride (PVC) Pressure Pipe, 4" through 12" for Water.
 - r. M 11 Steel Pipe – Design and Installation
 - s. M 23 PVC Pipe -- Design and Installation.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for site water distribution system materials and products, including pipe and fittings, valves, and accessories.

- B. Shop Drawings: Submit shop drawings for site water distribution systems, showing piping materials, size, locations, and elevations.
 - 1. Include details of underground structures, connections, thrust blocks, and anchors.
 - 2. Show interface and spatial relationship between piping and proximate structures.
 - 3. Show location of materials to be provided on a copy of the utility plan.
- C. Record Drawings: At project closeout, submit record drawings of installed site water distribution system piping and products, in accordance with requirements of Division 1.
- D. Maintenance Data: Submit maintenance data and parts list for site water distribution system materials and products.
 - 1. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with Division 1 requirements.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver pipe to job site identified as to type and class.
- B. Deliver fittings to job site identified as to type and class.
- C. Deliver joint materials in manufacturer's unopened containers with mixing and application instructions printed thereon.
- D. Protect products from damage.

PART 2 - PRODUCTS

2.01 IDENTIFICATION

- A. Underground-Type Plastic Line Markers:
 - 1. Manufacturer's standard permanent, bright colored, continuous printed plastic tape, intended for direct burial service; min. 6" wide x 4 mils thick.
 - 2. Provide blue tape with black printing reading "CAUTION WATER LINE BURIED BELOW".
 - 3. Manufacturers: Subject to compliance with requirements, provide plastic line markers of one of following:
 - a. Allen Systems Inc.
 - b. Seton Name Plate Corp.
 - c. Markings Corp.
- B. Nonmetallic Piping Label: If nonmetallic piping used for water service, provide engraved plastic laminate, label permanently affixed to main electrical meter panel stating "THIS STRUCTURE HAS A NONMETALLIC WATER SERVICE".
- C. Tracer Wire:
 - 1. Tracer Wire shall be a minimum of 12 gauge solid copper wire.
 - 2. Wire shall run full length of pipe and stub up at each structure. Structures to include fire hydrants, valves, backflows, check valves and meters.
 - 3. Wire shall be continuous. When wire must be sliced the splice shall be done at a structure.

2.02 PIPES AND PIPE FITTINGS

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities indicated.
 - 1. Where not indicated, provide proper selection determined by Installer to comply with installation requirements.

2. Provide sizes and types matching piping and equipment connections; provide fittings of materials to match pipe materials used in site water distribution systems.
 3. Installer' option where more than one type material or product indicated.
- B. Piping:
1. Provide pipes of one of following materials, of weight/class indicated.
 2. Provide pipe fittings and accessories of the same material and weight/class as pipes. Use joining methods indicated.
- C. Copper Tube:
1. Pipe: ASTM B 88; Type K, soft-annealed temper.
 2. Fittings: Wrought-copper solder-joint fittings, ANSI B16.22, Solder joints.
- D. Ductile-Iron Pipe:
1. Pipe: Shall Conform to ASTM A746 for thickness Class 52. Additional thickness may be required by deep cover in accordance with ASTM A746, Table 12 for type 2 laying conditions.
 2. Fittings: Shall Be mechanical joints in accordance with ANSI/AWWA C-110/ A21.10 cement lined, with rubber gaskets conforming to AWWA C111 with a working pressure of 250 p.s.i.
 3. Lock Joints: Shall conform to ANSI/AWWA C-151/A21.51 and shall be bolted or boltless type suitable for a working pressure of 150 p.s.i.
 4. Pipe should be cut using saw or abrasive wheel. No cutting by burning allowed.
- E. Steel Pipe:
1. Pipe: AWWA C200 for sizes 6" and larger, Schedule 40.
 2. Fittings: Fabricated steel, AWWA C208; welded joints, complying with AWWA C206 or flanged joints complying with AWWA C207.
 3. Lining: Cement-mortar protective lining complying with AWWA C205.
 4. Coating: Coal-tar protective coating complying with AWWA C203 or tape coating system complying with AWWA C214.
- F. Polyvinyl Chloride (PVC) Pipe:
1. Pipe: AWWA C900 for sizes 4" through 12"; DR18.
 2. Fittings: Ductile-iron complying with AWWA C110, cement lined, with rubber gaskets conforming to AWWA C111.
- G. Poly (Vinyl Chloride) PVC Pipe (PVC-P):
1. Sizes ½" through 4": ASTM D 2241, Schedule 40, 200 psi, SDR 21 extruded from clean virgin, approved Class 12454-A PVC resin compounds conforming to ASTM D 1784.
 - a. Fittings: PVC, Schedule 40 socket-type, solvent cement joints; or elastomeric gasketed joints.
 2. Sizes over 4": AWWA C 900, Class 150.
 3. Rubber Rings: ASTM F 477, (1985).
 4. Couplings and Fittings: Ductile iron or cast iron, ANSI A21.10.
- H. Corrugated Steel Casing Pipe:
1. Pipe Shall consist of matching half-round segments of 14 gauge corrugated galvanized steel casing pipe which, when assembeled, becomes lengths of full-round corrugated steel pipe.
- I. Joints and Gaskets
1. Mechanical Joint Ductile Iron Pipe
 - a. Mechanical joint ductile iron pipe shall be furnished with mechanical joint retainer glands, complete with rings, gaskets, bolts and joint materials conforming to ANSI A-21.11, latest designation.
 2. Slip Joint Ductile Iron Pipe
 - a. Gaskets shall conform to ANSI A-21.11, latest designation. Use lubricants and gaskets of proper size, shape and composition as recommended by the pipe manufacturer.

3. Polyvinyl Chloride Pipe
 - a. Pipe shall be furnished complete with push type bell and spigot joints conforming to ASTM D-3139, latest designation. Gaskets shall be elastomeric seals conforming to ASTM F-477, latest designation designed for joining plastic pipe.
4. Corrugated Steel Casing Pipe
 - a. Pipe shall be joined in strict accordance with manufacturer's recommendations for the size required.

2.03 VALVES

- A. Twelve (12) Inch and Larger Valves
 1. Twelve inch and larger valves shall be Butterfly Type Dresser Style 450, Mueller, Pratt or approved equal for underground service with a two (2) inch square operating nut. Connections shall be mechanical joint with retainer glands.
- B. Ten (10) Inch and Smaller Valves
 1. Ten (10) inch and smaller valves shall be Resilient Seat Gate Type Dresser Style 3067-01 Mueller or approved equal for underground service with a two (2) inch square operating nut. Connections shall be mechanical joint with retainer glands.
- C. Air Release Valves
 1. Air release valves shall be Apco No. 200A or approved equal with ball check valve on vent to prevent return of air into water main.
- D. Tapping Sleeves, Crosses and Valves
 1. Tapping sleeves, crosses, and valves shall be mechanical joints and of the proper type for the pipe material to be tapped.
- E. Check Valves:
 1. Provide as indicated, swing check valves, AWWA C508, 150 psi working pressure.
 2. Provide iron body, cast-iron disc, bolted cap.
 3. Manufacturers: Subject to compliance with requirements, provide check valves of one of following:
 - a. Clow Corp.; Valve Div.
 - b. Dresser Mfg.; Div. of Dresser Industries.
 - c. Fairbanks Co.
 - d. Kennedy Valve; Div. of ITT Grinnell Valve Co. Inc.
 - e. Waterous Co.
 - f. Mueller Co.

2.04 CROSS CONNECTION CONTROL ASSEMBLIES (BACK FLOW DEVICES)

- A. Consist of: Backflow prevention device manufactured in full conformance with standards established by American Water Works Association entitled AWWA C510 Standards for Reduced Pressure Principals Devices and Double Check Valve Backflow Prevention Devices and completely comply with laboratory and field performance specifications of Foundation for Cross Connection Control and Hydraulic Research of University of Southern California.
 1. Ductile iron Grade 65-45-12 with Fusion epoxy coated internal and external AWWA C550-90
 2. Internal Check – Stainless steel
 3. Trim: Bronze
 4. Elastomer
 - a. Double Check - EPDM
 - b. Reduced Pressure - Nitrile
 5. Spring: Stainless steel
 6. Max. Working Pressure: 175psi (12.1 bar)
 7. Hydrostatic Test Press: 350psi (24.1 bar)
 8. Temperature Range: 32°F to 140°F (0°C to 60°C)

9. The assembly shall include same size valves located on either side of the backflow prevention assemblies. Four test cocks shall be appropriately located on the assembly for testing and certification.
 10. End Connections:
 - a. Threaded connections, all bronze construction for sizes of 2 inches and smaller
 - b. Flanged connections, galvanized cast-iron or epoxy coated cast-iron construction for sizes large than 2 inches. ANSI B16.1 Class 125
 11. Shutoff Valves:
 - a. For backflows 4" and larger - OS&Y resilient wedge gate valves meeting AWWA C509
 - b. For backflow smaller than 4" - NRS resilient wedge gate valves meeting AWWA C509
- B. Model and size approved by governing Local Authority, or if no local authority available, meet governing State Authority.
1. Equip assembly AWWA C506 Backflow Preventor
 2. The nominal size of the backflow prevention device shall be equal to or greater than the size of the purchased meter. For example, a 25mm (1") meter shall have a 25mm (1") or larger backflow device.
 3. Water lines 8" or larger provide : Double Check Backflow device with bypass and detector meter
 4. Water lines 2" to 6" Provide a Double check Backflow Device
 - a. Include two check valves and relief device arranged to discharge to atmosphere.
 - b. Cycling not allowed when fluctuation in piping pressure occurs.
 - c. Automatically maintain low pressure zone to positively prevent continuous discharge of relief device.
 - d. Design so that any moving part replaced without removing backflow preventer.
 5. Reduced pressure backflow prevention shall be required for all locations identifies in AWWA M14 Table 4-1.
- C. Certificate of Full Approval or Current Certificate of Approval:
1. Furnish for each design, size and make of backflow preventer provided.
 2. Certificate from Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, and attest that design, size, and make of backflow preventer satisfactorily passes complete sequence of performance tests and evaluations for respective level of approval
 3. Certificate of Provisional Approval not acceptable in lieu of above.
- D. Anti-Freeze Device:
1. Provide for each backflow preventor
 2. Activated by ambient air temperature.
 3. Factory set anti-freeze devices to begin to open at 35°F air temperature, to fully open at 29°F air temperature, and to fully close at 37°F air temperature.
 4. Provide strainer furnished by anti-freeze device manufacturer.
 5. Min. flow at full open position: 8 gpm at 60 psi.
 6. Install so that discharge flow spills without any build-up of ice to block discharge from anti-freeze device.
 7. Provide nonferrous metal plate painted yellow with black lettering with words "DO NOT CLOSE VALVE" in conspicuous location adjacent to each anti-freeze device.
 8. Self-contained thermally-actuated valve operated by material having proper temperature and volume relationship to open and close valve.
 - a. All bronze with stainless steel springs and Buna-S poppet.
 - b. Equip valve with over-temperature spring to protect thermal system and poppet from damage due to high temperatures.
 - a) If thermal system fails, valve to open.
- E. Available Manufacturer: Subject to compliance with requirements, provide backflow prevention of one of following:
1. Watts
 2. Febco
 3. Ames
 4. Zurn

2.05 WATER METERS

A. Water Meters:

1. General:
 - a. Provide meter type required by Local Authority having jurisdiction.
 - b. Contractor shall pay all cost associated with meter installation from local water authority.
2. Compound-Type Meters: Provide as indicated, compound-type meters, UL-listed, 175 psi working pressure, with accuracy of $\pm 3\%$ for rated flow. All meters 3" and larger shall have a bypass.
3. Compound-Type Manufactures:
 - a. Badger Meter Inc.
 - b. Hersey Products Inc.
 - c. Neptune Water Meter Co.; Sub. of Neptune International Corp.
 - d. Rockwell International Corp.; Municipal & Utility Div.
4. Detector-Type Meters: Provide as indicated, detector-type meters, UL-listed, 175 psi working pressure, with disc meter bypass.

2.02 METER AND BACKFLOW VAULTS:

A. General

1. Every Meter and Backflow shall have a vault.
2. Vaults shall be
 - a. For 2" and smaller provide HDPE Vault box
 - b. For Larger than 2" vault shall be Precast or concrete block construction.
3. Vaults shall meet requirements of local regulatory agencies
4. Meter and Backflow shall be placed in separate vaults.
5. Reduced pressure backflows and locations with high water tables shall have vaults above ground. All others shall be constructed in the ground with a minimum of 6" above ground and a maximum of 12". Soil shall be placed to drain water away from vault.
6. Above ground vaults:
 - a. Shall have brick exterior. Brick to be selected by architect.
 - b. Provide openings with grates for ventilation and holes for drainage.
7. Construct vault of dimension indicated. If details are not provided, construct vault with a minimum of 2' clearance around meter or backflow and valves.
8. Vault shall have manhole step or access ladder into vault.
9. A drain or drainage system shall be installed to prevent water from accumulating in vault
10. All Access doors shall be aluminum cast flush with the concrete lid. Minimum opening size is 3' x 3'.
11. Provide cast or ductile sleeves and waterproof sleeve seals for pipe entry and exit.
12. All piping in vaults shall be ductile iron pipe

B. Precast Vault

1. Provide valve pits indicated, constructed of poured-in-place or precast concrete. Lid shall be 6" minimum thickness of concrete with reinforcement.
2. Bottom of pit shall be concrete with drain holes or 8" of stone.
3. Enclosures shall be rated for no less 5,000 pounds over a 10" x 10" area and be designed and tested to temperatures of -50°F. Material compressive strength should be no less than 11,000 p.s.i. Covers shall have a minimum co-efficient of friction of .5. Boxes shall be stackable for extra depth. Enclosures may also be constructed of reinforced concrete block or poured concrete construction.

C. Concrete Block Vault

1. Concrete block or CMU construction shall be 8" standard block with slit-face CMU block for the top three (3) courses.
2. A footing not less than 2' -0" wide and 2' -0' deep with #5 rebar reinforcing shall be provided. Footing shall extend perimeter of wall.
3. All cells shall be grout filled and vault shall be water proof.

4. Steel Reinforcing shall be placed in block cells 16" on centers.
5. Lid shall be 6" minimum thickness of concrete with reinforcement.
6. Bottom of pit shall be concrete with 8" of crushed stone.

D. Coatings:

1. All structures located partially or wholly below the water table shall have water proof protective coating: One of the following coatings shall be provided:
 - a. Coal tar epoxy coating.
 - b. Cementitious Crystalline
2. Coal Tar Epoxy Coating
 - a. All interior and exterior surfaces shall have a factory applied coal tar epoxy coating.
 - b. Concrete shall be cleans and free of dust, curing compound, oil and other foreign matter.
 - c. The coating shall be factory applied in two coats to achieve dry film thickness of 10 mils per coat.
3. Cementitious Crystalline
 - a. Cementitious Crystalline shall be added to concrete to provide a waterproof barrier.
 - b. Amount added shall be determined by manufacturer.
 - c. Cementitious Crystalline shall change appearance of concrete to indicate the structure has the waterproofing additive. The concrete is typically has a pink color.

E. HDPE Vaults

1. For meters and Backflow devices 2" and smaller
2. Vault shall be a minimum size and loading :
 - a. Backflow - 24"x 48" ; with a static loading 10,400 lbs/sf.
 - b. Water meter – 15" x 25" with a static loading 350 lbs/sf.
3. Minimum depth of 24" and maximum depth of 30" to top of assembly
4. Lid shall be Polymer Concrete with Hex head bolt down
5. Color shall be Grey or Black

2.06 ACCESSORIES

- A. Anchorages: Provide anchorages for tees, wyes, crosses, plugs, caps, bends, valves, and hydrants.
 1. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages.
- B. Clamps, Straps, and Washers: Steel, ASTM A 506.
- C. Rods: Steel, ASTM A 575.
- D. Rod Couplings: Malleable-iron, ASTM A 197.
- E. Bolts: Steel, ASTM A 307.
- F. Cast-Iron Washers: Gray-iron, ASTM A 126.
- G. Thrust Blocks: Concrete, 3,000 psi.
- H. Valve Boxes:
 1. Valve boxes shall be of the roadway extension type, of proper length and base size with suitable detachable cover, coated inside and out with a good asphaltum paint. Boxes shall be manufactured of ductile iron, be 5-1/4 inch inside diameter, "Standard Telescopic Valve Box" as manufactured by Griffin Foundry and Mfg. Company, Rome, Georgia, or approved equal. Cover shall be marked "Water" in raised cast letters. All boxes not located in roadway shall have a 24" diameter Precast concrete collar placed level around the top for protection.

- I. Valve Manholes: As detailed on drawings.
- J. Valve Markers: Each valve 2 inches or larger, except fire hydrant valves, shall have a valve marker 5" square by 4' - 6" long with four (4) #2 reinforcing rods placed directly behind the valve.
- K. Specials: Specials shall be short body Class 259 ductile iron conforming to ANSI A-21.1 and A-21.10. Fittings shall be epoxy resin lined and conform to ANSI A-21.11. Ductile iron fitting shall be manufactured by the Ductile Iron Company of America, or equal. Fittings and Specials shall be complete with rings, bolts, gaskets, etc., for joints.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install in accordance with requirements and regulations of governmental authorities having jurisdiction except where additional or more stringent requirements are specified or referenced herein or on drawings.
- B. Utility System Trenching: Conform to Division 2 section "Trenching" except where more stringent or additional requirements specified herein.

3.02 INSPECTION

- A. Examine areas and conditions under which site water distribution system's materials and products installed.
- B. Do not proceed with work until unsatisfactory conditions corrected in manner acceptable to Installer.

3.03 INSTALLATION OF IDENTIFICATION

- A. General: During back-filling/top-soiling of underground site water distribution piping, install continuous underground-type plastic line markers, located directly over buried lines at 6" to 8" below finished grade.

3.04 INSTALLATION; GENERAL

- A. Install pipe in accordance with manufacturer's instructions.
- B. Lift all pipes and fittings by hoists and lower on skidways in manner to avoid shock.
 - 1. Use ropes or slings for lowering the pipe into the trench.
 - 2. Dropping or dumping pipe and fittings not permitted..
- C. Inspect each pipe and fitting before lowering into trench.
 - 1. Clean interior of pipe and all joint surfaces and maintain clean thereafter
 - 2. Plug open ends of pipe whenever pipe laying not in progress.
 - 3. Under no conditions lay pipe in water, or when trench conditions or weather unsuitable.
 - 4. Select pipe and fittings so that deviations small as possible at joints and so that inverts present smooth surface.
 - 5. Pipe and fittings rejected if not forming tight fitting joint.
 - 6. Before pipe laid, remove all dirt from inside and remove all lumps, blisters, excess coal tar, dirt, oil, grease and moisture from inside bell and from outside spigot end.
- D. Lay pipes to lines and grades shown on drawings.
 - 1. Contractor set line stakes.
 - 2. Install all joints, make up and inspect.
 - 3. Contractor correct any section of piping found defective in material, alignment, grade or joints at no additional cost to Owner.

- E. Install concrete reaction blocking or rod restrained fittings as detailed on drawings at all changes in directions.

3.05 INSTALLATION OF PIPE AND PIPE FITTINGS

- A. Copper Tube: Install in accordance with CDA 'Copper Tube Handbook'.
- B. Ductile-Iron Pipe: Install in accordance with AWWA C600 "Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances".
- C. Steel Pipe: Install in accordance with AWWA M11 "Steel Pipe - Design and Installation".
- D. Polyvinyl Chloride Pipe: Install in accordance with manufacturer's installation instructions.
- E. Depth of Cover: Provide minimum cover over piping of 36", unless otherwise noted.
- F. Water Main Connection:
 1. Make necessary applications for connections, water metering, and service permits.
 2. Arrange and pay for tap in water main, of size and in location as indicated, from water Purveyor.
 3. Provide curb valve and in curb box indicated.
 4. Pay all costs associated with connection to water main.
- G. Water Service Termination:
 1. Terminate site water distribution piping 5'-0" from building foundation in location and invert indicated.
 2. Provide temporary pipe plug for piping extension into building, by work of Division 15.
- H. Water Service Termination:
 1. Terminate portable water piping inside building where indicated.
 2. Provide line size gate valve, ¾" valve test tee, and pressure gauge.
 3. Provide sleeves cast into building wall, and water-tight sleeve seal.

3.05 DUCTILE IRON PIPE:

- A. Ductile Iron sewer pipe is required for Water Lines:
 1. Lines have less than three (3) feet of cover.
 2. When lines cross under sanitary or storm line.
 3. When line crosses sanitary or storm sewer line with less than two (2) feet of clearance between the two.
 4. When line passes laterally within one (1) foot of sanitary or storm drainage structure.
 5. When line is covered by sixteen (16) feet of fill or more.
 6. In wet or unstable soil conditions where bedding is difficult.
 7. When lines are located under concrete or asphalt pavement

3.06 INSTALLATION OF VALVES AND METERS

- A. General:
 1. Install valves indicated with stems pointing up.
 2. Provide valve box over underground valves.
 3. Provide vaults for backflow preventer assemblies.
- B. Valve Box:
 1. Make top section adjustable for elevation and set to allow equal movement above and below finished grade.
 2. Center base over valve and rest on compacted backfill.
 3. Place top of base section approximately on line with nut at top of valve stem, and plumb entire assembly.
 4. Reset any box moved from its original position by settlement of trench which prevents use of wrench for opening or closing valve, at no cost to the Owner.

- C. Backflow Preventers and Vault:
1. Pipe backflow preventers above grade where reduced pressure type required and below grade where reduced pressure type not required.
 2. Provide below grade vaults with positive, approved, piped drainage lines, min. 2" diameter schedule 80 PVC at min. 1% grade, from vault connecting to nearest storm drainage system.
 - a. Provide min. 6" air break between assembly discharge and receptor/drain.
 3. Bear bottom of vault over min. 6" deep crushed stone bed.
 - a. Provide 1" dia. weep holes in bottom of vault at 8" x 8" O.C.
 4. Submit detailed shop drawings of box and cover assembly for review and approval by Architect.
- D. Water Meter: House meter in vault acceptable to local authorities, one of following:
1. Standard, traffic type, cast iron meter box with marked cover
 2. Reinforced concrete vault with removable or hinged metal top with lifting devices unless otherwise detailed.
 - a. Top: Min. $\frac{3}{8}$ " thick aluminum floor plate with raised grid pattern suitable to support 150 psf.
 - b. Paint all surfaces black.
 - c. Provide with min. 12" x 12" hinged portal in top over meter.

3.07 PROTECTION OF WATER SUPPLY PIPES

- A. Horizontal Separation
1. Lay water mains min. 10 feet horizontally from any existing or proposed sanitary sewer or force main.
 2. Where not practical to maintain 10 foot separation, such deviation may allow installation of water main, sanitary sewer or force main closer, provided that water main in separate trench or on undisturbed earth shelf located on side of sanitary sewer or force main and at elevation so that bottom of water main min. 18" above top of sewer or force main.
 3. Measure distance from edge to edge
- B. Crossings:
1. Lay water mains crossing sanitary sewers and force mains to provide min. vertical distance of 18" between outside of water main and outside of sanitary sewer or force main; this to occur where water main above or below sanitary sewer or force main.
 2. Arrange crossing so that water main joints equidistant and far as possible from sanitary sewer or force main joints.
 3. Where water main crosses under sanitary sewer or forced main, provide adequate structural support for sanitary sewer or force main to prevent damage to water main.
- C. Special Conditions: Pipe Encasement
1. General When impossible to obtain proper horizontal and vertical separation stipulated above. Contractor shall construct water line of ductile iron pipe material and pressure test to assure water tightness prior to backfilling.
 2. Water Lines shall be encased in concrete when water and sewer lines cross with one of the following conditions occurring.
 - a. Water and sewer are less than 18 inches vertical separation
 - b. Water and sewer are less than 10 feet horizontal separation
 - c. Water lines cross beneath sewer lines at any depth.
- D. Thrust Restraint: Provide thrust restraint for all plugs, caps, hydrants, bends and tees by either thrust blocking or restrained joints as follows.
1. Thrust Blocking:
 - a. Provide all plugs, caps, bend 11-1/4 degrees or greater and tees with thrust blocking in accordance with the Thrust Block Details.
 - b. Bear thrust blocking directly against undisturbed trench wall, and construct with concrete having min. compressive strength of 2,500 psi.

- c. Arrange thrust blocking so not to interfere with reworking joints should such work become necessary.

3.08 CONNECTION TO EXISTING WATER

A. General:

1. Contractor responsible for all costs associated with connection of site water distribution system to existing main regardless of whether work performed by employees of Contractor or by local authority.
2. Contractor shall furnish necessary materials and perform all excavation, dewatering, shoring, backfilling, etc., necessary to make connection to existing water main.
3. Make connections, whether temporary or permanent, to existing water system in strict accordance with requirements as stated below and in accordance with connection policies of municipal water supplier having jurisdiction, where they vary or are more stringent than the requirements of these specifications.
4. Schedule any connection to existing water main which requires shutdown of existing water main or interruption of service to any customer, with the municipal water supplier and any affected user.

B. Protection: Any physical connection of untested water mains with existing public water mains prohibited except when approved backflow prevention devices installed by Contractor and inspected by authorized representatives of municipal water supplier.

1. Cap any new water main to be tested and restrained with retaining glands or thrust blocks to prevent blow out or leakage during pressure testing.
2. Obtain water for filling and flushing new water main from any accessible fire hydrant or special wet tap of existing public main.
3. Protect physical connection for obtaining water for new untested water line by single check valve.
4. Make appropriate taps of sufficient size at the end of new system to allow air to escape during filling sequence.
 - a. Physically disconnect tie-in with existing public system after sufficient water for hydrostatic testing and disinfection obtained.
 - b. Once new water system demonstrates adequate hydrostatic testing, is chlorinated as specified herein and local authority having jurisdiction, flush new system using filling method described herein, then subject system or main to bacteriological testing.

C. Tap:

1. Make permanent connection for new system with clean materials using required components.
 - a. Once connection made, flush new system using water from existing public system to ensure adequate flow and velocity into new water system.
2. If wet tap required, Contractor responsible for preparing site.
 - a. Preparation includes excavation and installation of tapping sleeve.
 - b. Contractor make available lifting device for tapping machine and min. 100 CFM air compressor to power tapping machine.
3. The municipal water supplier or other authority having jurisdiction to inspect and approve tapping procedure and equipment.
 - a. All taps made by municipal water supplier unless authority granted in writing by municipal water supplier superintendent for private firm to perform wet tap for specific new main.
 - b. Where municipal water supplier's policy dictates, they provide tapping machine and one man to operate unit.
 - c. Direct all questions regarding local requirements and procedure to municipal water supplier.

3.09 FIELD QUALITY CONTROL

A. General:

1. Conduct tests in accordance with AWWA and NFPA standards.
2. Conduct piping tests before joints covered, and after thrust blocks sufficiently hardened.

3. Fill pipeline 24-hrs. prior to testing, and apply test pressure to stabilize system.
4. Use only potable water.
5. Increase pressure in 50 psi increments and inspect each joint between increments.
6. Tests are to be conducted and approved by County Inspector.

B. Hydrostatic Tests of Watertight Joints:

1. Provide all equipment and perform all work in connection with the tests.
 - a. Contractor obtain test pump assembly complete with gauge and measuring device.
2. Pressure test all pipe by hydrostatic test pressure of fifty pounds per square inch in excess of pipe class (200 psi test pressure for Class 150 pipe), continuously for two hour period.
3. Fill each section tested with water, taking care to expel all air from pipes; tap pipe at high points to vent air.
4. Apply required pressure, as measured at point of lowest elevation for min. 2 hours and examine all pipe, fittings, valves, hydrants, and joints for defects.
 - a. Make all leaking joints watertight.
5. Determine leaking with pipe under hydrostatic test pressure.
6. No pipe installation accepted unless and until leakage meets the requirements of AWWA C 600, section 13.7; see Diagram No. 1 for the Schematic of the test equipment.
7. Conduct leakage test at test pressure for two hour period.
8. Requirements of this specification satisfied if line leakage for 2 hour test does not exceed allowable loss calculated using Table 1, AWWA C 600.
 - a. The maximum leakage allowed will be ten (10) gallons per inch diameter per mile per day.
9. Gauges: Standard pressure type with min. 5" dia. dial, and pressure range not over 50% of max. required test pressure.
10. Provide and maintain gauge test stand with laboratory calibrated test gauge at site.
 - a. Check all gauges used in work against test gauge whenever requested by Owner's representative.
11. Water for Testing
 - a. Prior to receiving water for hydrostatic testing, the Contractor shall notify the City Water and Sewer Department that he desires water for testing and disinfection. A temporary fill line shall be extended from an existing active water main to the water main being filled. This line shall be equipped with a meter and a backflow prevention device as specified herein. The Water and Sewer Department shall provide an inspector to operate all active water valves and witness tests and disinfection procedures. The Contractor shall not operate active water valves under any circumstances.
 - b. Water used in testing shall be paid for by the Contractor at the standard rate as established by the Water and Sewer Department. The amount shall be calculated by determining the capacities of the lines installed and being tested or as read from the meter on the temporary fill line.

3.10 BACKFLOW CERTIFICATION

A. General:

1. Backflow Prevention devices shall be inspected and tested in accordance with state requirements to ensure backflow devices are operating properly.
2. Testing agency shall be employed by the contractor and have a minimum of 5 years experience.
3. Testing agency is required to provide a letter stating that backflow prevention devices are installed correctly.

3.11 CLEANING AND STERILIZATION

A. General:

1. Clean pipe before laying and keep clean until accepted in completed work.
2. Disinfection of Site Water Distribution System: Flush pipe system with clean potable water until no dirty water appears at point of outlet.
3. Disinfection of Water Mains: Flush and disinfect in accordance with AWWA C601 "Standard for Disinfecting Water Mains".
4. The City Water and Sewer Department shall be notified 24 hours before filling lines for disinfection.

- B. Site Water Distribution System: Chlorinate entire system and test samples approved by Local Health Department or other agency having jurisdiction.
1. Apply chlorine by following methods:
 - a. Liquid chlorine gas feed, or calcium hypochlorite and water mixture.
 - b. Apply chlorinating agent at beginning of section adjacent to feeder connection and inject through corporation cock, hydrant or connection ensuring treatment of entire line
 - (1) Feed water into new line with chlorine applied in amounts to produce min. dosage of 50 ppm in all parts of system.
 - (2) Tread mains previously filled to concentrated dosage at intervals along line and retain for min. 24 hours.
 - (3) Chlorinate lines so that min. chlorine residual of 25 ppm remains in water after 24 hour standing in line per AWWA 601-81, Section 7.
 - c. During chlorination process operate all valves and accessories.
 - d. After chlorination, flush water from line at its extremities until replacement water tests equal, chemically and bacteriologically, those of permanent supply source.
- C. Liquid Chlorine:
1. Apply chlorine gas-water mixture by means of solution fed chlorinating device; see AWWA C 601.
 2. Feed chlorine gas directly from chlorine cylinder equipped with device for regulating rate of flow and effective diffusion of gas within pipe.
 3. Equipment used subject to approval of Architect.

END OF SECTION 02514

SECTION 02530

SANITARY SEWAGE SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Extent of sanitary sewage systems work indicated on drawings and by requirements of this Section.
- B. Sanitary sewer system work includes, but not limited to:
 - 1. Sanitary sewer pipe.
 - 2. Manholes, frames, and covers.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Section 02300, "Earthwork".
- C. Section 02321, "Trenching".
- D. Section 03300, "Cast-In-Place Concrete".
- E. Refer to Division-15 section "Soil and Waste Systems" for interior building systems including drain, waste, and vent piping.

1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sanitary sewage system's products of types, materials, and sizes required, whose products in satisfactory use in similar service for min. 5 years.
- B. Installer Qualifications: Firm with min. 3 years of successful installation experience on projects with sanitary sewage work similar to that required for Project.
- C. Codes and Standards:
 - 1. Plumbing Code Compliance: Comply with applicable portions of Standard Plumbing Code pertaining to selection and installation of sanitary sewage system materials and products.

1.04 REFERENCED STANDARDS

- A. References:
 - 1. The 2000 Edition of Georgia Department of Transportation "Standard Specification for Construction of Highways and Bridges"
 - 2. The Current Edition of Georgia Department of Natural Resources, Environmental Protection Division, "Guidelines for Gravity Sewers"
 - 3. Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers "Recommended Standards for Wastewater Facilities"
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. M-199/ M-199M: Precast Reinforced Concrete Manhole Sections

C. Standards of Uni-Bell Plastic Pipe Association:

1. UNI-B-3: Installation of Polyvinyl Chloride (PVC) Pressure Pipe.
2. UNI-B-4: Polyvinyl Chloride (PVC) Plastic Gravity Sewer Pipe and Fittings.
3. UNI-B-5: Installation of Polyvinyl Chloride (PVC) Sewer Pipe.
4. UNI-B-6: Recommended Practice Low Pressure air testing of Installed Sewer Pipes

D. Standards of American Water Works Association (AWWA):

1. C110/A21.10: Ductile Iron and Grey Iron Fittings for Water
2. C111/A21.11 Rubber Gasket Joints for Ductile Iron Pressure Pipe and fittings
3. C-151/A21.51 Ductile Iron Pipe, Centrifugally Cast for Water

E. Standards of American Society for Testing and Materials (ASTM): Use Latest Issued Specification:

1. A 48/A 48M: Grey Iron Castings
2. A 536: Ductile Iron Castings
3. A 615/A 615M Deformed and Plain Carbon Steel bars for Concrete Reinforcement
4. A 746 Ductile Iron Gravity Sewer pipe
5. C 32 Sewer and Manhole Brick (Made From Clay or Shale)
6. C 139 Concrete Masonry Units for Construction of Catch Basins and Manholes
7. C 150 Portland Cement
8. C 270 Mortar for Unit Masonry
9. C 443 Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
10. C 478/C 478M Precast Reinforced Concrete Manhole Sections
11. C 564 Rubber Gaskets for Cast Iron Soil Pipe and Fittings
12. C 857 Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
13. C 877/C877M External Sealing Bands for Concrete Pipe, manholes and Precast box sections.
14. C 891 Installation of Underground Precast Concrete Utility Structures
15. C 923/ C923M Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and laterals.
16. C 924 Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
17. C 969 Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
18. C 1091 Phosphorus in Lubricating Oils and Additives
19. D 2122 Determining Dimensions of Thermoplastic Pipe and Fittings
20. D 2321 Underground Installation of Thermoplastic Pipes for Sewers and other Gravity Flow Applications
21. D 2564 Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
22. D 2665 Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
23. D 2855 Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
24. D 3034 Type PSM Poly Vinyl Chloride (PVC) Sewer pipe and Fittings
25. D 3212 Joints for Drain and Sewer Plastic pipes Using flexible Elastomeric Seals
26. F 477 Elastomeric Seals (Gaskets) for Jointing Plastic Pipe
27. F 679 Poly Vinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer pipe and Fittings
28. F 1417 Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air
29. F 1866 Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings

30. F 1970

Special Engineered Fittings, Appurtenances or Valves for use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems

1.05 SUBMITTALS**A. Product Data:**

1. Submit manufacturer's technical product data and installation instructions for sewage system materials and products.

B. Shop Drawings:

1. Submit shop drawings for sanitary sewage systems, showing piping materials, size, locations, and inverts.
2. Include details of each underground structure, connection, and manhole. Show Invert and rim elevations. Each structure shall be shown separately in plan and profile. Generic precast information is not allowed.
3. Provide table identifying pipe material for each pipe run. Pipe material is required to be indicated for each location.
4. Copy of Ditch Diggers Certification.
5. Include details and installation requirements of underground structures, connections, and clean-outs.
6. Show interface and spatial relationship between piping and proximate structures.

C. Record Drawings:

1. At project closeout, submit record drawings of installed sanitary sewage piping and products, in accordance with requirements of Division 1.

D. Maintenance Data:

1. Submit maintenance data and parts lists of sanitary sewage system materials and products.
2. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with Division 1 requirements.

PART 2 - PRODUCTS**2.01 IDENTIFICATION**

A. Detection tape is required on all pipe materials. Tracer wire is required on all non ferrous pipe material.

B. Underground-Type Plastic Line Markers:

1. Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; min. 6" wide x 4 mils thick.
2. Provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".
3. Manufacturer: Subject to compliance with requirements, provide identification markers of one of following:
 - a. Allen Systems, Inc.
 - b. Emed Co., Inc.
 - c. Seton Name Plate Corp.

C. Tracer Wire:

1. Tracer Wire shall be a minimum of 12 gauge solid copper wire.
2. Wire shall run full length of pipe and stub up in manhole or structure.

2.02 CONDUIT MATERIALS

- A. General:
1. Provide pipes of one of following materials, of weight/class indicated.
 2. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method indicated.
- B. Ductile Iron Pipe
1. Pipe: Shall Conform to ASTM A746 for thickness Class 52. Additional thickness may be required by deep cover in accordance with ASTM A746, Table 12 for type 2 laying conditions.
 2. Fittings: Shall be mechanical joints in accordance with ANSI/AWWA C-110/ A21.10 with a working pressure of 250 p.s.i.
 3. Lock Joints: Shall conform to ANSI/AWWA C-151/A21.51 and shall be bolted or boltless type suitable for a working pressure of 150 p.s.i.
 4. Pipe should be cut using saw or abrasive wheel. No cutting by burning allowed.
- C. Cast-Iron Pipe:
1. Pipe: Shall be mechanical joint, conforming to federal specification WW-P-421C.
 2. Fittings:
 - a. Shall be Cast iron Class 150.
 - b. Shall be Neoprene rubber compression gaskets conforming to ASTM C 564, standard strength unless otherwise indicated.
 3. All interior and exterior of all cast iron pipe and fittings shall be coated with coal tar pitch.
- D. Polyvinyl Chloride (PVC) Sewer Pipe: (sizes 4" thru 15")
1. Pipe: ASTM D 3034, Type PS 115, SDR 26.
 2. Fittings: PVC, ASTM D 3034, solvent-cement joints complying with ASTM D 2855 using solvent cement complying with ASTM D 2564; or elastomeric joints complying with ASTM D 3212 using elastomeric seals complying with ASTM F 477.
- E. Polyvinyl Chloride (PVC) Sewer Pipe: (sizes 18" thru 24")
1. Pipe: ASTM F 679, Type PS46.
 2. Fittings: PVC, ASTM D 3034, solvent-cement joints complying with ASTM D 2855 using solvent cement complying with ASTM D 2564; or elastomeric joints complying with ASTM D 3212 using elastomeric seals complying with ASTM F 477.
- F. Polyvinyl Chloride (PVC) DWV Pipe (sizes up to 4"):
1. Pipe: Schedule 40, ASTM D 2665.
 2. Fittings: PVC Schedule 40, ASTM D 2665; solvent-cement joints, ASTM F 1970; or threaded or special joints. ASTM F1866.

2.03 SANITARY SEWER MANHOLES

- A. General:
1. Provide either precast reinforced concrete sanitary manholes as indicated and complying with ASTM C 478 and ASTM C 857.
 2. Unless noted or detailed otherwise minimum thickness of concrete to be 4".
- B. Top:
1. Precast concrete, of concentric cone, eccentric cone, or flat slab top type, as indicated.
 2. Eccentric cone precast top for depths 4'-0" and greater.
 3. Flat slab tops for depth less than 4'-0".

- C. Base:
1. Precast concrete, with base riser section and separate base slab, or base riser section with integral floor, as indicated.
- D. Joints:
1. Joint installation to be indicated by supplier/manufacturer.
 2. Joints shall be either approved neoprene seal or rubber gasket.
 3. The neoprene seal can be replaced with two (2) separate layers of approved 1" mastic or one (1) layer of approved 3" mastic to be placed on the flat portions of the precast section connections.
 4. All Joints shall be grouted on inside and outside.
 5. All joints shall be watertight.
- E. Fall Shelves
1. Manholes deeper than 15'-0" shall have a fall ledge(s).
 2. Design live load shall be 150 psf
 3. Ledges should be aligned 90 degrees from opening below.
 4. Ledges shall be concrete or expanded aluminum with structural supports.
 5. For manholes 15'-0" to 24'-0" in depth the shelf shall be placed at half the depth.
 6. For manholes greater than 24'-0" the shelves shall be placed at a spacing not to exceed 12'-0" max.
 7. All sewer connections shall be located below lowest ledge.
- F. Steps:
1. Grey cast iron, ASTM A 48, Class 30B, integrally cast into manhole sidewalls.
 2. Injected molded copolymer polypropylene around a 1/2" ASTM A-615 Grade 60 steel bar, meeting or exceeding ASTM C-478 and AASHTO M-199, integrally cast into basin sidewalls.
- G. Frame and Cover:
1. Grey cast iron, ASTM A 48, Class 30B, traffic type, prefitted to prevent rattling.
 2. Unless noted otherwise cover to be 26" diameter, heavy-duty, indented top design.
 3. Furnish covers with cast-in legend "Sanitary Sewer" on roadway face.
 4. Conform to details shown on drawings or to Fed. Specification RR-F-621, circular, without vents.
 5. In areas prone to flooding, sewer manhole lids shall be water tight and lockable (or bolt on.)
- H. Coatings:
1. All structures located partially or wholly below the water table shall have water proof protective coating: One of the following coatings shall be provided:
 - a. Coal tar epoxy coating.
 - b. Cementitious Crystalline
 2. Coal Tar Epoxy Coating
 - a. All interior and exterior surfaces shall have a factory applied coal tar epoxy coating.
 - b. Concrete shall be cleans and free of dust, curing compound, oil and other foreign matter.
 - c. The coating shall be factory applied in two coats to achieve dry film thickness of 10 mils per coat.
 3. Cementitious Crystalline
 - a. Cementitious Crystalline shall be added to concrete to provide a waterproof barrier.
 - b. Amount added shall be determined by manufacturer.
 - c. Cementitious Crystalline shall change appearance of concrete to indicate the structure has the waterproofing additive. The concrete is typically has a pink color.
- I. Pipe Connectors:
- a. Resilient, complying with ASTM C 923.

2.04 CLEANOUTS

A. General:

1. Provide as indicated, pipe extension to grade with ferrule and countersunk cleanout plug.
2. Provide round cast-iron access frame over cleanout, with heavy-duty secured scoriated cover with lifting device.
3. Manufacturer: Subject to compliance with requirements, provide identification markers of one of following:
 - a. JAY R. SMITH MFG. CO. 4250 Series.
 - b. ZURN MFG. CO –Jones Spec C0-2460NH4-BP
 - c. NIBCO

2.05 MASONRY MATERIALS

- A. Concrete Masonry Units: ASTM C 139.
- B. Brick: ASTM C 32, Grade MS.
- C. Masonry Mortar: Use masonry mortar for below grade applications only. ASTM C 270, Type S or M.

PART 3 - EXECUTION

3.01 INSPECTION

- A. General: Installer shall examine areas and conditions under which sanitary sewer system work is to be installed and notify contractor in writing of conditions detrimental to the proper and timely completion of the work.
 1. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

3.02 INSTALLATION OF IDENTIFICATION

- A. General: Detection tape is required on all pipe materials. Tracer wire is required on all non ferrous pipe material.
- B. Detection Tape: During back-filling/top-soiling of sanitary sewage systems, install continuous underground-type plastic line marker, located directly over buried line at 2' – 0" above installed pipe.
- C. Tracer wire is required to be placed to top of non ferrous pipe or wrapped the length of pipe. End shall continue into the manhole structures.

3.03 INSTALLATION OF CONDUIT

- A. General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements indicated.
 1. Inspect piping before installation to detect apparent defects.
 2. Mark defective materials with white paint and promptly remove from site.
 3. Lay piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert.
 4. Place bell ends or groove ends of piping facing upstream.
 5. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.

- B. Ductile Iron Pipe:

1. Ductile Iron sewer pipe is required for sanitary sewer lines:
 - a. Lines have less than three (3) feet of cover.
 - b. When lines cross under storm line.
 - c. When line crosses storm sewer line with less than two (2) feet of clearance between the two.
 - d. When line passes laterally within one (1) foot of storm drainage structure
 - e. When line is covered by sixteen (16) feet of fill or more.
 - f. In wet or unstable soil conditions where bedding is difficult.
 - g. When slope of the line is greater than 20%.
 - h. At outside drops on manholes.
 - i. Under pavement.

 - C. Conduit Installation: Install conduit in accordance with following industry recommendations except as specifically required on drawings or under provisions of Section 02300 Earthwork and Section 02321, Trenching.
 1. Plastic Pipe: Install in accordance with manufacturer's installation recommendations, with ASTM D 2321, and in accordance with UNI-BELL standards UNI-B-3 (pressure pipe) or UNI-B-5 (gravity pipe)
- 3.04 CLEANING CONDUIT
- A. Clear interior of piping of dirt and other superfluous material as work progresses.
 1. Maintain swab or drag in line and pull past each joint as completed.
 2. In large, accessible piping, use brushes and brooms for cleaning.
 3. Place plugs in end of uncompleted conduit at end of day or whenever work stops.
 4. Flush lines between manholes if required to remove collected debris.
- 3.05 JOINT ADAPTERS
- A. Make joints between cast iron and other types of pipe with standard manufactured cast iron adapters and fittings intended for that purpose.
 - B. Grout joints between cast iron pipe and concrete pipes thoroughly with cement mortar to make watertight joint.
 1. Make joints between other types of pipe with standard manufactured adapters and fittings intended for that purpose.
- 3.06 SEWAGE BYPASS(only when allowed)
- A. Sewer is only allowed if approved by engineer and local jurisdiction.
 1. A detailed plan is to be provided prior beginning for review.
 2. Plan to meet requirements of local jurisdiction.
 3. Contractor shall be responsible for all cost associated with bypass.
 4. Contractor shall monitor bypass systems 24 hours a day for the duration of the bypass.
 5. Bypassing raw wastewater onto ground or into receiving stream is strictly prohibited.
- 3.07 CLOSING ABANDONED UTILITIES
- A. Close open ends of abandoned underground utilities, which are indicated to remain in place.
 1. Provide sufficiently strong closures to withstand hydro-static or earth pressure resulting after ends of abandoned utilities closed.
 2. Close open ends of piping with threaded metal caps, plastic plugs, 8" thick brick masonry bulkhead, or other acceptable methods suitable for sizes and type material being closed; wood plugs not acceptable.
- 3.08 STONE BACKFILL

- A. Where subgrade of pipe trench unsuitable material, remove 6" of unsuitable material and place stone backfill in trench to stabilize subgrade.
 - 1. If water is present in trench stone backfill may not be required if dewatering methods completely removes water from trench. Dewatering may be utilized to stabilize trench if soil material suitable.
 - 2. Stone backfill limited to areas where well pointing and other conventional methods of dewatering will not produce a dry trench bottom or where soil is unsuitable as a subgrade.
 - 3. Place stone 8" deep and 1'-0" wider than pipe barrel and carefully bed pipe to grade in stone.

3.09 SANITARY MANHOLES

- A. General:
 - 1. Set manholes elevations to inverts shown on schedules and on drawings.
 - 2. Unless otherwise shown, set tops of frames and covers flush with finish surface in graded or paved areas.
 - 3. In other locations set tops 3" above finish surface, unless otherwise indicated.
 - 4. Place 57 stone or gravel not less than 4" at the base of each manhole.
 - 5. Manholes shall be constructed of precast concrete.
- B. Locations: Construct manholes where shown on drawings.
- C. Precast Concrete Manholes:
 - 1. Install in accordance with approved shop drawings.
 - 2. Install in accordance with ASTM C 891.
 - 3. Manhole Steps:
 - a. Use epoxy compound where manhole steps are mortared into manhole walls.
 - b. Manhole Steps shall be installed in manhole such that forms one line perpendicular to the flow line except when safety ledges are installed.
 - c. Manholes steps shall be installed to align with safety ledges for manholes deeper than 15'-0".
 - 4. Joints:
 - a. Provide rubber joint gasket complying with ASTM C443 at joints of sections.
 - b. Joints to be either approved neoprene seal or rubber gasket.
 - c. The neoprene seal can be replaced with two (2) separate layers of approved 1" mastic or one (1) layer of approved 3" mastic. Mastic to be placed on the flat portions of the precast section connections.
 - d. Joints to be grouted on inside and outside.
 - e. All joints shall be watertight.
- D. Manhole Drops:
 - 1. New Manholes: Outside drops shall be installed on manholes where invert of sewer line entering the manhole is 18" or more from the invert of the manhole.
 - 2. All Drops shall be ductile iron.
- E. Manhole Inverts: Construct in accordance with applicable details and requirements contained herein:
 - 1. Invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent sewer section. Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of channels shall be made gradually and evenly.
 - 2. The inverts shall be formed directly in the concrete of the manhole base, or shall be built-up with brick and mortar, or shall be half tile laid in concrete, or shall be constructed by laying full section of sewer pipe through manhole and breaking out top half after surrounding concrete has hardened.
 - 3. Pipe connections to manhole shall be made using water stops, standard "O" ring joints, special manhole couplings, or shall be made in accordance with manufacturer's recommendations.
 - 4. The floor of the manhole outside the channels shall be smooth and shall slope towards the channels at not less than 1 inch per foot not more than 2 inches per foot.
 - 5. Free drop within manhole shall not exceed 1'-6" measured from invert of inlet pipe to the top of the floor of

the manhole outside of the channels. Drop manholes shall be constructed whenever the free drop exceeds 1'-6".

- F. Sampling manholes: Contractor shall install a sampling manhole at the discharge location of the grease trap.
 - 1. Manhole shall have a maximum of 1'-6" and a minimum of 6" drop from grease trap to invert of manhole.
 - 2. No other connections or laterals shall be allowed to connect to this manhole.

3.10 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures, so finished work conforms nearly as practicable to requirements specified for new work.
 - 1. All tap connections into Precast or existing structures shall be cored.
 - 2. Breakouts in precast or existing are NOT allowed.
 - 3. Connections to existing manholes the invert is to be removed or corrected for new line.
 - 4. Drop Connections to Existing manholes:
 - a. When taping into existing the connection shall be within 18" on bottom of manhole or an outside drop shall be installed.
 - b. Drops shall be installed outside the manholes where the manhole depth is greater than 8'-0" in depth
 - c. Drops shall be installed inside the manholes where the manhole depth is greater than 8'-0" in depth
- B. Use commercially manufactured wyes for branch connections.
 - 1. Field cutting into piping not permitted.
 - 2. Spring wyes into existing line and encase entire wye, plus 6" overlap, with min. 6" of 3,000 psi 28-day compressive strength concrete.
 - 3. Spring wye into existing line where branch connections made from side into existing 4" to 21" piping and encase entire wye with min. 6" of 3,000 psi 28-day compressive strength concrete.
 - 4. For branch connections from side into existing 24" or larger piping or to underground structures, cut opening into unit sufficiently large to allow 3" of concrete to be packed around entering connection.
 - a. Cut ends of connection passing through pipe or structure wall to conform to shape of, and be flush with, inside wall, unless otherwise indicated.
 - b. On outside of pipe or structure wall, encase entering connection in 6" of concrete for min. length of 12" to provide additional support or collar from connection to undisturbed ground.
 - c. Provide concrete which with min. 28-day compressive strength of 3,000 psi, unless otherwise noted.
 - 5. Use epoxy bonding compound as interface between new and existing concrete and piping materials.
- C. Take care while making tap connections to prevent concrete or debris from entering existing piping or structure.
- D. Remove debris, concrete, or other extraneous material, which may accumulate.

3.11 BACKFILLING (see trenching section for information)

- A. General: Conduct backfilling operations of open-cut trenches closely following laying, jointing, and bedding or pipe, and after initial inspection and testing completed.
- B. To minimize local area traffic interruptions, allow max. 100' between pipe laying and point of complete backfilling.

3.12 JACK AND BORE

A. General:

1. Jack and bore is required on all utility crossing on right-of-ways belonging to the public and where indicated on drawings.
2. Installation requirements.
 - a. Casing shall be welded steel for entire length.
 - b. Casing shall be sealed at each end.
 - c. Pipe in Casing shall be Ductile Iron Pipe.
 - d. Casing Spacers shall be Stainless Steel.
 - e. Empty Casings shall be filled with gout and sealed.
 - f. Casing should extend a minimum of 10' beyond edge of pavement. Casing shall be extended to avoid obstructions such as ditches, other utilities or sidewalks.
 - g. Casing should be constructed in accordance with Georgia Department of Transportation requirements and the local authority having jurisdiction.

3.13 FIELD QUALITY CONTROL

A. General:

1. Inspection of the sewers should include visual inspections, deflection testing (mandrel) lamping and/or laser alignment. Deflection testing and low pressure testing should be conducted on all gravity sewer sections.
2. Perform testing of completed piping in accordance with local authorities having jurisdiction.
3. All testing shall be performed and/or paid for by contractor.
4. All testing shall be witnessed by Architect/ Engineer and shall meet requirements of local jurisdiction

B. Hydraulic Testing (infiltration)

1. Infiltration testing shall be performed in accordance with ASTM C 1091 (infiltration) and/or ASTM C969 and shall generally include the following:
 - a. Plug the upper inlet end of the test section including laterals.
 - b. At the lower end (outlet), collect the water and measure the quantity collected within a specific time in a calibrated container after a constant flow is generated at the pipe section outlet.
 - c. An alternate measurement is to use a calibrated weir installed at the outlet.
2. Infiltration of ground water between any two adjoining manholes shall not exceed 25 gallons per inch diameter per mile of pipe per day. When leakage exceeds this amount, the sewer shall not be accepted until repaired and retested.
3. Testing indicated shall be performed by contractor and witnessed by Architect.
4. Additional Testing shall be performed by contractor and witnessed by Architect to meet requirements of local jurisdiction.

C. Interior Inspection:

1. Inspect piping to determine if line displacement or other damage occurred.
2. Make inspections after lines between manholes, or manhole locations, have been installed and approximately 2-ft of backfill is in place, and again at completion of project.
3. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects, and reinspect.
4. Additional test for infiltration, deflection, lateral deflection and leakage shall be required if initial tests are failed.

D. Deflection Testing: (Mandrel Test)

1. Deflection testing is required on all flexible pipes including PVC sewer pipe.
2. All deflection testing shall be performed in accordance with ASTM D3034, ASTM F679 and /or ASTM D2122.
3. Maximum deflection shall be 5 %.
4. A deflection testing shall be performed by pulling a Mandrel through the sewer line. This test shall be

- performed for each run of pipe.
5. Testing shall be performed by contractor and witnessed by Architect/ Engineer to meet requirements of local jurisdiction.

<u>Pipe Size</u>	<u>Mandrel Diameter</u>
8"	7.37"
10"	9.22"
12"	10.98"
15"	13.43"

E. Low Pressure Inspection:

1. A low Pressure air test shall be conducted on each section of sewer piping.
 - a. Prior to inspection each section of pipe shall be thoroughly cleaned and wetted.
 - b. Immediately after the pipe is clean and is water soaked, the sewer shall be tested in sections between manholes using air-lock balls.
 - c. Air shall be supplied slowly to the plugged section of sewer line until it reaches approximately 4.0 psi.
 - d. After the pressure is allowed to stabilize in the line approximately (3 to 5 minutes), the pressure may be reduced to 3.5 psi before starting the test.
 - e. The test shall be performed for a minimum of 5 minutes or in accordance with ASTM F1417 or UNI-B-6 (whichever time is longer).
 - f. If the line loses more than 1 psi of pressure in the time period the line fails and will need to be repaired or replaced.
 - g. If the line does not lose more than 1 psi of pressure in the time period the line passes.
 - h. Retesting is required on any portion of the line that fails the test.

F. Video Inspection:

1. Contractor to have video of inside entire length of all sewer lines including manholes after installation is complete and prior to line becoming active. Inspections after line is active are NOT acceptable.
2. The sewer line shall be cleaned prior to inspection
3. Clean water shall be place in the line prior to inspection to fill the pipe to the spring line and let run out. Then video inspection is to occur immediately after.
4. Four (4) copies of video on VHS format videotapes shall be sent to the Architect and one (1) copy to the local authority for review. Video to include the following information on the tape.
 - a. Firm conducting the test
 - b. Date and time
 - c. Location of test
 - d. Manhole locations

END OF SECTION 02530

SECTION 02720

STORM SEWAGE SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 WORK INCLUDED

- A. General: Extent of storm sewer system work shown on drawings and described herein includes, but not limited to:
 - 1. Storm sewer conduits
 - 2. Manholes, frames and covers
 - 3. Inlets, frames and gratings
 - 4. Head walls and end sections

1.03 REFERENCED STANDARD SPECIFICATIONS

- A. Georgia Department of Transportation "Standard Specifications for Highways and Bridges", 1983 edition.

1.04 RELATED WORK

- A. Extent of storm sewage systems work indicated on drawings and schedules, and by requirements of this Section.
- B. Refer to Division-2 section "Trenching" for excavation and backfill required for storm sewage systems; not work of this section.
- C. Refer to Division-3 sections for concrete work required for storm sewage systems; not work of this Section.
- D. Refer to Division-15 section "Storm Water Systems" for interior building systems including conductors, horizontal branches, and connections to roof and deck drains; not work of this section.

1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of storm sewage system's products of types, materials, and sizes required, whose products in satisfactory use in similar service for min. 5 years.
- B. Installer's Qualifications: Firm with min. 3 years of successful installation experience on projects with storm sewage work similar to that required for Project.
- C. Codes and Standards:
 - 1. Plumbing Code Compliance: Comply with applicable portions of Local and Standard Plumbing Code pertaining to selection and installation of storm sewage system's materials and products.
 - 2. Environmental Compliance: Comply with applicable portions of local Environmental Agency (Agency having Authority) regulations pertaining to storm sewage systems.

1.06 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for storm sewage system materials and products.

- B. Shop Drawings:
1. Submit shop drawings for storm sewage systems, showing piping materials, size, locations, and inverts.
 2. Include details of each underground structure, connection, and manhole. Show Invert and rim elevations. Each structure shall be shown separately in plan and profile. Generic precast information is not allowed.
 3. Provide table identifying pipe material for each pipe run. Pipe material is required to be indicated for each location.
 4. Copy of Ditch Diggers Certification
 5. Show interface and spatial relationship between piping and proximate structures.
- C. Record Drawings: At project closeout, submit record drawings of installed storm sewage piping and products, in accordance with requirements of Division 1.
- D. Maintenance Data:
1. Submit maintenance data and parts lists for storm sewage system materials and products.
 2. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with Division 1 requirements.
- E. Producer's Statement of Applicability:
1. Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 2. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 3. Statement also states that proposed application of product on project is suitable and proper.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials to be installed in Georgia Department of Transportation (GDOT) right-of-way shall meet the specifications and GDOT specifications and regulations.
- B. Contractor shall verify extent of work to be performed in the GDOT right-of-way with the approved permit drawings prior to ordering materials.

2.02 IDENTIFICATION

- A. Underground-Type Plastic Line Markers:
 1. Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; min. 6" wide x 4 mils thick.
 2. Provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".
 3. Manufacturers: Subject to compliance with requirements, provide identification markers of one of following:
 - a. Allen Systems Inc.
 - b. Emed Co., Inc.
 - c. Seton Name Plate Corp.

2.03 PIPE AND PIPE FITTINGS

- A. General: Provide pipe fittings (ells, tees, reducing tees, wyes, couplings, increasers, cross transitions, and end caps) and accessories of same material and weight/class as pipes, with joining method indicated.

- B. Material: Provide pipes of **ONE** of following materials, of weight/class indicated, unless otherwise indicated or specified.
- C. Reinforced Concrete Pipe: ASTM C 76, Class III unless otherwise indicated.
 - 1. Fittings: Reinforced concrete, same strength as adjoining pipe, tongue- and-groove gasketed joints complying with ASTM C 443.
 - 2. Sizes 15" Thru 84"
- D. High Density Polyethylene, Corrugated Pipe: HDPE; ASTM F2306 & AASHTO M-294; smooth interior.
 - 1. Fittings: Material to match pipe.
 - 2. Provide gaskets to form watertight connections meeting ASTM D3212
 - 3. Sizes 12" Thru 36"

2.04 ROOF DRAIN AND DOWN SPOUT PIPING AND FITTINGS

- A. Polyvinyl Chloride (PVC) Sewer Pipe: ASTM D 3034, Type PSM, SDR 35.
 - 1. Fittings: PVC, ASTM D 3034, solvent cement joints complying with ASTM D 2855 using solvent cement complying with ASTM D 2654; or elastomeric joints complying with ASTM D 3212 using elastomeric seals complying with ASTM F 477.
 - 2. Sizes 4" Thru 15"
- B. High Density Polyethylene, Corrugated Pipe: HDPE; ASTM F2306 & AASHTO M-294; smooth interior.
 - 1. Fittings: Material to match pipe.
 - 2. Provide gaskets to form watertight connections meeting ASTM D3212
 - 3. Sizes 15" Thru 18"

2.05 STORM SEWER MANHOLES

- A. General: Construct manholes of either pre-cast concrete or masonry as described herein:
 - 1. Precast reinforced concrete storm sewer manholes, complying with ASTM C 478.
 - 2. Unit masonry for storm sewer manholes to comply with:
 - a. Concrete Masonry Units: ASTM C 139-73 (1989).
 - b. Manhole Brick: ASTM C 32-73 (1990); Grade MS.
 - c. Sewer Brick: ASTM C 32-73 (1990); Grade SS.
 - d. Masonry Mortar: ASTM C 270-89 Type M.
- B. Top: Construct manhole tops of precast concrete complying with ASTM C 478-90b, with minimum structural capacity to support AASHTO H20 wheel loadings, of sizes indicated and as follows:
 - 1. Of concentric cone, eccentric cone if structure greater than 4'-0" in depth.
 - 2. Of flat slab top type if structure 4'-0" or less in depth.
- C. Base: Cast-in-place or Precast concrete, with base riser section and separate base slab, or base riser section with integral floor, as indicated.
- D. Steps:
 - 1. Ductile-iron or aluminum, ASTM A 48-83 (1990), Class 30B, integrally cast into manhole sidewalls, unless noted otherwise.
 - 2. Injected molded copolymer polypropylene around a 1/2" ASTM A-615 Grade 60 steel bar, meeting or exceeding ASTM C-478 and AASHTO M-199, integrally cast into basin sidewalls.
- E. Frame and Cover: Ductile-iron, ASTM A 48-83 (1990), Class 30B, 26" diameter cover, heavy-duty, indented top design, with lettering cast into top reading "STORM SEWER", the statement that "DO NOT POLLUTE DRAINS TO STREAM" and the fish symbol.

- F. Pipe Connections: Resilient, complying with ASTM C 923.

2.06 CATCH BASINS / DRAINAGE INLETS

- A. General: Construct catch basins of either pre-cast concrete or masonry as described herein:
1. Precast reinforced concrete catch basin, complying with ASTM C 478.
 2. Structure may be round or square.
 3. Unit masonry for catch basins be solid and to comply with:
 - a. Manhole Brick: ASTM C 32-73 (1990); Grade MS.
 - b. Sewer Brick: ASTM C 32-73 (1990); Grade SS.
 - c. Masonry Mortar: ASTM C 270-89 Type M.
- B. Top: Construct catch basin tops of precast concrete complying with ASTM C 478-90b, with minimum structural capacity to support AASHTO H20 wheel loadings, of sizes indicated and as follows:
1. Of concentric cone, eccentric cone if structure greater than 4'-0" in depth.
 2. Of flat slab top type if structure 4'-0" or less in depth.
- C. Base: Cast-in-place or Precast concrete, with base riser section and separate base slab, or base riser section with integral floor.
- D. Steps:
1. Ductile-iron or aluminum, ASTM A 48-83 (1990), Class 30B, integrally cast into basin sidewalls.
 2. Injected molded copolymer polypropylene around a 1/2" ASTM A-615 Grade 60 steel bar, meeting or exceeding ASTM C-478 and AASHTO M-199, integrally cast into basin sidewalls.
- E. Frame and Grate:
1. Standard: Ductile-iron, ASTM A 48-83 (1990), Class 30B, flat grate, heavy-duty, of size indicated.
 2. Locking : Ductile-iron, ASTM A 48-83 (1990), Class 30B, flat grate, heavy-duty, of size indicated and able to be secured to prevent entry with countersunk pentagonal-head-bolt-operated.
 3. All manhole covers, grates and tops shall bear the Statement that "DO NOT POLLUTE DRAINS TO STREAM" and the fish symbol.
- F. Pipe Connectors: Resilient, complying with ASTM C 923.

2.07 OUTFALLS

- A. General: For headwalls larger than 24" contractor to provide safety grate to prevent entry. Grates shall be constructed from extruded aluminum. Grates shall be removed for easy access and cleaning. Headwalls in areas enclosed by chain link fence (detention pond) are not required to have safety grates.
- B. Flared Ends: Unless indicated otherwise pipe outfalls to be constructed using flared end sections of piping in accordance with the following.
1. Corrugated Metal Pipe: Precast reinforced concrete pipe with flared end and adapter fitting.
 2. Reinforced Concrete Pipe: Precast reinforced concrete pipe flared end section of construction to match piping.
 3. High Density Polyethylene Corrugated Pipe: Precast reinforced concrete pipe flared end and adapter fitting.
- C. Head-Walls: Where Concrete, PVC or Metal piping is utilized or where indicated on drawings provide cast-in-place concrete head walls in accordance with the following.
1. Construct of cast-in-place concrete as indicated, with reinforced headwall, apron, and tapered sides.
 2. Headwall shall meet GADOT Standard 1001A for straight, U type wing and 45° wings. Contractor to choose style unless specified.

- D. Safety Slope end Sections – Metal safety slope end section shall be provided for all pipe ends as headwalls along Georgia Department of transportation Right-of-ways. End sections to comply with State of Georgia Department of Transportation, "Standard Specifications, Construction of Roads and Bridges".
- E. Rip-Rap: Comply with Section 603, State of Georgia Department of Transportation, "Standard Specifications, Construction of Roads and Bridges"; Latest Edition.
 - 1. Provide a mixed of Type 1 and Type 3 rip-rap at every outfall to prevent washout.
 - a. Up to 24" pipes provide a minimum of 15 c.y.
 - b. Over 24" pipes provide a minimum of 25 c.y.
 - 2. Geotextile under liner : AASHTO M-288, type 1

2.08 TRENCH DRAINS

- A. Cast in Place: Unless indicated otherwise trench drains to be constructed using in accordance with the following.
 - 1. Grates shall be Ductile-iron, ASTM A 48-83 (1990), Class 30B
 - 2. Grates located across sidewalks shall be pedestrian grade
 - 3. Trench Drains shall be constructed of using 4000psi concrete.
- B. Precast: Unless indicated otherwise trench drains to be constructed using in accordance with the following
 - 1. Channels shall be constructed using interlocking polymer concrete and be able to withstand the following.
 - a. Compressive strength 15,000 psi
 - b. Tensile strength 2,800 psi
 - c. Flex strength 3,000 psi
 - 2. Grates shall meet the following
 - a. Across Sidewalks
 - 1) Stainless Steel
 - 2) Pedestrian grade.
 - 3) Design load: 210 psi
 - 4) Lockable/screw down
 - b. Across roadways
 - 1) Ductile Iron
 - 2) Design load: 850 psi
 - 3) Rust Protection Coated
 - 3. Joints and sealants shall be constructed in accordance with manufactures specification.
 - 4. Contractor to provide all fittings, buckets, basins, end caps and outlet caps necessary to complete the drain
- C. Slotted Drain: Unless indicated otherwise trench drains to be constructed using in accordance with the following
 - 1. Channels shall be constructed using interlocking polymer concrete and be able to withstand the following.
 - a. Compressive strength 15,000 psi
 - b. Tensile strength 2,800 psi
 - c. Flex strength 3,000 psi
 - 2. Joints and sealants shall be constructed in accordance with manufactures specification.
 - 3. Contractor to provide all fittings, buckets, basins, end caps and outlet caps necessary to complete the drain
 - 4. Contractor to supply owner with cleaning tool necessary to maintain.

2.09 YARD DRAIN AND INLINE DRAINS

- A. General: Provide yard drain and inline drains as indicated. Unless indicated otherwise trench drains to be constructed using in accordance with the following. These drains shall not be used under pavement for vehicular traffic.

- B. Yard Drain shall be constructed of high density polyethylene. Provide watertight connections in accordance with ASTM 3212. Inlet shall also meet ASTM 3034 and ASTM F1336. Structure shall be heavy duty and capable of handling an H-25 rating.
 - 1. Grate shall be ductile iron with a minimum of 24" in diameter. All Grates shall be heavy duty and capable of handling an H-25 rating.
 - 2. Concrete collar is required at top of structure. The concrete shall extend a minimum of 1'-0" around structure.
- C. Inline Drain shall be constructed of pipe in accordance with the following:
 - 1. Polyvinyl Chloride (PVC) Sewer Pipe: ASTM D 3034, Type PSM, SDR 35.
 - a. Fittings: PVC, ASTM D 3034, solvent cement joints complying with ASTM D 2855 using solvent cement complying with ASTM D 2654; or elastomeric joints complying with ASTM D 3212 using elastomeric seals complying with ASTM F 477.
 - b. Sizes 4" Thru 15"
 - 2. High Density Polyethylene, Corrugated Pipe: HDPE; ASTM F2306 & AASHTO M-294; smooth interior.
 - a. Fittings: Material to match pipe.
 - b. Provide gaskets to form watertight connections meeting ASTM D3212
 - c. Sizes 15" Thru 18"
 - 3. Only pipes and fitting associated with the installation shall be used.
 - 4. Grate top: shall be ductile iron with a minimum of 15" in diameter. All Grates shall be heavy duty and capable of handling an H-10 rating.
 - 5. Concrete collar is required at top of structure. The concrete shall extend a minimum of 1'-0" around structure.

2.10 DRYWELLS

- A. General: Provide precast reinforced concrete drywalls as indicated, constructed of precast perforated concrete rings, with 6" minimum thickness solid concrete floor 12" larger in diameter than concrete rings, and lift-off type concrete cover with cast-in lift rings.
- B. Drywells shall be provided at each exterior door with a exterior sand or gate trap.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Contractor to examine areas and conditions, under which storm sewer system work installed.
 - 1. Notify Architect in writing of conditions detrimental to proper and timely completion of Work.
 - 2. Do not proceed with installation until unsatisfactory conditions corrected in manner acceptable to Architect.

3.02 INSTALLATION OF IDENTIFICATION

- A. General: During back-filling/top-soiling of storm sewage systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade.

3.03 INSTALLATION OF PIPE AND PIPE FITTINGS

- A. Installation of Piping and storm material shall not begin until detention or sediment structures are installed. Refer to Earthwork section 02300 and Erosion, Sedimentation and Pollution Control section 02370.
- B. General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements indicated.
 - 1. Refer to Trenching specification 02321 for requirements of bedding.
 - 2. Inspect piping before installation to detect apparent defects.
 - 3. Mark defective materials with white paint and promptly remove from site.

4. Lay piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert.
 5. All Metal and High Density Polyethylene Pipe to be installed and moved using nylon slings. Slings are to be used according to manufactures recommendations. No chains or wire ropes are allowed.
 6. Place bell ends or groove ends of piping facing upstream.
 7. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.
- C. Installation: Install pipe and fittings of materials selected from approved materials noted above except as noted herein:
1. Where pipes extend under paved areas (drives, pads, parking) and the pipe has a minimum of 12" of coverage use either cast iron or reinforced concrete piping; other materials listed not acceptable.
 2. Where pipes extend under paved areas (drives, pads, parking) and the pipe has less than 12" of coverage use either cast iron or reinforced concrete piping; other materials listed not acceptable. Encase pipe in 6" concrete sleeve, reinforced with WWM.
- D. Reinforced Concrete Pipe shall be installed in the following locations
1. In Public right-of-ways or easements.
 2. Lines that have fill deeper than fifteen (15) feet.
 3. Lines that have less than one (1) foot of cover.
 4. Lines located in live streams, branches or creeks.
- E. Utility System Trenching:
1. Refer to Section 02321, "Trenching"; comply with requirements therein.
- F. Cast-Iron Soil Pipe: Install in accordance with applicable provisions of CISPI "Cast Iron Soil Pipe & Fittings Handbook".
1. After inspection and min. 48 hours before installation, apply high-build bituminous coating to external surfaces in single coat in accordance with manufacturer's recommendations to attain min. dry-film thickness of 12 mils.
 2. Install as specified in similar Division 15 Specifications Sections.
- G. High Density Polyethylene Pipe: Install pipe and fittings in accordance with manufactures and the Corrugated Polyethylene Pipe Association recommendations.
1. Handle with care during installation to minimize damage to pipe.
 2. Gravel bedding shall be required (when needed) to obtain bedding requirements indicated by manufacturer.
 3. Install gaskets with bands at all joints; make watertight.
- H. Corrugated Metal and Metal Coated Pipe: Install in accordance with applicable provisions of NCSA "National Corrugated Steel Pipe Association Installation Manual".
1. Handle with care during installation to minimize damage to coating.
 2. Apply factory furnished bituminous coating to surfaces damaged during installation; remove and replace where field repairs cannot be made effectively.
 3. Install gaskets with bands at all joints; make watertight.
- I. Reinforced Concrete Pipe: Install in accordance with applicable provisions of ACPA "Concrete Pipe Installation Manual".
1. Inspect concrete piping prior to setting; chipped, cracked or otherwise damaged pipe shall not be used.
 2. Remove and replace damaged pipe with new.
 3. Lift holes shall be grouted
 4. Joints shall be grouted in accordance with Concrete Pipe Installation Manual.

- J. Plastic: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D 2321.
 - 1. Install in a water tight manner with joints and pipe capable of withstanding a 20'-0" pressure head.
 - 2. Install in a manner to avoid buoyancy when empty in place.

3.04 CLEANING PIPE (CONDUIT):

- A. General: Keep interior of conduit free of dirt and other superfluous materials as work progresses.
 - 1. Maintain swab or drag in line and pull past each joint as completed.
 - 2. In large, accessible piping, use brushes and brooms for cleaning.
 - 3. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.
 - 4. Flush lines between manholes if required to remove collected debris.

3.05 CONNECTIONS AND JOINTS:

- A. Joint Adapters: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose or at manholes and inlets.
 - 1. Make changes in direction or grade at manholes, inlets or with standard fittings.
 - 2. Connect intersecting lines with structures (manholes or inlets) or standard fittings.
- B. Roof Drain, Downspout and Condensate Connections:
 - 1. Connect roof drains Downspout and condensate lines to storm drains connections with PVC and smooth interior HDPE pipe manufactured fittings. Only manufactured tee, wyes, reducers, elbows, and cross fittings shall be used. The fittings shall be supplied by manufacturer.
 - 2. Make fittings watertight, adequate to resist pressure head of 20 ft. of water.

3.06 CLEAN-OUTS:

- A. Where indicated or required, provide and install cleanouts.
 - 1. Unless noted otherwise cleanouts to be placed on roof drain lines and laterals less than 12" in diameter.
- B. Provide cleanouts at a maximum of 100'-0" on center, at changes in direction or elevation and at ends of line unless a grade inlet or manhole is located where cleanout is scheduled to be installed.
- C. Extend full size off set line from trunk line to grade using a sweeping "Y" and straight sections as necessary. Transition from full size pipe to a 6" pipe and terminate pipe perpendicular to grade; flush with grade.
 - 1. Provide ductile iron from line to surface including sweeping "Y" and straight sections as necessary.
 - 2. Provide minimum of 16" square; 6" deep concrete pad at clean out.
 - 3. Provide flush screw-on brass top to cap pipe.

3.07 CLOSING ABANDONED UTILITIES:

- A. Close open ends of abandoned underground utilities indicated to remain in place.
- B. Provide sufficiently strong closures to withstand hydro-static or earth pressure resulting after ends of abandoned utilities closed.
- C. Close open ends of concrete or masonry utilities with min. 8" thick brick masonry bulkheads.
- D. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of materials being closed; wood plugs not acceptable.

3.08 INTERIOR PIPE INSPECTION:

- A. Inspect piping to determine if line displacement or other damage occurred.
- B. Make inspections after lines between manholes, or manhole locations, installed and approximately 2' of backfill in place, and again at completion of project.
- C. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects, and re-inspect.

3.09 DRAINAGE STRUCTURES

- A. General: Set manholes, inlets and head walls to elevations and at locations shown and scheduled.
 - 1. Lines shall be set straight, true and to specified slope.
 - 2. Provide inlet, or manhole at each change in direction of piping, whether specifically shown on drawings or not.
 - 3. All Structures shall be placed on gravel bed not less than 12" of stone.
 - 4. Square grates shall be oriented so that they align with adjacent surfaces (sidewalks, building, curb and gutter).
- B. Piping / Drainage:
 - 1. Extend storm drain piping completely through wall of structure and into structure 1".
 - 2. Seal, watertight around piping where it enters structure.
 - 3. Where pipe length is greater than required above, cut excess piping and remove.
 - 4. Form smooth, rounded concrete channels from pipe inlet inverts to pipe outlet invert in order to promote smooth drainage.
- C. Pre-Cast Structures: Install pre-cast manhole as indicated on contract documents and approved shop drawings.
 - 1. Minimum wall thickness of manhole to be 6" unless noted otherwise.
 - 2. Install in accordance with ASTM C 891.
 - 3. Provide rubber joints gasket complying with ASTM C 443-a (1990) at joints of sections.
 - 4. Use epoxy bonding compound where manhole steps mortared into concrete walls.
- D. Masonry Structures:
 - 1. Mix mortar with only enough water for workability.
 - a. Retempering of mortar not permitted.
 - b. Keep mortar mixing and conveying equipment clean.
 - c. Do not deposit mortar upon, or permit contact with, ground.
 - 2. Lay masonry in mortar to form full bed with ends and side joints in one operation, and with full bed vertical joints, no more than 5/8" wide.
 - a. Protect fresh masonry from freezing and from rapid drying.
 - b. Minimum wall thickness to be 8"; excluding mortar coating.
 - c. Apply 1" thick mortar coating on both interior and exterior wall surfaces.
 - 3. Use epoxy bonding compound where manhole steps mortared into masonry walls.

3.10 STORM DRAINAGE MANHOLES

- A. General: Construct manholes of pre-cast concrete or masonry (sewer brick or CMU) in accordance with materials listed above.
- B. Where manholes occur in pavements, set tops of frames and covers flush with finish surface; elsewhere, set tops 3" above finish surface, unless otherwise indicated.

3.11 CATCH BASINS

- A. General: Construct catch basins to sizes and shapes indicated of either pre-cast concrete or masonry (sewer brick or CMU) as described above.
- B. Set frames and grates to elevations indicated, except as noted.
 - 1. Set top of inlet frame at 3" below adjacent grades.
- C. Drain finished grades to and into inlet so as to allow for proper drainage.

3.12 OUTFALLS

- A. General: Construct of concrete with 28-day min. compressive strength of 3000 psi.
- B. Provide flared end sections where indicated.
- C. Construct head walls to sizes and shapes indicated.
- D. For headwalls larger than 24" contractor to provide safety grate to prevent entry. Grates shall be constructed from extruded aluminum. Frame shall be easily removed for cleaning.
- E. Install stone rip-rap at head walls to shapes designated per plans and details.

3.13 DRYWELLS

- A. General: Install as indicated, set on undisturbed native soil.
- B. Fill: Pack around drywell with 1" to 2" size of crushed rock or gravel, to min. 12" beyond drywell perimeter, and full depth of drywell.

3.14 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures, so that finished work conforms nearly as practicable to requirements specified for new work.
- B. Use commercially manufactured wyes for branch connections.
 - 1. Field cutting into piping not permitted.
 - 2. Spring wye into existing line where branch connections made from side into existing 4" to 21" piping and encase entire wye with min. 6" of 3000 psi 28-day compressive strength concrete.
 - 3. For branch connections from side into existing 24" or larger piping, or to underground structures, cut opening into unit sufficiently large to allow 3" of concrete packed around entering connections.
 - a. Cut ends of connection passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated.
 - b. On outside of pipe or structure wall, encase entering connection in 6" of concrete for min. length of 12" to provide additional support or collar from connection to undisturbed ground.
 - c. Provide concrete with min. 28-day compressive strength of 3000 psi, unless otherwise indicated.
 - 4. Use epoxy bonding compound as interface between new and existing concrete and piping materials.
- C. Take care while making tap connections to prevent concrete or debris from entering existing piping or structure.
- D. Remove debris, concrete, or other extraneous material, which may accumulate.

3.15 BACKFILLING

- A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing completed.
- B. To minimize local area traffic interruptions, allow max. 100' between pipe laying and point of complete backfilling.

3.16 FINAL CLEANUP

- A. Structures
 - 1. All Structures to have lift rings removed.
 - 2. Lids and grates to shall be accessible
 - 3. All Cast iron to be free of asphalt, concrete and silt
 - 4. All cast iron to be painted black with a rust preventing paint.
- B. Pipe
 - 1. Shall be clean of silt and trash.
- C. Headwalls and outlet structures
 - 1. Shall be free of silt on apron and rip rap.

3.17 FIELD QUALITY CONTROL

- A. Testing:
 - 1. Perform testing of completed piping in accordance with local authorities having jurisdiction.
 - 2. Testing indicated shall be performed by contractor and witnessed by Architect.
 - 3. No visible leaks are allowed. Any leaks shall be repaired regardless of amount of leakage.
 - 4. Additional Testing shall be performed by contractor and witnessed by Architect to meet requirements of local jurisdiction.
- B. Interior Inspection:
 - 1. Inspect piping to determine if line displacement or other damage occurred.
 - 2. Make inspections after lines between manholes, or manhole locations, have been installed and approximately 2-ft of backfill is in place, and again at completion of project.
 - 3. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects, and reinspect.
 - 4. Additional test for infiltration, deflection, lateral deflection and leakage shall be required if initial tests are failed.
- C. As-Built Records: The contractor shall retain a licensed surveyor to make 'as-built' survey of all water lines and appurtenances, all sanitary and storm lines and structures, and all ditches, detention ponds and other facilities. Survey shall be extensive enough to locate facilities horizontally to the nearest 0.10' on grid, and to the nearest 0.02' vertically for lines and structure inverts and to the nearest 0.10' for ground shots. Furnish sufficient information to accurately map grades detention ponds and ditches and other drainage systems and components.
 - 1. Contractor shall present to the architect the completed as-built survey maps signed and sealed and certified as being accurate by the registered land surveyor.
- D. Contractor shall certify that sewer lines are laid straight and true to line and grade.
- B. Video Inspection:
 - 1. Contractor to have video of inside entire length of all storm sewer lines meeting the following conditions
 - a. Pipes with a diameter less than 12"
 - b. Roof Drains or Down spout lines
 - c. Storm line with out access points at both end of the pipe

- d. Storm Lines connected to yard drains or PVC Manufactured structures.
 - 2. Video shall be performed after installation is complete for a minimum of 2 months. The storm sewer line shall be cleaned prior to inspection.
 - 3. Clean water shall be place in the line prior to inspection to fill the pipe to the spring line and let run out for smaller diameter pipes (12" or less). For larger diameter pipes contractor to clean pipe (12" or larger). Then video inspection is to occur immediately after.
 - 4. Four (4) copies of video on VHS format videotapes shall be sent to the Architect for review. Video to include the following information on the tape.
 - a. Firm conducting the test
 - b. Date and time
 - c. Location of test
 - d. Manhole locations
 - 5. Areas failing the video inspection shall be re installed and video inspections shall be performed on places corrected.
- E. Back Fill Compaction Testing: Provide following minimum number of passing field density tests for each 24" depth of compacted backfill. Tests to be performed at completion of compaction of each layer of fill.
- 1. Under buildings and paving: 1 test per 100 LF
 - 2. Graded (Lawn) areas and shoulders: 1 test per 200 LF
 - 3. Other areas: 1 test per 200 LF

END OF SECTION 02720

SECTION 02744**BITUMINOUS CONCRETE PAVEMENT (SUPERPAVE)****PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of asphalt concrete paving work shown on drawings.
- B. Prepared graded aggregate sub-base is specified in this section.
- C. Saw-cutting of edges of existing pavement is specified in this section.

1.03 QUALITY ASSURANCE

- A. Qualifications of Asphalt Concrete Producer: Producer engaged in acceptable operation of production of hot-mix hot-laid asphalt concrete for min. of 5 years.
- B. Codes and Standards: Comply with Department of Transportation, State of Georgia "Standard Specifications, Construction of Roads and Bridges", 2001 edition, hereinafter noted as "Standard Specifications" except for modifications or additions as specified herein.
 - 1. Contractor keep current copy of Standard Specifications on file at site.
 - 2. Where terms in Standard Specifications used, intent understood as follows (except for work on State Right-of-Way, for which the following terms shall have both the original and the modified meaning as follows):
 - a. "State" = Owner.
 - b. "Department" = Architect and/or Owner's representative.
 - c. "Engineer" = Owner's representative.
 - d. "Proposal Form" = Proposal, General or Special Conditions or Technical Specifications.
 - 3. Modify Standard Specifications by deletion references to method of measurement and basis for payment in Section 109.
 - 4. Comply with local governing regulations if more stringent than herein specified.
- C. Testing: By independent laboratory in accordance with ASTM E 329, approved and directed by Architect.
 - 1. Payment: In accordance with Section 01450 - Quality Control Services.
 - 2. Areas found not in compliance corrected and retested at no cost to Owner.
- D. Training: Provide on site, at all times, at least one person who is thoroughly trained and experienced in skills required, who shall be completely familiar with design and application of work described, and who shall be present during progress of work herein specified and who shall direct work performed under this section.
- E. Allowable Tolerances: In-place pavement not to exceed following:
 - 1. Thickness of Base Course: $\frac{1}{2}'' \pm$.
 - 2. Thickness of Surface Course: $\frac{1}{4}'' \pm$.
 - 3. Surface Smoothness of Base Course: $\frac{1}{4}''$ in 10'-0".
 - 4. Surface Smoothness of Surface Course: $\frac{3}{16}''$ in 10'-0".

1.04 SUBMITTALS

- A. Producer's Qualifications: Certification of asphalt concrete producer's qualifications.
- B. Manufacturer's Instructions: Standard application instructions for prime coats modified for specific project requirements.
- C. Submittal data to architect for review a min. of 45 days prior to beginning paving operation.
- D. Base Course
 - 1. Origin of material and certification of material
 - 2. Graduation of soil per testing requirements. One test is required per pit used
 - 3. Soil Cement ratio design to be submitted prior to beginning stamped and signed by a Georgia Registered Engineer.
- E. Pavement Striping materials
- F. Job-Mix formula (Sampling and Testing):
 - 1. Bituminous Plant Mix Surface Course: Applied in accordance with Standard Specifications.
 - a. Roads: Type "12.5 mm Superpave".
 - b. Parking Lots and their connecting drives: Type "9.5 mm Superpave".
 - 2. Bituminous Pavement Mixture estimated at more than 300 tons, less than 1000 tons: Submit job-mix formula with pertinent laboratory and field test data to Architect for review and approval min. 45 days prior to beginning paving operation.
 - 3. Sampling and Testing: Submit specified data, including Marshal test properties, for approval by Owner's representative.
 - a. Laboratory to notify of satisfactoriness of proposed design mix prior to beginning of placement of pavement.
 - b. Such data not required on mix estimated at 300 tons or less; see below.
 - c. Contractor perform density tests of compacted base course, compacted bituminous binder and surfaces courses as directed, at no additional cost to Owner.
 - 4. Bituminous Pavement Mixture estimated at 300 tons or less: Provide manufacturer's certificates of compliance for materials, job-mix formula and copies of tests of bituminous plant mixture furnished for project.
 - a. Provide sampling and testing for job quality control as specified under Part 3 Article entitled "Testing".

1.05 BONDS AND PERMITS

- A. Work Performed on Department of Transportation Right-of-Way: Where work indicated to be performed on Department of Transportation right-of-way the Owner will be responsible for:
 - 1. Either placing money in an escrow account or obtain and pay for a bond in the amount required by the Department of Transportation.
 - 2. Obtaining Department of Transportation Permit.
- B. Work Other Than in Department of Transportation Right-Of-Way: Where work performed in areas other than in Department of Transportation right-of-way the Contractor shall be responsible for all bonds and permits required by agencies having jurisdiction.

1.06 SITE CONDITIONS

- A. Manufacturer, transportation and application of materials to meet Industry Standards for job conditions at site.
- B. Provide subgrade for support of paving prepared and compacted as specified in Division-2 section "Earthwork".

- C. Do not begin paving work until all underground work of other subsurface system trades completed at designated elevations, including:
 - 1. Adjacent curbs.
 - 2. Curb and gutter.
 - 3. Walks.
 - 4. Valve boxes.
 - 5. Manholes and inlet frames.

- D. Inspect job conditions preventing execution of work specified.
 - 1. Verify that subgrades compacted as specified and to elevations and slopes indicated.
 - 2. Do not proceed until unsatisfactory conditions corrected.

- E. Weather Limitations:
 - 1. Apply prime and tack coats when ambient temperature above 50° F. (10° C.), and when temperature not below 40° F. (1° C.) for 12 hours prior to application.
 - 2. Do not apply when base wet or contains excess of moisture.
 - 3. Construct asphalt concrete surface course when atmospheric temperature above 40° F. (4° C.), and when base dry.
 - 4. Place base course when min. air temperature above 30° F. (-1° C.) and rising.

- F. Grade Control: Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Use only materials in accordance with requirements of Standard Specifications and as specifically referenced hereinafter.

- B. Base Course Construction
 - 1. General
 - a. Install type and thickness of base course as indicated on drawings.
 - b. All base course materials shall meet or exceed requirements of the Georgia Department of Transportation.

 - 2. Soil Base Material (Sand-Clay)
 - a. This material shall be composed of natural or artificial mixtures of clay and soil binder or other aggregates. The mixture shall be free of injurious materials.
 - b. Boulder larger than 2" shall be removed from the mixture.
 - c. The fraction passing the N0. 40 Sieve shall meet the following:
 - (1) Liquid Limit (LL) no more than 25.
 - (2) Plastic Index (PI) of not more than 9.

- d. Graduation of soil shall meet the following:

<u>Requirements</u>	<u>Percent by Weight</u>
Passing 2 inch sieve	100
Passing 1-1/2 inch sieve	95-100
Passing 3/4 inch sieve	60-97
Passing No. 10 sieve	25-55

<u>Material Passing No. 10 Sieve</u>	<u>CLASS A</u>	<u>CLASS B</u>
Passing No. 10 sieve	100	100
Passing No. 60 sieve	15-60	15-85
Passing No. 200 sieve	9-30	9-35
Clay (8 minutes suspension on Elutriation test)	9-15	9-25
Volume Change (% maximum)	12	12
Maximum Density (#/CF)	110+	110+

- e. Testing: Method of testing shall be in accordance with the following:

(1) Soil Graduation	GDT4
(2) Volume Change	GDT6
(3) Maximum Density	GDT 7 or GDT67
(4) Liquid Limit	AASHTO: T89
(5) Plastic Limit and Plastic Index	AASHTO: T90

3. Soil Cement

- a. Soil Cement shall consist of selected soil, which meets the requirements of Georgia Department of Transportation for Roadway Materials Class I. (IA1, IA2, or IA3)
- b. Soil Cement design shall be developed and stamped by a Georgia Professional Engineer and submitted for approval prior to beginning.
- c. Fly Ash shall meet the requirements of AASHTO M 295 Class ‘F’ or Class ‘C’
- d. Graduation of soil shall meet the following:

Class I – Roadway Material

	IA1	IA2	IA3
% Passing No. 60 Sieve	15-65	15-85	15-100
% Passing No. 200 Sieve	0-25	0-35	0-25
% Clay	0-12	0-16	0-12
% Change Volume	0-10	0-12	0-18
Maximum Dry Density*	115+	100+	98+

- Maximum Dry Density in (lb/ft3)

- e. Testing: Method of testing shall be in accordance with the following:

1) Soil Graduation	GDT: 4
2) Volume Change	GDT: 6
3) Maximum Density	GDT: 7 or GDT 67

4. Base Course Aggregate:
 - a. Shall be obtained from a Georgia Department of Transportation approved pit.
 - b. Course Aggregate shall be: Class A, Group I or II.
 - c. Graduation Requirements:

CLASS A – Aggregate base Course
Percent By Weight

<u>Sieve Size</u>	<u>Group I</u>	<u>Group II</u>
2" Sieve	100	100
1-1/2" Sieve	97-100	97-100
3/4" Sieve	60-95	60-90
No. 10 Sieve	25-50 *	25-45
No. 60 Sieve	10-35	5-30
No. 200 Sieve	7-15	0-15

- For Group I Aggregates having less than 37% passing the No. 10 sieve, a minimum of 9 % passing the NO. 200 sieve is required

- d. Testing: Method of testing shall be in accordance with the following:
 - 1) Soil Graduation GDT: 4
 - 2) Liquid Limit AASHTO: T89
 - 3) Plastic Limit and Plastic Index AASHTO: T90
- e. Use of recycled base material or crushed concrete is prohibited.

C. Bituminous Prime Coat:

1. Apply in accordance with Section 412 of Standard Specifications.
2. Prime Coat: Grade RC 30, MC 30, RC 70 or MC 70.
3. Application Rate: 0.20 to 0.30 gal./s.y.
4. Option: Emulsified asphalt if approved by Owner's representative.

D. Bituminous Tack Coat: If prime coat not fresh, clean and free of traffic marks, apply tack coat immediately prior to application of surface course.

1. Apply in accordance with Section 413 of Standard Specification.
2. Tack Coat: Emulsified Asphalt Grade SS-1
3. Application Rate: 0.08 to 0.15 gal./s.y.
4. Option: Cutback Asphalt if approved by Owner's representative.

E. Bituminous Hot Plant Mix Courses:

1. Surface and Binder Course:
 - a. Asphaltic Concrete as listed below:
 - 1) Composition:

Asphaltic Concrete	12.5mm Superpave	9.5 mm Superpave Level B	9.5 mm Superpave Level A
Coarse Aggregate Size	89 & Screenings	89 & Screenings	89 & Screening
Asphalt Cement, Viscosity Grade	MC-30	MC-30	MC-30

2) Approximate Job Mix Asphaltic Concrete:

Sieve Size	Percentage Passing		
	12.5mm Superpave	9.5 mm Superpave Level A	9.5 mm Superpave Level B
Asphaltic Concrete			
1 inch	-	-	-
¾ inch	100	-	-
½ inch	90 - 100	100	100
⅜ inch	70 - 85	90 - 100	90-100
No. 4	-	65-85	55-75
No. 8	34-39	53-58	42-47
No. 50	-	-	-
No. 200	3.5-7	4 - 7	4 - 7

3) Additional Requirements:

<u>Design Parameter</u>	<u>Design Criteria</u>
a. Percent of Maximum Specific Gravity (%G _{mm}) at the design number of gyrations, (N _d) (See Note 1)	96%
b. % G _{mm} at the initial number of gyrations (N _i)	Level A < 91.5% Level B < 90.5%
c. Fines to Effective asphalt binder ratio (F/P _{be})	
1) Asphaltic Concrete 9.5 mm Superpave (level A)	0.6-1.2
2) All Superpave mixtures exclude item 1	0.8-1.6
d. Tensile Strength (GDT 66)	
1) Ratio	
e. Retention of Coating	95% min.

*Note 1 – Maximum specific gravity (G_{mm}) determined in accordance with AASHTO T209

**Note 2 – A Tensile splitting ration of no less than 70% may be accepted so long as all individual test values exceed 100 psi (690kPa)

Percent Voids in mineral aggregate (VMA) at N _d	
Nominal Sieve size	Minimum % VMA
1 in (25mm)	12
¾ in (19mm)	13
½ in (12.5mm)	14
⅜ in (9.5 mm)	15

*VMA is to be determined based on effective specific gravity of the aggregate (G_{se}).

Mix Design	Percent Voids filled with asphalt (VFA) at N _d	
	Range % VFA	
	Minimum	Maximum
Level A	67	80
Level B	65	78
Level C	65	76
Level D	65	75

Superpave Gytratory Compaction Criteria		
Mix Design	Number of Gytrations	
	N _i	N _d
Level A	6	50
Level B	7	75
Level C	8	100
Level D	9	125

- F. Recycled Asphalt Pavement:
1. Limit the percentage of recycled asphalt pavement allowed in recycled mixes so that the overall amount of alluvial gravel does not exceed 5% of the total mix.
 2. Process recycled asphalt material so that 100 percent will pass the 2 in (50mm) sieve.
- G. Herbicide Treatment:
1. Commercial chemical for weed control, registered by Environmental Protection Agency.
 2. Provide granular, liquid, or wettable powder form.
 3. Manufacturers: Subject to compliance with requirements, provide products of one of following:
 - a. Allied Chemical Corp.
 - b. Achem Products, Inc.
 - c. Ciba-Geigy Corp.
 - d. Dow Chemical U.S.A.
 - e. E.I. DuPont De Nemours & Co., Inc.
 - f. FMC Corp.
 - g. Thompson-Hayward Chemical Co.
 - h. U.S. Borax and Chemical Corp.
- H. Pavement markings
1. Lane Marking Paint: Chlorinated rubber-alkyd type,
 - a. AASHTO M 248 (FS TT-P-115), Type II.
 - b. Manufactures
 - 1) Glidden
 - 2) Sherwin Williams
 - 3) Dulux
 2. Thermoplastic pavement markings: Shall be in accordance with Georgia Dot Specification section 653
 - a. Physical requirements: ASTM D476, Type II Rutile
 - b. Color, ASTM D 4960
 - c. Color retention ASTM D 620
 - d. Water absorption: No more than 0.5% (ASTM D570)
 - e. Glass Beads ASTM D1155
- I. Plastic Pavement Markers (Reflective road markers)
1. Plastic pavement markers shall be a minimum of 4"x4" and shall be installed in accordance with the "Manual on Uniform Traffic Control Devices"
 2. All devises shall be constructed to reflect light form headlights on two sides. Reflector shall be prismatic.
 3. Provide Standard Colors as required by other markings:
 - a. White
 - b. Yellow
 - c. White/red
 - d. Yellow/red
 4. All reflectors shall be installed using two part epoxy or bituminous adhesive.

- J. Wheel Stops: Precast of 3,500 psi air-entrained concrete, approximately 6" high, 9" wide, and 7'0" long, with chamfered corners and drainage slots on underside.

PART 3 - EXECUTION

3.01 GENERAL

- A. Construct bituminous paving including graded aggregate base course, prime coat, tack coat, bituminous overlay and/or bituminous binders and/or wearing surface in accordance with applicable sections of Standard specifications and details shown on drawings.
- B. Perform work on D.O.T. Right-of-Way according to plans and specifications except where otherwise required by D.O.T.
 - 1. Permit supersedes plans and specifications.
 - 2. Interpretations of Permit and other directions by Authorized D.O.T. officials shall govern.

3.02 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Proceeding with work identified in this section shall be construed as acceptance of conditions as being acceptable for work herein specified.

3.03 PREPARATION

- A. Complete the grading of sub-grades to the lines shown on the drawings and parallel to the finished elevations of the paved area, with allowances made for the thickness of the work to follow.
- B. Compact sub-grade using heavy equipment as recommended by geo-technical laboratory.
 - a. Upon completion of fill, compacting and grading, the sub-grade shall be compacted to 98% of its standard maximum dry density; unless noted or detailed otherwise.

3.04 SUBGRADE PREPARATION

- A. Contractor shall test Subgrade for clay content in soils.
- B. Remove loose material from compacted subbase surface immediately before applying herbicide treatment or prime coat.
- C. Construct Subgrade in accordance with Department of Transportation specification section 209.
- D. Contractor is responsible for any aeration and/or compaction necessary to obtain specified compaction of 100% of maximum dry density at optimum moisture in accordance with ASTM D-698.
- E. Proof roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.
- F. Notify Contractor of unsatisfactory conditions; do not begin paving work until deficient subbase areas corrected and ready to receive paving.
- G. Herbicide Treatment:
 - a. Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions.
 - b. Apply to compacted, dry subbase prior to application of prime coat.

3.05 BASE COURSE

A. General

- a. Install type and thickness of base course as indicated on drawings.
- b. Compact using rollers or hand tamps as necessary to bond and compact entire depth of base course to a 100% of maximum dry density at optimum moisture in accordance with ASTM D-698.

B. Soil Bases Material (Sand clay)

- a. All Soil base material shall be natural or mixed in place, transported, placed and compacted in accordance with Georgia Department of transportation Standards.
- b. Soil shall be approved prior to placement.
- c. One layer shall not exceed 6 inches.

C. Soil Cement

- a. All Soil Cement shall be mixed in place or plant mixed, transported, placed and compacted in accordance with Georgia Department of transportation Section 301

- b. Minimum Strength of Soil cement shall be as follows:

Thickness (inches)	Strength
6	300 psi
8	300psi
10	450psi
12	450 psi

- c. Contractor shall **NOT** Plow, Harrow or blade mix.
- d. Mixing shall not begin unless air temperature is above 40 degrees F. and rising and soil temperature in the subgrade shall be above 50 degrees F.
- e. Soil Cement to be spread using a metered spreader in accordance with GDOT requirements.
- f. One layer not to exceed 8 inches.

D. Graded aggregate Base Course

- a. Install graded aggregate base course to thickness indicated; if not indicated to minimum thickness as follows:
- b. Drives and parking areas other than those defined below: 8" thick after compaction.
- c. Service drives, kitchen drive, bus drive and parking: 8" thickness after compaction.
- d. Thickness to be placed
 1. Minimum thickness of 4" thick
 2. Maximum thickness of 8" thick

3.06 ASPHALT PREPARATION

A. Prime Coat:

- a. Apply at rate of 0.20 to 0.30 gal./s.y., over compacted sub-grade.
- b. Apply material to penetrate and seal, but not flood, surface.
- c. Cure and dry long as necessary to attain penetration and evaporation of volatile materials.

B. Tack Coat:

- a. Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement.
- b. Clean existing and contact surface prior to installing tack coat.
- c. Distribute at rate of 0.08 to 0.15 gal./s.y. of surface.
- c. Allow to dry until at proper condition to receive paving.

- d. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces.
- e. Remove and clean damaged surfaces.
- f. Allow adequate time for drying and curing prior to placement of asphaltic mix.

3.07 PLACING MIX

A. General:

- a. Place asphalt concrete mixture on prepared surface, spread and strike-off.
- b. Spread mixture at minimum temperature of 225° F. (107° C.).
- c. Place inaccessible and small areas by hand.
- d. Place each course to required grade, cross-section, and compacted thickness.
- e. Paving thickness to be as indicated; if not indicated minimum thickness after compaction to be 2" for 'light duty' pavement and 2-1/2" for 'heavy duty' pavement.

C. Paver Placing:

- a. Place in strips min. 10' wide, unless otherwise acceptable to Architect.
- b. After first strip placed and rolled, place succeeding strips and extend rolling to overlap previous strips.
- c. Complete base course for section before placing surface course.
- d. Joints:
 - 1. Make joints between old and new pavements or between successive days' work, to ensure continuous bond between adjoining work.
 - 2. Construct joints with same texture, density and smoothness as other sections of asphalt concrete course.
 - 3. Clean contact surfaces and apply tack coat.

3.08 ROLLING

A. General:

- a. Begin rolling when mixture bears roller weight without excessive displacement.
- b. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

B. Breakdown Rolling:

- 1. Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge.
- 2. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

C. Second Rolling:

- 3. Follow breakdown rolling soon as possible, while mixture hot.
- 4. Continue second rolling until mixture thoroughly compacted.

D. Finish Rolling:

- 5. Perform finish rolling while mixture still warm enough for removal of roller marks.
- 6. Continue rolling until roller marks eliminated and course attained maximum density.

E. Patching:

- 7. Remove and replace paving areas mixed with foreign materials and defective areas.
- 8. Cut-out such areas and fill with fresh, hot asphalt concrete.
- 9. Compact by rolling to max. surface density and smoothness.

F. Protection:

- 10. After final rolling, permit no vehicular traffic on pavement until cooled and hardened.
- 11. Erect barricades to protect paving from traffic until mixture cooled enough not to mark.

3.09 REMOVAL OF EXISTING PAVEMENT

- A. Where new pavement abuts existing pavement, remove existing as necessary using saw-cutting methods to obtain a straight and uniform line.
 - a. DO NOT use percussion removal methods.
 - b. Contact surfaces to be thoroughly cleaned. Apply tack coat to contact surface prior to application of asphalt mix.

3.10 HANDICAPPED PARKING; TRAFFIC AND LANE MARKINGS

- A. Cleaning: Sweep and clean surface to eliminate loose material and dust.
- B. Paint directional signage, arrows, lane dividers, parking space borders (stripping), handicapped symbols, as shown on drawings. If not shown on drawings, provide as a minimum:
 - 1. Entrance and exit directional arrows at each entrance and exit.
 - 2. Stop Bars, lane division and other markings required at intersections
 - 3. Striping of Decel and Acel Lanes to comply with Georgia DOT Requirements
 - 4. Lane divider lines on paved roadways where two way traffic will exist.
 - 5. Parking space boarder stripping at each parking space.
 - 6. Universal Handicapped symbol at each handicapped parking space.
 - 7. Handicapped curb cuts to comply with ADA.
- C. Striping (on site): Use chlorinated-rubber base traffic lane-marking paint, factory-mixed, quick-drying, and non-bleeding unless specified otherwise.
 - 1. Colors:
 - a. White, except as otherwise indicated.
 - b. Yellow at danger zones and as indicated.
 - c. Blue to mark handicap areas indicated.
 - 2. Line Width: 4" minimum except as otherwise indicated.
 - 3. Do not apply traffic and lane marking paint until layout and placement verified with Architect.
 - 4. Apply paint with mechanical equipment to produce uniform straight edges.
 - 5. Apply in minimum of 2 coats at manufacturer's recommended rates. Paint coverage to be adequate to prevent bleed-thru of paving color. Additional coats may be required if black is visible through paint.
- D. Striping (off site): Use thermoplastic traffic lane markings in all public right-of-ways and where specified on site.
 - 1. Colors:
 - a. White, except as otherwise indicated.
 - b. Yellow at danger zones and as indicated.
 - 2. Line Width: 4" minimum except as otherwise indicated.
 - 3. Lane markings in public right-of-way shall conform to Georgia Department of Transportation striping standards.
- E. Plastic pavement Markings (Reflective Road markers)
 - 1. Provide color to match lane striping or as designated by Georgia Department of Transportation.
 - 2. Provide adequate amount of adhesive to secure marker to pavement surface.

3.11 WHEEL STOPS

- A. Secure wheel stops to asphalt concrete surface with min. two 3/4" dia. galvanized steel dowels embedded in precast concrete at 1/3 points.
 - a. Size length of dowel to penetrate min. 6" into asphalt concrete.
 - b. Drill placement holes oversize and embed dowels in hot bituminous grout material.

3.12 APPEARANCE OF ASPHALT

- A. Asphalt shall only be accepted only if appearance is acceptable.
 - 1. Appearance of asphalt should appear smooth and uniform across entire paving area.
 - 2. The following conditions are not acceptable:
 - a. Marking from machinery.
 - b. Damaged asphalt from stored construction materials.
 - c. Locations in asphalt holding water.
 - d. Differential joints in asphalt.
 - e. Locations where asphalt has loose particles and appears non consistent.
 - f. Excessive cutting and patching to repair non conforming asphalt.
 - g. Grade shall be level with surrounding structures manholes, curbs, turndowns.
 - 3. In cases where appearance is not acceptable the contractor shall be required remove and resurface entire area.

3.13 SAMPLING

- A. Contractor take samples at start of paving operation and at intervals throughout paving operations.
- B. Contractor to take samples of plant mixture from truck and test to determine conformance to specified pavement test properties, bitumen content, and gradation requirements.
 - a. One sample each 500 tons or portion thereof; min. one sample.
- C. Contractor to obtain samples of finished pavement including that which spans longitudinal joint.
 - a. Obtain samples of size adequate to determine density, thickness and other specified requirements.
 - b. Cut one core per 100 tons; min. 3 cores, max. 5 cores per day's operation.
- D. Contractor responsible for tests.
 - a. Furnish power saw or core drill and labor for cutting samples.
 - b. Backfill holes with fresh paving mixture and thoroughly compact to finished surface and grade.

3.14 TESTING

- A. Tests required of samples taken as specified in "Sampling" paragraph above and for control testing as specified below.
 - a. Submit copies of all test reports to Owner's representative.
 - b. Immediately report to Owner's representative any test failing to meet specified requirements and recommended corrective action.
- 4. Control Testing:
 - a. Comply with minimum number and types of field tests listed below for project control:

Type of Test	Number of Tests
Stability, flow, unit weight percent voids, total mix, and percent voids filled.	Determine from set of three Marshall specimens prepared from each four (4) hours of plant operation. Mechanical Marshall <ul style="list-style-type: none"> i. hammer may be used, provided it is ii. periodically calibrated against the results iii. obtained by the hand hammer.
In-place density and thickness	From set (three (3) sawed or cored samples) for <ul style="list-style-type: none"> iv. each four (4) hours of plant operation; one-half (1/2) v. should be obtained at joints.

Extractions (ASTM D 2172)	Two (2) per day.
Sieve analysis (ASTM C 136)	One (1) per shipment.
Percent of fractured faces of aggregate	One (1) per shipment.

- b. Frequency of tests increased by Owner's representative if proper control of bituminous plant and placing operation not being maintained with minimum number of tests specified.

3.15 FIELD QUALITY CONTROL

A. General: During construction maintain established system of quality control to assure compliance with contract requirements and record of all materials, equipment and construction operations including, but not limited to, the following:

- a. Condition of existing surface.
- b. Gradation of aggregates.
- c. Percentage of fractured faces of aggregate.
- d. Mix design properties - Marshall tests complete.
- e. Safety requirements.
- f. Application of herbicides.
- g. Grade control.
- h. Preparation of bituminous mixes.
- i. Density and thickness of compacted mixes.
- j. Straightedge requirements.
- k. Test of plant mixtures.
- l. Determination of quantities.
- m. Correction of defective pavement.
- n. Surface preparation for application of traffic paint.
- o. Application of traffic markings.
- p. Installation of Wheel Stops.

- 5. Prior to acceptance of work covered under this Section, furnish Owner's representative copy of all records and test data and record of corrective action taken.

END OF SECTION 02744

SECTION 02753

PLAIN CEMENT CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of plain cement concrete paving shown on drawings, including curbs, gutters, and pavement.
- B. Sidewalks specified in Division-2 Section.
- C. Prepared sub-base specified in Division-2 section "Earthwork".
- D. Concrete and related materials specified in Division-3.
- E. Joint fillers and sealers specified in Division-7.

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified.
- B. Contractor to provide testing of concrete in accordance with requirements of Section 03300, Cast-In-Place-Concrete. Provide as a minimum the following:
 - 1. Slump test; One set per truck.
 - 2. Compression Tests; One set per pour.

1.04 SUBMITTALS

- A. Furnish samples, manufacturer's product data, test reports, and materials certifications required in referenced sections for concrete and joint fillers and sealers.

1.05 JOB CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and retain horizontal and vertical alignment until removal.
 - 1. Use straight forms, free of distortion and defects.
 - 2. Use flexible spring steel forms or laminated boards to form radius bends as required.
 - 3. Coat forms with non-staining form release agent not discoloring or defacing surface of concrete.

- B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.
1. Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect.
- C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40.
- D. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 40.
1. Cut bars true to length with ends square and free of burrs.
- E. Metal Expansion Caps: Furnish for one end of each dowel bar in expansion joints.
1. Design caps with one end closed and min. length of 3" to allow bar movement min. of 1", unless otherwise indicated.
- F. Hook Bolts: ASTM A 307, Grade A bolts, internally and externally threaded.
1. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- G. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.
- H. Expansion Joint Materials: Comply with requirements of applicable Division 7 sections for preformed expansion joint fillers and sealers.
1. Metal Keyway not permitted as expansion materials.
- I. Anti-Spalling Compound: 50% (by volume) boiled linseed oil and 50% (by volume) mineral spirits, complying with AASHTO M-233.
- J. Liquid-Membrane Forming Curing Compound:
1. Complying with ASTM C 309, Type I, Class A unless other type acceptable to Architect.
 2. Max. moisture loss of 0.55 gr./sq. cm. when applied at 200 s.f./gal.
 3. Products: Subject to compliance with requirements, provide one of following:
 - a. "Masterseal"; Master Builders.
 - b. "A-H 3 Way Sealer"; Anti-Hydro Waterproofing Co.
 - c. "Ecocure"; Euclid Chemical Co.
 - d. "Clear Seal"; A.C. Horn.
 - e. "J-20 Acrylic Cure"; Dayton Superior.
 - f. "Sure Cure"; Kaufman Products Inc.
 - g. "Spartan-Cote"; The Burke Co.
 - h. "Sealkure"; Toch Div. - Carboline.
 - i. "Kure-N-Seal"; Sonneborn-Contech.
 - j. "Polyclear"; Upco Chemical/USM Corp.
 - k. "L&M Cure"; L & M Construction Chemicals.
 - l. "Klarseal"; Seton Industries.
 - m. "LR-152"; Protex Industries.
- K. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "J-40 Bonding Agent"; Dayton Superior Corp.
 - b. "Weldcrete"; Larsen Products.
 - c. "Everbond"; L & M Construction Co.
 - d. "Hornweld"; A.C. Horn.
 - e. "Sonocrete"; Sonneborn-Contech.
 - f. "Acrylic Bondcrete"; The Burke Co.

- L. Epoxy Adhesive:
1. ASTM C 881, two component material suitable for use on dry or damp surfaces.
 2. Provide material "Type", "Grade", and "Class" to suit project requirements.
 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Epoxitite"; A.C. Horn.
 - b. "Edoco 2118 Epoxy Adhesive"; Edoco Technical Prod.
 - c. "Silkadur Hi-Mod"; Sika Chemical Corp.
 - d. "Euco Epoxy 463 or 615"; Euclid Chemical Co.
 - e. "Patch and Bond Epoxy"; The Burke Co.
 - f. "Sure-Poxy"; Kaufman Products Inc.

2.02 CONCRETE MIX, DESIGN AND TESTING

- A. Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control, and as herein specified.
1. Design mix to produce standard-weight concrete consisting of portland cement, aggregate, air-entraining admixture and water to produce following properties:
 - a. Slump Range: 2 - 4"; unless noted.
 - b. Air Content: 5% to 8%.
 - c. W-C Ratio: 0.45 to 0.53
 2. Minimum compressive strength of concrete to be as follows:
 - a. Drives: 3500 psi. at 28 days, unless otherwise indicated.
 - b. Curbs and Gutters: 3500 psi. at 28 days, unless otherwise indicated.
 - c. Service Area Slabs: 4000 psi. at 28 days, unless otherwise indicated.

PART 3 - EXECUTION

3.01 GENERAL

- A. Minimum concrete thickness shall be the following:
- | | |
|----------------------------------|--|
| 1. Kitchen service yards | 8" minimum thickness with #4 rebar 12" on center each way. |
| 2. High school lab service yards | 8" minimum thickness with #4 rebar 12" on center each way. |
| 3. Curb and Gutter | see detail for size |
| 4. Concrete flumes and swales | 6" minimum thickness with #4 rebar 18" on center each way |

3.02 SURFACE PREPARATION

- A. Compact sub-base at areas to receive concrete paving (Walks, Drives, Curbs and Gutters) and 10'-0" beyond limits of paving as described herein.
- B. Compact sub-base to 98% of Standard Proctor Maximum Dry Density (ASTM D698) to a minimum depth of 3'-0".
1. Compaction shall be accomplished through use of vibratory compaction equipment.
 2. Moisten soil as required to obtained specified densities.
- C. Compact surface to 100% of Standard Proctor Maximum Dry Density (ASTM D698).
1. Compaction shall be accomplished through use of static rolling equipment.
 2. Moisten soil as required to obtained specified densities.
- D. Remove loose material from compacted surface immediately before placing concrete.

3.03 FORM CONSTRUCTION

- A. Set forms to required grades and lines, rigidly braced and secured.
 - 1. Install sufficient forms to allow continuous progress of work and so forms can remain in place min. 24 hours after concrete placement.
 - 2. Check completed formwork for grade and alignment to following tolerances:
 - a. Top of forms max. 1/8" in 10'.
 - b. Vertical face on longitudinal axis, max. 1/4" in 10'.
 - 3. Clean forms after each use, and coat with form release agent often as required to ensure separation from concrete without damage.

3.04 REINFORCEMENT

- A. Locate, place and support reinforcement as specified in Division 3 sections, unless otherwise indicated.

3.05 CONCRETE PLACEMENT

- A. General: Comply with requirements of Division 3 sections for mixing and placing concrete, and as herein specified.
- B. Do not place concrete until sub-base and forms checked for line and grade.
 - 1. Moisten sub-base if required to provide uniform dampened condition at time concrete placed.
 - 2. Do not place concrete around manholes or other structures until at required finish elevation and alignment.
- C. Place concrete using methods preventing segregation of mix.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator.
 - 2. Keep vibrator away from joint assemblies, reinforcement, or side forms.
 - 3. Use only square-faced shovels for hand-spreading and consolidation.
 - 4. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
- D. Use bonding agent at locations where fresh concrete placed against hardened or partially hardened concrete surface.
- E. Deposit and spread concrete in continuous operation between transverse joints, far as possible.
 - 1. If interrupted for more than 1/2-hour, place construction joint.
- F. Curbs and Gutters: Automatic machine used for curb and gutter placement at Contractor's option.
 - 1. If machine placement used, submit revised mix design and laboratory test results, which meet or exceed minimums specified.
 - 2. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete.
 - 3. If results not acceptable remove and replace with formed concrete as specified.

3.06 JOINTS

- A. General:
 - 1. Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete.
 - 2. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 3. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

- B. Weakened-Plane (Contraction) Joints:
1. Provide weakened-plane (contraction) joints, sectioning concrete into areas shown on drawings, if not indicated as follow:
 - a. At maximum of 5'-0" on center each way.
 2. Construct weakened-plane joints for min. depth equal to 1/4 concrete thickness, as follows:
 - a. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with recommended cutting tool and finishing edges with jointer.
 3. Saw-Cut joints of any type are **NOT** acceptable.
- C. Construction Joints:
1. Place construction joints at end of placements and at locations where placement operations stopped for period of more than 1/2-hour, except where such pours terminate at expansion joints.
 2. Construct joints as shown or, if not shown, use removable wood keyway-sections to form keyway.
 3. Where load transfer-slip dowel devices are used, install so that one end of each dowel bar free to move.
- D. Expansion Joints:
1. Provide premolded joint filler for each expansion joint.
 2. Provide expansion joints where concrete abuts buildings, curbs, catch basins, manholes, inlets, structures, fixed objects and other locations indicated.
 3. Provide expansions joints in pavement (drives, curb and gutter) as follows:
 - a. Locate expansion joints at a maximum of 30' o.c. along length of pavement, unless otherwise indicated.
 - b. Where concrete over 30'-0" wide, provide at 30'-0" on center along width of pad or walk.
 - c. Curb and gutter to have expansion joints at every change of direction.
 4. Extend joint fillers full-width and depth of joint, and min. of 1/2" or max. of 1" below finished surface where joint sealer indicated; if no joint sealer, place top of joint filler flush with finished concrete surface.
 5. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible.
 - a. Where more than one length required, lace or clip joint filler sections together.
 6. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material; remove protection after concrete placed on both sides of joint.
- E. Fillers and Sealants: Comply with the requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance.
1. Seal all exterior expansion joints with sealant.

3.07 CONCRETE FINISHING

- A. Screeding and Floating:
1. After striking-off and consolidating concrete, smooth surface by screeding and floating.
 2. Use hand methods only where mechanical floating not possible.
 3. Adjust floating to compact surface and produce uniform texture.
 4. After floating, test surface for trueness with 10' straightedge.
 5. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.
 6. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius, unless otherwise indicated.
 7. Eliminate tool marks on concrete surface.
- B. Finishing: After completion of floating and troweling when excess moisture or surface sheen disappears, complete surface finishing, as follows:
1. Broom Finish:
 - a. Draw fine-hair broom across concrete surface, perpendicular to line of traffic.
 - b. Repeat operation if required to provide a fine line texture acceptable to Architect.

- c. Inclined Slab Surfaces: Provide coarse, non-slip finish by scoring surface with stiff-bristled broom, perpendicular to line of traffic.

C. Form Removal:

- 1. Do not remove forms for 24 hours after concrete placed.
- 2. After form removal, clean ends of joints and point-up any minor honeycombed areas.
- 3. Remove and replace areas or sections with major defects, as directed by Architect.

3.08 CURING

- A. Protect and cure finished concrete paving, complying with applicable requirements of Division 3 sections.
- B. Use membrane-forming curing and sealing compound or approved moist-curing methods.
- C. Anti-Spalling Treatment:
 - 1. Use second coat of curing and sealing compound or, if moist curing methods used , apply anti-spalling compound over concrete.
 - 2. Apply compounds to concrete surfaces no sooner than 28 days after placement, to clean, dry concrete free of oil, dirt, and other foreign material.
 - 3. Apply curing and sealing compound at max. coverage rate of 300 s.f./gal.
 - 4. Apply anti-spalling compound in two sprayed applications.
 - a. First application rate: 40 s.y./gal.
 - b. Second application rate: 60 s.y./gal.
 - c. Allow complete drying between applications.

3.09 REPAIRS AND PROTECTIONS

- A. Repair or replace broken or defective concrete, as directed by Architect.
- B. Drill test cores where directed by Architect, when necessary to determine magnitude of cracks or defective areas.
 - 1. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage until acceptance of work.
 - 1. Exclude traffic from pavement for min. 14 days after placement.
 - 2. When construction traffic permitted, maintain pavement clean as possible by removing surface stains and spillage of materials as they occur.
- D. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION 02753

SECTION 02775

SIDEWALKS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Extent of concrete walks shown on drawings.

1.02 RELATED WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Earthwork and prepared subbase is specified in Division-2 sections.
- C. Concrete and related materials are specified in Division-3 sections.
- D. Joint Fillers and Sealers are specified in Division-7 sections.

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified.

1.04 SUBMITTALS

- A. Submit samples, manufacturer's product data, test reports and material certification as required in referenced sections of concrete work and joint fillers and sealers.

1.05 JOB CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
 - 1. Provide flagmen, barricades, warning signs and warning lights for movement of traffic and cause least interruption of work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
 - 1. Use flexible spring steel forms or laminated boards to form radius bends as required.
 - 2. Coat forms with non-staining form release agent that will not discolor or deface surface of concrete.
- B. Welded Wire Mesh: Welded cold-drawn steel wire fabric complying with ASTM A 185.
- C. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.
- D. Expansion Joint Materials: Comply with requirements of Division-7 sections for preformed expansion joint fillers and sealers.

2.02 TRUNCATED DOMES (HANDICAP RAMP)

- A. See Specification section 02780 Unit Pavers
- B. Comply with requirements for Precast Truncated Domes Meeting ADA Specifications
- C. Domes shall be precast brick or paver. Maximum size shall be 18" x 18"
- D. Architect shall determine color. Contractor to provide option of all standard colors including but not limited to Brown, Red, Yellow and Gray.

2.03 CONCRETE MIX, DESIGN AND TESTING

- A. Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control, and as herein specified.
 - 1. Design mix to produce standard-weight concrete consisting of portland cement, aggregate, air-entraining admixture and water to produce following properties:
 - a. Compressive Strength: 3000 psi, minimum at 28 days.
 - b. Slump Range: 2" to 4".
 - c. Air Content: 5% to 8%.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine areas and conditions under which concrete curbs, walks, and paving to be installed and notify Contractor in writing of conditions detrimental to proper and timely completion of work.
 - 1. Do not proceed with work until unsatisfactory conditions corrected in acceptable manner.

3.02 SURFACE PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.
 - 1. Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction.
 - 2. Do not begin paving work until such conditions corrected and ready to receive paving.
- B. Compact sub-base at areas to receive concrete paving and 10'-0" beyond limits of paving as described herein.
- C. Compact sub-base to 95% of Standard Proctor Maximum Dry Density (ASTM D698) to a minimum depth of 3'-0".
 - 1. Compaction shall be accomplished through use of vibratory compaction equipment.
 - 2. Moisten soil as required to obtain specified densities.
- D. Compact surface to 98% of Standard Proctor Maximum Dry Density (ASTM D698).
 - 1. Compaction shall be accomplished through use of static rolling equipment.
 - 2. Moisten soil as required to obtain specified densities.

3.03 CONCRETE PADS

- A. Place concrete pads at each exterior door where no side walk exists. Pad to be min. 5'-0" deep by the width of the door opening plus 2'-0".
- B. Construct concrete equipment pad for each exterior item of equipment, including, but not limited to, HVAC equipment, electrical equipment, transformers, generator, cooler/freezer compressors.
 - 1. Individual equipment pads to be of 6" larger than equipment each direction unless larger pad detailed.

2. Multiple pads adjacent to each other construct a single pad of sufficient size to handle all equipment complying with the following:
 - a. Equipment to have a min. of 3'-0" between items of equipment.
 - b. Equipment shall be a min. of 3'-0" from face of structure.
 - c. Provide a min. of 1'-0" from face of equipment to face of concrete slab.

C. Pad(s) to slope away from the building at 1/8" per foot to drain water.

3.04 CONCRETE SIDEWALKS

A. General:

1. Minimum Thickness of sidewalks shall be 4 inches.
2. Edge of Concrete shall be thickened to 5 inches minimum.
3. Finished sidewalk appearance shall be approved by architect.
 - a. Cracking, breaks in concrete, pits in concrete surface, and rough finish are not acceptable.

B. Place sidewalks where indicated in drawings.

1. Width of walks to be as shown. If not shown minimum of 5'-0".
2. Longitudinal slope on side walks shall be no more 1:20; unless specifically noted otherwise.
3. Transverse slope shall be 1/8" per foot to drain water away from building; unless noted otherwise.
4. Finished grade on up hill side of walk to be flush with top of walk.

3.05 HANDICAPPED CURB CUTS

A. Provide handicapped curb cuts where indicated on drawings or required herein.

B. Handicapped curb cuts to be constructed in the following locations:

1. Where a perpendicular sidewalk abuts a concrete turn down or concrete curb and gutter at asphalt or concrete pavement.
2. Main entrance to building.
3. Bus loading entrance to building.
4. Handicapped parking spaces
5. Walk to flag pole.

C. Construct handicapped curb cuts in accordance with the applicable details and as follows:

1. In accordance with requirements of agencies having jurisdiction.
2. Width: Min. 5'-0".
3. Depth: 6'-0" for a 6" curb.
4. Slope of ramp and flared edges: Max. 1:12.
5. Tactile Warning Surface: Truncated Domes

D. Sample: Prior to constructing handicapped curb cuts or ramps the contractor shall construct a sample curb cut utilizing materials and methods specified for review and approval by the Architect and Agency having jurisdiction.

1. Approved samples may be incorporated into the work.
2. Rejected samples to be removed and reconstructed as directed.

3.06 FORM CONSTRUCTION

A. Set forms to required grades and lines, rigidly braced and secured.

1. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
2. Check completed formwork for grade and alignment to following tolerances:
 - a. Top of forms not more than 1/8" in 10'.
 - b. Vertical face on longitudinal axis, not more than 1/4" in 10'.

- B. Clean forms after each use and coat with form release agent often as required to ensure separation from concrete without damage.

3.07 CONCRETE PLACEMENT

- A. General: Comply with requirements of Division 3 sections for mixing and placing concrete, and as herein specified.
- B. Preparation:
 1. Do not place concrete until subbase and forms checked for line and grade.
 2. Moisten subbase if required to provide uniform dampened condition at time concrete placed.
 3. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- C. Placement:
 1. Place concrete using methods, which prevent segregation of mix.
 2. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator.
 3. Keep vibrator away from joint assemblies, reinforcement or side forms.
 4. Use only square-faced shovels for hand-spreading and consolidation.
 5. Consolidate with care to prevent dislocation of reinforcing, dowels and joint devices.

3.08 JOINTS

- A. General:
 1. Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete, unless otherwise indicated.
 2. Construct transverse joints at right angles to centerline, unless otherwise indicated.
- B. Perimeter Joints:
 1. When walkway abuts existing walks, place transverse joints to align with previously paved joints unless otherwise detailed.
- C. Weakened-Plane (Contraction) Joints:
 1. Provide weakened-plane (contraction) joints, sectioning concrete into areas indicated. If not indicated place weakened-plane joints at a maximum spacing of 5'-0" each direction.
 2. Construct weakened-plane joints for depth equal to at least 1/4 concrete thickness, as follows:
 3. Joints to be true and straight, either parallel or perpendicular to side of walk.
 4. Unless otherwise approved in writing by the Architect weakened-plane joints to be tooled type joints. Sawed cut joints of any type are **NOT** acceptable.
 - a. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion of slab with recommended cutting tool and finishing edges with jointer.
 - b. Sawed Joints: **NOT** accepted.
 - c. Inserts: Use embedded strips of metal or sealed wood to form weakened-plane joints. Set strips into plastic concrete and carefully remove after concrete has hardened.
- D. Construction Joints:
 1. Place construction joints at end of all pours and at locations where placement operations stopped for period of more than 1/2-hour, except where such pours terminate at expansion joints.
 2. Construct joints as shown or, if not shown, use standard metal key-way section forms.
- E. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.
 1. Locate expansion joints at 30' o.c. for each pavement lane, unless otherwise indicated.
 2. Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than 1" below finished surface

- where joint sealer indicated.
- 3. If no joint sealer required, place top of joint filler flush with finished concrete surface.

3.09 CONCRETE FINISHING

- A. After striking-off and consolidating concrete, smooth surface by screeding and floating.
 - 1. Use hand methods only where mechanical floating not possible.
 - 2. Adjust floating to compact surface and produce uniform texture.
- B. After floating, test surface for trueness with 10' straightedge.
 - 1. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.
- C. After completion of floating and when excess moisture or surface sheen disappears, complete surface finishing, as follows:
 - 1. Burlap finish, by dragging seamless strip of damp burlap across concrete, perpendicular to line of traffic; repeat operation to provide gritty texture acceptable to Architect.
 - 2. Light Broom finish, using a stiff bristle brush place a light broom finish. Deep grooves in sidewalk finish are not permitted. If direction of brush pull is evident, sidewalk will be rejected.

3.10 EXPOSED GRAVEL SURFACE

- A. Prior to constructing exposed gravel surface the contractor shall construct a sample curb cut utilizing materials and methods specified for review and approval by the Architect.
 - 1. Approved samples may be incorporated into the work.
- B. Rejected samples to be removed and reconstructed as directed.
- C. Exposed gravel to completely fill areas designated.
- D. Joints are to be placed prior to placing gravel. Sawed Joints are **NOT** accepted.

3.11 FORM REMOVAL

- A. Do not remove forms for 24 hours after concrete placed.
 - 1. After form removal, clean ends of joints and point-up any minor honeycombed areas.
 - 2. Remove and replace areas or sections with major defects, as directed by Architect.

3.12 CURING

- A. Protect and cure finished concrete paving, complying with applicable requirements of Division 3 sections.
 - 1. Use moist-curing methods for initial curing whenever possible.

3.13 REPAIRS AND PROTECTIONS

- A. Repair or replace broken or defective concrete, as directed by Architect.
- B. Drill test cores where directed by Architect, when necessary to determine magnitude of cracks or defective areas.
 - 1. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy resin grout.
- C. Protect concrete from damage until acceptance of work.
 - 1. Exclude traffic from pavement for at least 14 days after placement.
 - 2. When construction traffic permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

- D. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION 02775

SECTION 02780

UNIT PAVERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this Section.

1.02 SUMMARY

- A. Section includes following:
 - 1. Brick Pavers used as a Tactile Warning Surface:
 - a. Pavers shall be set in latex-modified portland cement mortar by tilesetter's method.
- B. Related Sections: Following sections contain requirements that relate to this Section:
 - 1. Division 2 Section "Earthwork" for compacted subgrade under unit pavers.
 - 2. Division 2 Section "Plain Cement Concrete Paving" for cast-in-place concrete walks, curbs and gutters serving as edge restraint for unit pavers.
 - 3. Division 7 Section "Joint Sealers" for sealing control and expansion joints in brick paving with elastomeric sealants.

1.03 SUBMITTALS

- A. General: Submit following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for the following products:
 - 1. Brick pavers.
- C. Samples for initial selection purposes in form of actual units or sections of units showing full range of colors, textures, and patterns available for each type unit paver indicated.
 - 1. Include similar samples of material for joints and accessories involving color selection.
- D. Samples for verification purposes in full-size units of each type of unit paver indicated, in sets for each color, texture, and pattern specified, showing full range of variations expected in these characteristics.
 - 1. Provide samples with joints grouted and cured indicating full range of color expected in completed work.
- E. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience.
 - 1. Include list of completed project with project names, addresses, names of Architects and Owners, plus other information specified.
- F. Compatibility and adhesion test reports from latex additive manufacturer indicating that brick pavers tested for compatibility and adhesion with mortar and grout containing latex additives.
 - 1. Include latex additive manufacturers' interpretation of test results relative to mortar and grout performance and recommendations for installation practices needed to obtain adhesion.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Successfully completed unit paver installations similar in material, design, and extent to that of this Project.

- B. Single-Source Responsibility: Obtain each color, type, and variety of unit pavers, joint materials, and setting materials from single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying progress of Work.
- C. Preconstruction Compatibility and Adhesion Testing:
1. Submit samples of flooring materials contacting or affecting mortar and grout containing latex additives to manufacturer of latex additives for compatibility and adhesion testing indicated below.
 2. Use test methods standard with manufacturer to determine if mortar and grout materials obtain optimum adhesion with, and nonstaining to, installed brick pavers and other materials constituting brick paving installation.
 3. Submit sufficient number of bricks and other materials involved in installation to allow comprehensive testing.
 4. Schedule sufficient time for testing and analysis of results to prevent delay in progress of Work.
 5. Investigate materials failing compatibility or adhesion tests and obtain mortar and grout manufacturer's written recommendations for use of materials to obtain optimum bond and prevent staining.
- D. Field-Constructed Mock-Up:
1. Prior to installation of unit pavers, erect mock-ups for each form and pattern of unit pavers required to verify selections made under sample submittals.
 2. Build mock-ups to comply with following requirements, using materials and same base construction including special features for expansion joints and contiguous work indicated for final unit of Work.
 3. Locate mock-ups on site in location and size indicated or, if not indicated, as directed by Architect.
 4. Notify Architect one week in advance of dates and times when mock-ups erected.
 5. Demonstrate quality of workmanship to be produced in final unit of Work.
 6. Obtain Architect's acceptance of mock-ups before start of final unit of Work.
 7. Retain and maintain mock-ups during construction in undisturbed condition as standard for judging completed unit of Work.
 8. When directed, demolish and remove mock-ups from Project site.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect unit pavers and aggregate during storage and construction against wetting by rain, snow, or ground water and against soilage or contamination from earth and other materials.
- B. Protect grout and mortar materials from deterioration by moisture and temperature.
1. Store in dry location or in waterproof container.
 2. Keep containers tightly closed and away from open flame.
 3. Protect liquid components from freezing.

1.06 PROJECT CONDITIONS

- A. Cold-Weather Protection:
1. Do not use frozen materials or materials mixed or coated with ice or frost.
 2. Do not build on frozen subgrade or setting beds.
 3. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations:
1. Protect unit paver work against freezing when atmospheric temperature 40°F. (4°C.) and falling.
 2. Heat materials and provide temporary protection of completed portions of unit paver work.
 3. Comply with International Masonry All-Weather Council's "Guide Specification for Cold-Weather Masonry Construction," Section 04200, Article 3.
- C. Hot-Weather Requirements:
1. Protect unit paver work when temperature and humidity conditions produce excessive evaporation of setting

- beds and grout.
- 2. Provide artificial shade and wind breaks and use cooled materials as required.
- 3. Do not apply mortar to substrates with temperatures of 100°F. (38°C.) and above.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of following:
 - 1. Paving Brick:
 - a. Belden Brick Co.
 - b. Boral Bricks, Inc.
 - c. Con-Pave.
 - d. Endicott Brick Co.
 - e. Glen-Gery Corporation.
 - f. Hastings Pavement Co., Inc.
 - g. Pinehall
 - 2. Latex-Portland Cement Mortars and Grouts:
 - a. American Olean Tile Co., Inc.
 - b. Bostik Construction Products Div., Emhart Chemical Group.
 - c. Laticrete International, Inc.
 - d. L & M Mfg. Inc.
 - e. Summitville Tiles, Inc.

2.02 COLORS AND TEXTURES

- A. Provide materials and products that result in colors and textures of exposed unit paver surfaces and joints complying with following requirements:
 - 1. Provide selections made by Architect from full range of standard colors for materials and products of type indicated.
 - 2. For tactile warning surfaces provide raise truncated cone texture complying with requirements of "Americans with Disabilities Act (ADA) and as described below.

2.03 UNIT PAVERS - TACTILE WARNING SURFACE (STRIPS):

- A. Brick Pavers: Light-traffic paving brick consisting of solid (uncored), unfroged brick of standard modular size (2-1/4" X 3-5/8" X 7-5/8"), complying with requirements of ASTM C 902 for following end-use environments (weather and traffic) and application method:
 - 1. Weather Class SX.
 - 2. Traffic Type I.
 - 3. Application PS.
- B. Temporary Protective Coating:
 - 1. Precoat exposed surfaces of brick pavers with continuous film of temporary protective coating compatible with brick and mortar/grout products and removable without damaging grout or brick.
 - 2. Do not coat unexposed brick surfaces; handle brick to prevent coated surfaces from contacting backs or edges of other units.
 - 3. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating prior to setting brick.
- C. Dimensional Tolerances: Manufacture unit to standard dimensions indicated with deviations in any direction not exceeding $\pm 1/16"$.

- D. Surface texture shall meet the following requirements:
1. Detectable warning surfaces shall consist of raised truncated domes with a diameter of nominal 0.9 inches (23mm), height of nominal 0.2 inches (5mm), and center to center spacing of nominal 2.35 inches (60mm).
 2. Detectable warning surfaces shall be of contrasting colors with adjoining surfaces.
 3. Material used shall be an integral part of walking surface and shall differ from adjoining surface in resilience or sound on "cane" contact.
- E. Tactile Warning Surface is also referred to as "Tactile Warning Strips", and "Detectable Warning Surfaces". Units shall comply with the following:
1. ANSI - A117.1, 1986.
 2. AMERICANS WITH DISABILITIES ACT (ADA)
 3. Requirements of local Fire Marshal.

2.04 PORTLAND CEMENT MORTAR SETTING BED MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II.
- B. Aggregate: ASTM C 144 with fineness module of 2.25 ± 0.10 .
- C. Latex additive (water emulsion) described below, serving as replacement for part or all of gauging water, of type specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate, not containing retarder.
1. Latex Additive: Styrene butadiene rubber.
- D. Reinforcing Wire Fabric: Galvanized welded wire fabric, 2" x 2" - W0.3 x W0.3 (16 ASW gage or 0.0625 inch diameter); comply with ASTM A 185 and ASTM A 82 except for min. wire size.
- E. Water: Clean, free of materials detrimental to strength or bond or mortars.

2.05 GROUT MATERIALS

- A. Latex-Portland Cement Grout: ANSI A118.6, composition as follows:
- B. Latex additive (water emulsion) serving as replacement for part or all of gauging water, combined at job site with dry grout mixture, with latex and dry grout mixture as follows:
1. Latex Additive: Styrene butadiene rubber.
 2. Dry Grout Mixture: As follows, for combining with latex additive (water emulsion):
 - a. Portland Cement: ASTM C 150, Type I or II, of natural color or white as required to produce color indicated.
 - b. Aggregate: ASTM C 144, graded to comply with latex additive manufacturer's requirements.
- C. Colored Mortar Pigments for Grout:
1. Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar and grout mixes.
 2. Use only pigments proven through testing and experience satisfactory for use in portland cement grout.

2.06 MORTAR AND GROUT MIXES

- A. General:
1. Comply with referenced standards and with manufacturers' instructions relative to mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce setting-bed and joint materials of uniform quality and with optimum performance characteristics.
 2. Discard mortars and grout when they have reached their initial set.

- B. Cement Paste Slush Coat: Mix slush coat to consistency similar to thick cream and consisting of either neat cement and water or cement, sand, and water.
 - 1. For latex-modified portland cement setting-bed mortar, substitute latex admixture for part or all of water per directions of latex additive manufacturer.
- C. Latex-Modified Portland Cement Setting-bed Mortar: Proportion and mix portland cement, aggregate, and latex additive for setting bed to comply with directions of latex additive manufacturer and as necessary to produce stiff mixture with moist surface when bed ready to receive brick pavers.
- D. Latex-Modified Portland Cement Slurry Bond Coat: Proportion and mix portland cement, aggregate, and latex additive for slurry bond coat to comply with directions of latex additive manufacturer.
- E. Latex-Modified Portland Cement Grout: Add latex additive to dry grout mix in proportion and concentration recommended by latex additive manufacturer.
- F. Job-Mixed Colored Pigmented Grout:
 - 1. Select and proportion pigments with other ingredients to produce color required.
 - 2. Do not exceed pigment-to-cement ratio of 1 to 10, by weight.
 - 3. Proportion cement and aggregate to comply with directions of latex additive manufacturer.

PART 3 - EXECUTION

3.01 LOCATION OF USE

- A. Where indicated on drawings to furnish: Brick Tactile Warning Surface, Tactile Warning Surface, Detectable Surface, Textured Warning Surface or similar language.
- B. Unless specifically noted otherwise install brick tactile warning surface in the following locations:
 - 1. At top of exterior stairs.
 - 2. At top of exterior ramps.
 - 3. At handicapped curb cuts.
 - 4. At edge or end of concrete walk where walk abuts drive without a step or curb.
 - 5. Elsewhere shown on drawings.
- C. Limits of Tactile Warning Strips:
 - 1. At top of exterior Steps and Stairs:
 - a. Full width of stairs; 6'-0" deep; starting 12" from top riser.
 - 2. At Handicapped ramp.
 - a. Full width of ramp; 6'-0" deep; starting 12" from top of ramp.
 - 3. At Handicapped Curb cut:
 - a. Full width of curb cut; including flared sides.
 - 4. Edge of Pavement (where walk abuts drive without a step or curb):
 - a. 3'-0" wide; full length of walk where parallel to paved area.
 - b. 3'-0" deep; full width of walk where walk, where perpendicular to paved area.

3.02 EXAMINATION

- A. Examine surfaces indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit pavers.
- B. Do not proceed with installation until unsatisfactory conditions corrected.

3.03 PREPARATION

- A. Vacuum clean concrete substrates to remove dirt, dust, debris, and loose particles.
- B. Remove substances from concrete substrates that impair bond of mortar, including curing and sealing compounds, form oil, and laitance.

3.04 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, and other visible defects or cause staining in finished work.
- B. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges.
 - 1. Cut units to provide pattern indicated and to fit adjoining work neatly.
 - 2. Use full units without cutting where possible.
 - 3. Hammer cutting not acceptable.
- C. Joint Pattern: As indicated below:
 - 1. Lay unit pavers in joint pattern shown, if not shown lay in running bond pattern.
- D. Spaced Joint Widths: Where brick paving indicated with spaced joints filled with grout, comply with following requirements:
 - 1. Provide nominal 3/8" joint width with variations not exceeding $\pm 1/16"$.
- E. Tolerances: Do not exceed 1/32" unit-to-unit offset from flush (lippage) and tolerance of 1/8" in 10' from level or slope as indicated for finished surface of paving.
- F. Expansion and Control Joints:
 - 1. Provide sealant-filled joints at locations and widths indicated. If not indicated, install 1/4" premoulded expansion joint filler and sealant in the following locations:
 - a. Where pavers abut concrete, building, column or other obstruction.
 - b. At each offset in brick paving.
 - c. At a maximum of 20'-0" on center each way.
 - 2. Sealant materials and installation specified in Division 7 Section "Joint Sealers."
- G. Surface Drainage:
 - 1. Slope surface uniformly at 1/8" per foot as necessary to provide positive drainage and avoid ponding water.

3.05 MORTARED APPLICATIONS

- A. Saturate-concrete subbase with clean water several hours before placing setting-bed.
 - 1. Remove surface water about 1 hour before placing setting-bed.
- B. Apply cement paste slush coat over surface of concrete subbase about 15 minutes prior to placing setting-bed.
 - 1. Limit area of slush coat to avoid drying out prior to placing setting-bed.
 - 2. Do not exceed 1/16" thickness for cement slush coat.
- C. Apply mortar setting-bed over cement paste slush coat immediately after slush coat applied.
 - 1. Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of brick to finished grades indicated.
- D. Mix and place only that amount of mortar setting bed covered with brick prior to initial set.
 - 1. Cut back, bevel edge, remove, and discard setting bed material reaching initial set prior to placing brick.
- E. Place reinforcing wire fabric over membrane, lap at joints by min. one full mesh at joints and support to become

embedded in middle of setting bed.

1. Do not butt edges against vertical surfaces.
- F. Wet brick pavers several hours before laying unless initial rate of absorption (suction) when subjected to testing by method described in Section 9 of ASTM C 67 less than 3/4 oz./30 s.i. immersed area.
1. Do not lay brick pavers with free moisture on surface.
- G. Place brick pavers before initial set of cement occurs.
1. Immediately prior to placing brick on green or wet setting bed, apply uniform 1/16" thick slurry bond coat to bed or to back of each brick with flat trowel just prior to placing it on bed.
- H. Tamp and beat brick pavers with wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances.
1. Set each brick in single operation prior to initial set of mortar; do not return to areas already set and disturb bricks for purposes of realigning finished surfaces or adjusting joints.
- I. Grout joints soon as possible after initial set of setting bed.
1. Force grout into joints, taking care not to smear grout on adjoining brick and other surfaces.
 2. After initial set of grout, finish joints by tooling to produce very slightly concave polished joint, free from drying cracks.
- J. Cure grout by maintaining in damp condition for 7 days except as otherwise recommended by latex additive manufacturer.

3.06 REPAIR, POINTING, CLEANING, AND PROTECTION

- A. Remove and replace loose, chipped, broken, stained, or otherwise damaged pavers, or if units do not match adjoining units as intended.
1. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.
- B. Pointing:
1. During tooling of joints, enlarge voids or holes and completely fill with mortar or grout.
 2. Point-up joints at sealant-type joints to provide neat, uniform appearance, properly prepared for application of sealant.
- C. Cleaning: Remove excess grout from exposed brick surfaces, wash and scrub clean.
- D. Remove protective coating as recommended by protective coating manufacturer and acceptable to brick and grout manufacturer.
1. Trap and remove coating to prevent clogging drains.
- E. Provide final protection and maintain conditions in manner acceptable to Installer, ensuring unit paver work without damage or deterioration at time of Final Acceptance.

END OF SECTION 02780

SECTION 02822

VINYL COATED CHAIN LINK FENCING AND GATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of chain link fences and gates indicated on drawings and herein.
- B. Provide chain link fencing in the following locations:
 - 1. Perimeter playground.
 - 2. Main Service Yard
 - 3. Mechanical Yard.
 - 4. Detention Pond.
 - 5. Elsewhere where indicated on drawings.

1.03 QUALITY ASSURANCE

- A. Provide chain link fences and gates as complete units controlled by single source including necessary erection accessories, fittings, and fastenings.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data, and installation instructions for metal fencing, fabric, gates and accessories.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Fence and Gates to be of sizes indicated on drawings; if not indicated the following shall apply:
 - 1. Fence and Gate Height: 7'-0", unless noted; 4'-0" at Playground.
 - 2. Single Gate width: 3'-6", unless noted.
 - 3. Double Gate width: 7'-0", unless noted.
- B. Dimensions indicated for pipe, roll-formed, and H-sections are outside dimensions, exclusive of coatings.
- C. Manufacturer: Subject to compliance with requirements, provide products of one of following:
 - 1. Galvanized Steel Fencing and Fabric:
 - a. Allied Tube and Conduit Corp.
 - b. American Fence Corp.
 - c. Anchor Fence, Inc.
 - d. Page Fence Div./Page-Wilson Corp.
 - e. Cyclone Fence/United States Steel Corp.

2.02 STEEL FABRIC

- A. Fabric:
1. No. 9 ga. (0.148" \pm 0.005") finished size steel wires.
 2. 1-3/4" mesh at tennis courts; 2" mesh elsewhere.
 3. Top selvages knuckled for fabric 60" high and under, both top and bottom selvages twisted and barbed for fabric over 60" high.
 4. Furnish one-piece fabric widths for fencing up to 12' high.
- B. Fabric Finish: Galvanized, ASTM A 392, Class I, with min. 1.2 oz. zinc per sq. ft. of surface with extruded Polyvinyl Chloride coating (PVC).
- C. Color shall be selected by Architect.

2.03 FRAMING AND ACCESSORIES

- A. General
1. All Framework and Accessories shall be galvanized and extruded Polyvinyl Chloride coating (PVC).
- B. Steel Framework:
1. General: Galvanized steel, ASTM A 120 or A 123, with min. 1.8 oz. zinc/s.f. of surface.
 2. Fittings and Accessories: Galvanized, ASTM A 153, with zinc weights per Table I.
- C. End, Corner and Pull Posts: Min. sizes and weights as follows:
1. Up to 6' fabric height: 2.375" OD steel pipe, 3.65 lbs./l.f., or 3.5" x 3.5" roll-formed sections, 4.85 lbs./l.f.
 2. Over 6' fabric height: 2.875" OD steel pipe, 5.79 lbs./l.f., or 3.5" x 3.5" roll-formed sections, 4.85 lbs./l.f.
- D. Line Posts: Space 10' o.c. max., unless otherwise indicated, of following min. sizes and weights.
1. Up to 6' fabric height: 1.90" OD steel pipe, 2.70 lbs./l.f. or 1.875" x 1.625" C-sections, 2.28 lbs./l.f.
 2. 6' to 8' fabric height: 2.375" OD steel pipe, 3.65 lbs./l.f. or 2.25" x 1.875" H-sections, 2.64 lbs./l.f.
 3. Over 8' fabric height: 2.875" OD steel pipe, 5.79 lbs./l.f. or 2.25" x 1.875" H-sections, 3.26 lbs./l.f.
- E. Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of double gate installation, for nominal gate leaf widths as follows:
1. Up to 6': 3.5" x 3.5" roll-formed section, 4.85 lbs./l.f. or 2.875" OD pipe, 5.79 lbs./l.f.
 2. Over 6' to 13': 4.000" OD pipe, 9.11 lbs./l.f.
 3. Over 13' to 18': 6.625" OD pipe, 18.97 lbs./l.f.
 4. Over 18': 8.625" OD pipe, 28.55 lbs./l.f.
- F. Top Rail:
1. Manufacturer's longest lengths, with expansion type couplings, approximately 6" long, for each joint.
 2. Provide means for attaching top rail securely to each gate, corner, pull and end post.
 3. 1.66" OD pipe, 2.27 lbs./l.f. or 1.625" x 1.25" roll-formed sections, 1.35 lbs./l.f.
- G. Tension Wire: 7 gage, coated coil spring wire, metal and finish to match fabric.
1. Locate at bottom of fabric only.
- H. Wire Ties: 11 ga. galvanized steel or 11 ga. aluminum wire, to match fabric core material.
- I. Post Brace Assembly:
1. Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric.

2. Use same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightened.
- J. Post Tops: Provide weathertight closure cap with loop to receive tension wire or top rail; one cap for each post.
- K. Stretcher Bars:
1. One-piece lengths equal to full height of fabric, with min. cross section of 3/16" x 3/4".
 2. Provide one stretcher bar for each gate and end post, 2 for each corner and pull post, except where fabric integrally woven into post.
- L. Barbed Wire Supporting Arms:
1. Manufacturer's standard barbed wire supporting arms, metal and finish to match fence framework, with provision for anchorage to posts and attaching 3 rows of barbed wire to each arm.
 2. Supporting arms either attached to posts or integral with post top weather cap and capable of withstanding 250 lbs. downward pull at outermost end.
 3. Provide following type:
 - a. Single 45° arm; for 3 strands barbed wire, one for each post.
- M. Barbed Wire: 2 strand, 12-1/2 ga. wire with 14 ga. 4-point barbs spaced not more than 5" o.c.; metal and finish to match fabric.
- 2.04 GATES
- A. Fabrication:
1. Fabricate perimeter frames of gates from metal and finish to match fence framework.
 2. Assemble gate frames by welding or with special fittings and rivets for rigid connections, providing security against removal or breakage connections.
 3. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware and accessories.
 4. Space frame members max. 8' apart unless otherwise indicated.
 5. Provide same fabric as for fence, unless otherwise indicated.
 - a. Install fabric with stretcher bars at vertical edges and at top and bottom edges.
 - b. Attach stretcher bars to gate frame max. 15" o.c.
 - c. Install diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.
 6. Where barbed wire indicated above gates, extend end members of gate frames 1'-0" above top member and prepare to receive 3 strands of wire.
 - a. Provide necessary clips for securing wire to extensions.
- B. Swing Gates: Fabricate perimeter frames of minimum 1.90" OD pipe.
- C. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with following:
1. Hinges:
 - a. Size and material to suit gate size, non-lift-off type, offset to permit 180° gate opening.
 - b. Provide 1-1/2 pair of hinges for each leaf over 6' nominal height.
 2. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
- D. Double Gates: Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.

2.05 PADLOCKS

- A. Provide One each Master Pad Lock #3206 for each gate; pad locks to be keyed alike.

2.06 CONCRETE

- A. Provide concrete consisting of portland cement, ASTM C 150, aggregates, ASTM C 33, and clean water.
- B. Mix materials to obtain concrete with min. 28-day compressive strength of 2500 psi using min. 4 sacks of cement per cu. yd., 1" max. size aggregate, max. 3" slump, and 2% to 4% entrained air.

PART 3 - EXECUTION

3.01 GENERAL

- A. Unless detailed or noted otherwise the size of the fence shall be as required to provide a minimum of 3'-0" clearance on all sides of equipment being enclosed.
- B. Line Posts: Space posts equidistant at intervals not exceeding ten (10) feet on center.
- C. Terminal and Pull Posts: Set Terminal or Pull Posts (End, Corner and Gate) at the beginning and end of each continuous length of fence and at abrupt changes in vertical and horizontal alignment.
 - 1. Maximum spacing for terminal or pull posts 10 be 1,000 feet.

3.02 INSTALLATION

- A. Do not begin installation and erection before final grading completed, unless otherwise permitted.
- B. Excavation: Drill or hand excavate (using post hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
 - 1. If not indicated on drawings, excavate holes for each post to min. diameter recommended by fence manufacturer, but min. 4 times largest cross-section of post.
 - 2. Unless otherwise indicated, excavate hole depths approximately 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.
- C. Setting Posts: Center and align posts in holes 3" above bottom of excavation.
 - 1. Place concrete around posts and vibrate or tamp for consolidation.
 - 2. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
 - 3. Unless otherwise indicated, extend concrete footings 2" above grade and trowel to crown to shed water.
- D. Top Rails:
 - 1. Furnish top rails for all fences.
 - 2. Run rail continuously through post caps, bending to radius for curved runs.
 - 3. Securely fasten the top rail to terminal posts and join with sleeves or couplings which allow for expansion and contraction.
- E. Tension Wire:
 - 1. Furnish bottom tension wire at all fences.
 - 2. Install bottom tension wire within bottom 4" of fence fabric.
 - 3. Fasten fabric to tension wire using 11 ga. galvanized steel hog rings 24" o.c.
 - 4. Securely fasten tension wire to terminal and line posts.
 - 5. Tension wire shall be taut and free of sag.

- F. Brace Assemblies:
 - 1. Install braces to plumb posts when diagonal rod under proper tension.

- G. Fabric:
 - 1. Leave approximately 2" between finish grade and bottom selvage, unless otherwise indicated.
 - 2. Pull fabric taut and tie to posts, rails, and tension wires.
 - 3. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force released.
 - 4. Place fabric by securing one end, applying sufficient tension to remove slack prior to making attachments. Tighten fabric to provide a smooth uniform appearance free from sag.
 - 5. Join rolls of wire fabric by weaving a single picket into the ends of the rolls to form a continuous mesh. Then retwist or reknuckle the pickets back to provide a uniform appearance.

- H. Stretcher Bars: Thread through or clamp to fabric 4" o.c., secure to posts with metal bands 15" o.c.

- I. Barbed Wire:
 - 1. Furnish at all fences, unless noted otherwise.
 - 2. Pull wire taut and install securely to extension arms, secure to end post or terminal arms in accordance with manufacturer's instructions.

- J. Gates:
 - 1. Install gates plumb, level, and secure for full opening without interference.
 - 2. Install gates to provide min. of 2" and a maximum of 4" clearance between bottom of gate and grade at any point along direction of travel.
 - 3. Install ground-set items in concrete for anchorage.
 - 4. Adjust hardware for smooth operation and lubricate where necessary.

- K. Tie Wires:
 - 1. Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted min. 2 full turns.
 - 2. Bend ends of wire to minimize hazard to persons or clothing.
 - 3. Tie fabric to line posts, with wire ties 12" o.c.
 - 4. Tie fabric to rails and braces, with wire ties 24" o.c.
 - 5. Tie fabric to tension wires, with hog rings 24" o.c.

- L. Fasteners:
 - 1. Install nuts for tension bands and hardware bolts on side of fence opposite fabric side.
 - 2. Peen ends of bolts or score threads to prevent removal of nuts.

END OF SECTION 02821

**SECTION 02832
ORNAMENTAL FENCING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of ornamental fences and gates indicated on drawings and herein.
- B. Types of ornamental fencing required in this Section include:
 - 1. Aluminum picket type fence, gates and frame.
- C. Products furnished but not installed under this Section include inserts and anchors preset in masonry and concrete for anchorage of ornamental fencing system.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain ornamental fencing system from single manufacturer.
- B. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

1.04 SUBMITTALS

- A. Product Data: Manufacturer's technical data for products and processes used in fabrication of ornamental fencing, including finishes and grout.
- B. Shop Drawings:
 - 1. Show details of fabrication and installation for each type and material of fencing system required including plans, elevations, sections, profiles of pickets, fittings, connections, and anchors.
 - 2. Provide templates for anchor and bolt installation by others.
- C. Samples:
 - 1. Prepare samples of each type of metal finish required on metal of same thickness and alloy indicated for final work.
 - 2. Where finish involves normal color and texture variations, include sample sets composed of two or more units showing limits of such variations expected in completed work.
 - 3. Include 6" long samples of each distinctly different member.
 - 4. Include samples of fittings and brackets.
 - 5. Include sample of typical welded connection.

1.05 STORAGE

- A. Store ornamental fencing system in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind.
- B. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside covering.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, ornamental fencing systems of one of following:
 - 1. Aluminum Ornamental Fencing System:
 - a. Boundary Fence and Railing Systems, Inc., Richmond Hill, NY.; "Patrician" design.
 - b. Builders Fence Co., Inc., Sun Valley, CA
 - c. Ameristar, Tulsa, OK

2.02 METALS

- A. General: Comply with standards indicated for forms and types of metals indicated or required for handrail and railing system components.
- B. Aluminum: Provide alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than strength and durability properties of the alloy and temper designated below for each aluminum form required.
 - 1. Extruded Bar and Shape: ASTM B 221, 6063-T6.
 - 2. Extruded Pipe and Tube: ASTM B 429, 6063-T6.

2.03 MISCELLANEOUS MATERIALS

- A. Nonshrink Nonmetallic Grout:
 - 1. Pre-mixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C621.
 - 2. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
- B. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes recommended by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength and compatibility in fabricated items.
- C. Fasteners:
 - 1. Use fasteners of same basic metal as fastened metal, unless otherwise indicated.
 - 2. Do not use metals corrosive or incompatible with materials joined.
 - 3. Provide concealed fasteners for interconnection of components and for their attachment to other work, except where otherwise indicated.
- D. Anchors and Inserts:
 - 1. Provide anchors of type, size, and material required for type of loading and installation condition shown, as recommended by manufacturer, unless otherwise indicated.
 - 2. Use non-ferrous metal of hotdipped galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance.
 - 3. Use toothed steel or expansion bolt devices for drilled-in-place anchors.
- E. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).
- F. Zinc Chromate Paint: FS TT-P-645.
- G. Concrete: Provide concrete consisting of portland cement, ASTM C 150, aggregates, ASTM C 33, and clean water. Mix materials to obtain concrete with min. 28-day compressive strength of 2500 psi using min. 4 sacks of cement per cu. yd., 1" max. size aggregate, max. 3" slump, and 2% to 4% entrained air.

2.04 FABRICATION

- A. General: Fabricate ornamental fencing systems using only material which are smooth and free of surface blemishes including pitting, seam marks, and roller marks.
 - 1. Fence to be seamless in design with smooth, flush, tight fitting joints.
- B. Provide fencing components members in sizes and profiles indicated, with supporting posts and brackets of size and spacing shown, but not less than required by manufacturer and the following:
 - 1. Posts: Minimum 3" x 3" x 12 gauge steel tube designed for anchorage in concrete footing.
 - 2. Rails (top, bottom and side): Minimum 1-1/4" square extruded aluminum placed at top, bottom and sides.
 - 3. Pickets: Minimum 3/4" square aluminum tube pickets spaced at a max. 4" o.c.
 - 4. Gates: Unless noted or detailed otherwise each leaf of gate to be 3'-0" wide X 6'-0" high.
 - 5. Support brackets to be spaced a maximum of 6" from each end and a maximum of 4'-0" on center; min, five per post.
- C. Shop Assembly:
 - 1. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
 - 2. Disassemble units only as necessary for shipping and handling limitations.
 - 3. Clearly mark units for reassembly and coordinated installation.
- D. Welded Connections for Ornamental Fencing: Fabricate aluminum pipe fence systems for interconnection of members by concealed internal welds, which eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
 - 1. Use welding method appropriate for metal and finish indicated and to develop strength required to comply with structural performance criteria.
 - 2. Finish exposed welds and surfaces smooth, flush, and blended to match adjoining surfaces.
 - 3. Provide welded connections for aluminum ornamental fencing systems.
 - 4. Form changes in direction of members by bending members, insertion of prefabricated elbow fittings, radius bends, or by mitering.
- E. Hardware: Provide manufacturers standard hardware as listed or required:
 - 1. Standard latches with device for padlocking.
 - 2. Heavy weight hinges, minimum 5 hinges per leaf.
 - 3. Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.
 - 4. Provide One each Master Pad Lock #3206 for each gate; pad locks to be keyed alike.

2.05 METAL FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.

2.06 ALUMINUM FINISHES

- A. Class I Color Anodized Finish: AA-M12C22A42/44 (mechanical finish, nonspecular as fabricated; chemical etch, medium matte; 0.7 mil min. thick electrolytically deposited or integrally colored anodic coating) complying with AAMA 606.1 or AAMA 608.1.
 - 1. Color: Black.

2.07 WARRANTY

- A. Provide manufacturer' standard warranty covering materials, workmanship and finish.
 - 1. Minimum period of warranty: 15 years

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts and miscellaneous items having integral anchors, embedded in concrete as masonry construction.
 - 1. Coordinate delivery of such items to project site.
- B. Field Measurements: Take field measurements prior to fabrication.

3.02 GENERAL

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Perform cutting, drilling and fitting required for installation of ornamental fencing systems.
 - 1. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.
 - 2. Do not weld, cut or abrade surfaces of fencing components coated or finished after fabrication, and intended for field connection by mechanical means without further cutting or fitting.
- C. Corrosion Protection: Coat concealed surfaces of aluminum, in contact with grout, concrete, masonry, wood, or dissimilar metals, with heavy coat of bituminous paint or zinc chromate primer.

3.03 INSTALLATION

- A. Attachment:
 - 1. Secure horizontal rails terminating against masonry with strap anchors built into masonry as extensions of horizontal rails.
 - 2. Attach vertical gate posts to masonry pilasters with manufacturers standard bracket; min. of 5 brackets per post.
- B. Welds: In accordance with recommendations of AWS; grind welds smooth and flush, to match and blend with adjoining surfaces.

3.04 Gate Posts:

- A. Excavation: Drill or hand excavate (using post hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
 - 1. If not indicated on drawings, excavate holes for each post to min. diameter recommended by fence manufacturer, but min. 4 times largest cross-section of post.
 - 2. Unless otherwise indicated, excavate hole depths approximately 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.
- B. Setting Posts: Set gate post maximum 2" from face of brick pilaster.
 - 1. Place concrete around posts and vibrate or tamp for consolidation.
 - 2. Gate post to be set plumb and true. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
 - 3. Unless otherwise indicated, extend concrete footings 2" above grade and trowel to crown to shed water.
- C. Securely attach gate posts to masonry pilaster with a minimum of five anchor straps.
 - 1. Weld anchors to gate post.
 - 2. Anchor straps to extend into masonry 16".
 - 3. Place anchor straps at same spacing as gate hinges.

- D. Gates:
 - 1. Install gates plumb, level, and secure for full opening without interference.
 - 2. Install ground-set items in concrete for anchorage.
 - 3. Adjust hardware for smooth operation and lubricate where necessary.
 - 4. Bottom of gate to be 4" above surface of concrete pad.

3.05 ADJUSTING

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

3.10 PROTECTION

- A. Protect finishes of ornamental railing system from damage during construction period by use of temporary protective coverings approved by railing manufacturer.
 - 1. Remove protective covering at time of Final Acceptance.
- B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work.
 - 1. Return items not refinished in field to shop; make required alterations and refinish entire unit, or provide new units as required.

END OF SECTION 02832

SECTION 02920

LAWNS AND GRASSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections apply to this Section.
- B. Excavation, grading and redistribution of top soil part of Section 02300, Earthwork.

1.02 DESCRIPTION

- A. Section includes furnishing and planting of grass seed, grass plugs and grass sod, including preparation of ground, furnishing and applying mulch, water and fertilizer.
- B. Work required under the scope of this section includes, but not strictly limited to:
 - 1. Providing additional top soil necessary to comply with requirements contained in this section.
 - 2. Finished grading to finished contours shown.
 - 3. Incorporation of soil amendments into soil.
 - 4. Planting of sod and plugging, and sowing of seed where indicated.
 - 5. Maintenance of lawns for designated period.

1.03 AREAS TO BE GRASSED- (in this contract)

- A. Site shall be stabilized with temporarily grass as soon as grading work that area is complete.
- B. Grass with permanent grassing all disturbed areas and areas previously grassed with temporary grassing.
 - 1. All disturbed areas are to be graded, topsoil installed and princess 77 seed installed.

1.04 SOIL ANALYSIS REPORT

- A. Contractor shall obtain soil sample from each of five evenly distributed areas of graded site.
 - 1. Take top soil after top soil distributed and in place at finished grade.
 - 2. Obtain soil analysis and report from Agricultural Extension Service based on each sample.
 - 3. Submit copy of report to Architect who will determine necessary quantity and type of additives necessary to bring soil to satisfactory condition for sustaining grass growth.
- B. Materials and quantities listed herein for soil amendment purposes approximately only.
 - 1. Results of soil analysis report to determine actual quantities and types of amendments to be used.
 - 2. Discrepancies between those specified and actual quantities used to be at the expense of the contractor.

1.05 REFERENCES

- A. ASAP (American Sod Producers Associates) - Guideline Specifications To Sodding.
- B. FS O-F-241-Fertilizers, mixed, commercial.
- C. Cooperative Extension Service, The University Of Georgia Bulletin B-773 revised November 1988.
- D. Grass seed shall conform to tolerance for germination, purity and weed seed of U.S. Department Of Agriculture Standards.

1.06 DEFINITIONS

- A. Weeds: Includes dandelion, jimsonweed, quackgrass, horsetail, morning glory, rush grass, mustard, lambsquarter, chickweed, cress, crabgrass, Canadian thistle, nutgrass, poison oak, blackberry, tansy ragwort, wild bermuda grass, johnson grass, poison ivy, nut sedge, nimbleweed, bindweed, bent grass, wild garlic, perennial sorrel, and brome grass.

1.07 QUALITY ASSURANCE

- A. Qualifications of Applicator: Applicator shall be a company regularly engage in commercial grassing contracting, possessing all necessary labor and equipment and has successfully completed a minimum of 5 other project employing the methods specified in this Section and approved by the sod producer.
- B. Seed vendor's certified statement for each grass mixture required, stating botanical and common name, percentages by weight, and percentages of purity, germination, and weed seed for each grass seed species.
- C. Sod Producer: Company specializing in sod production and harvesting with minimum five (5) years experience and certified by the State Of Georgia.
- D. Sod and plug: Minimum age of 24 months, with root development that will support its own weight, without tearing when suspended vertically by handling the upper two corners.
 - 1. Submit sod verification for grass species and location of sod source.

1.08 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.09 MAINTENANCE DATE

- A. Submit maintenance data for continuing Owner maintenance prior to expiration of required maintenance period.
- B. Include maintenance instructions, cutting methods and maximum grass height; types; application frequency and recommended coverage of fertilizer and herbicides.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver material to site and protect and store in area designated by the general contractor.
- B. Packaged Materials:
 - 1. Deliver packaged materials in containers showing weight, analysis, and name of manufacturer.
 - 2. Protect materials from deterioration during delivery, and while stored at site.
- C. Store materials in a manner to prevent wetting and/or deterioration.
- D. Grass Sod: Cut, deliver, and install grass plugs and sod within 24 hours.
 - 1. Do not harvest or transport sod when moisture content may adversely affect sod survival.
 - 2. Deliver sod on pallets or in rolls.
 - 3. Protect sod from sun, wind, and dehydration prior to installation.
 - 4. Protect exposed roots from dehydration.
 - 5. Protect sod against breaking of rolls.
 - 6. Do not tear, stretch, or drop sod during handling and installation.

1.11 JOB CONDITIONS

- A. The Contractor is advised of the presence of underground utilities. The contractor shall be responsible for verifying location and flagging of all underground utilities prior to the commencement of any work associated with this contract.
 - 1. Perform work in a manner to avoid possible damage to utilities.
 - 2. Where necessary hand excavate.
- B. The contractor shall be responsible for the repair of damaged utilities, where such damage is a result of work performed under this contract.
 - 1. Repairs shall utilize materials and methods to match existing construction and shall comply with all applicable codes and regulations.
 - 2. Repairs shall be at no additional cost to the contract.
- C. Excavation: When conditions detrimental to grass growth encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

1.12 SEQUENCING AND SCHEDULING

- A. Immediately after redistribution of top soil and preparation of planting bed, plant trees and shrubs. Plant lawns after trees and shrubs have been planted.

1.13 SPECIAL PROJECT WARRANTIES

- A. Warranty lawns through specified lawn maintenance period and until final acceptance of project; whichever is longer.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Top Soil:
 - 1. Top soil shall be fertile, friable, natural loam surface soil reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 2" in any dimension, and other extraneous or toxic matter harmful to plant growth.
 - 2. Obtain top soil from local sources or from areas having similar soil characteristics to that found at project site.
 - 3. Obtain top soil only from naturally, well-drained sites where top soil occurs in a min. depth of 4".
 - 4. Do not obtain from bogs or marshes.
- B. Commercial Fertilizer:
 - 1. For lawns, slow release, complete fertilizer, nitrogen content of which derived from organic or inorganic sources, meeting following requirements of plant food by weight, unless soil analysis and report indicate a need for different mixture in which case apply recommended mixture.
 - 2. Comply with all State and Federal laws relative to fertilizer.
 - 3. Mixture: 12% nitrogen, 5% Phosphoric Acid, 8% Potash.
- C. Ammonium Nitrate:
 - 1. Commercial product in dry powder form, of recent manufacture, delivered in original, unopened containers bearing manufacturer's guaranteed statement of analysis.
 - 2. Contain min. 33.5% Nitrogen.
- D. Ground Limestone:
 - 1. Natural ground dolomitic limestone containing min. 85% of total carbonates with min. 30% magnesium carbonates, ground so min. 90% passes 20-mesh sieve and min. 50% passes 100-mesh sieve.
 - 2. Contractor's option: Slag passing sieve test above.

E. Grass Seed:

1. Delivered to site in original sacks as received from producer, tagged in accordance with agriculture seed laws of the United States and the State of Georgia.
 - a. Tag to show dealer's grantee of year grown, percent purity, percent germination and date of tests determining purity and germination.
 - b. Required date of test within six months of sowing.
2. Provide fresh, clean, new crop seed complying with tolerance, purity and germination established by Official Seed Analyst of North America.
3. Store seed, delivered prior to use, in manner to protect from damage by heat, moisture, rodents, or other causes.
4. Centipede Grass (*Eremochloa Ophiuroides*);
 - a. Shall contain a minimum of 98% pure seed with 90% minimum germination and a maximum of 0.5% weed seed.
5. Sahara Hulled Bermuda;
 - a. Shall contain a minimum of 98% pure seed with 90% minimum germination and a maximum of 0.5% weed seed.
 - b. Hulled seeds shall coated with a coating material (clay based) and a fungicide to increase successful germination by providing control of seed and soil borne pathogens.
 - c. Sow at the rate of 90 lbs. per acre (hulled)
6. Princess 77 Bermuda;
 - a. Shall contain a minimum of 98% pure seed with 90% minimum germination and a maximum of 0.5% weed seed.
 - b. Hulled seeds shall coated with a coating material (clay based) and a fungicide to increase successful germination by providing control of seed and soil borne pathogens.
 - c. Sow at the rate of
 - 1) 20 lbs. per acre (hulled)
 - 2) 20 lbs. acre (un-hulled).

F. Grass Plugs:

1. Cut from Hybrid Bermuda Sod, 'Tift 419' with heavy disc and tractor when sod is moist.
 - a. Tag each load of sprigs showing dealer's grantee of percentage purity.
 - b. Cut pieces to an average min. 6" X 6"
 - c. Keep plugs damp until used.
 - d. Keep only as many plugs as can be planted in one day.

G. Grass Sod:

1. ASAP Certified Field Grown Centipede (*Eremochloa ophiuroides*) sod
2. ASAP Certified Field Grown Tiftway (Tifton 419 Bermuda) sod.
3. Min. Two (2) years old, with strong fibrous roots, free of stones, burned or bare spots, and undesirable grasses; containing no more than five (5) weeds per 1,000 square feet, and complying with the following:
4. Machine cut sod and load on pallets in accordance with ASAP guidelines.
5. Machine cut (harvest) sod in areas not exceeding one (1) square yard, to a pad thickness of 3/4" Plus or minus 1/4", excluding top growth and thatch.
6. Provide sod of uniform pad size with maximum 5% deviation either in length or width.
7. Broken pads or pads with uneven end not acceptable.
8. Sod pads incapable of supporting their own weight when suspended vertically with firm grasp on upper 10% of pad will be rejected.

2.02 AUXILIARY MATERIALS

A. Tackifier:

1. Liquid concentrate diluted with water forming a transparent 3-dimensional film like crust permeable to water and air containing no agents toxic to seed germination.

- B. Straw Mulch:
 - 1. Clean oat or wheat straw well seasoned before bailing, free from mature seed-bearing stalks or roots of prohibited or noxious weeds.
- C. Wood Cellulose Fiber Mulch:
 - 1. Degradable green dyed wood cellulose fiber or 100% recycled long fiber pulp, free from weeds or other foreign matter toxic to seed germination and suitable for hydromulching.
- D. Erosion Control Mat:
 - 1. Provide slope mats where indicated. If none are indicated provide for all slopes with a gradient greater than 3:1. Mat shall consist of 100% biodegradable material and be designed for a velocity of 15 fps. Mat is to be installed parallel with the slope. Additional requirements are as follows:
 - a. Material: Wood or Straw
 - b. Thickness: Minimum of ½”
 - c. Netting: Minimum size of ½” x ½” on both sides
 - d. Staking: Minimum of four hard wood stakes per 20’-0” length. Additional stakes may be required to meet manufactures specifications
- E. Water:
 - 1. Clean, fresh and free of oil, acid, alkali, salt or other substances or matter, which could inhibit vigorous growth of grass.

PART 3 - EXECUTION

3.01 GENERAL

- A. It is the intent of these documents that the entire site, excluding areas on which building, paving and/or walks are to be placed, is to be grassed.
 - 1. Provide grass sod where indicated.
 - 2. Areas not specifically designated to receive grass sod or plugs are to be seeded.
- B. Except where specifically noted otherwise, contractor shall have the option of grassing site using seed, plugs or sod or any combination of seeding methods specified.
- C. Regardless of grassing method chosen acceptance of site subject to conditions stated below.

3.02 INSPECTION

- A. Verify that prepared soil base is ready to receive the work of this section. Notify Architect.
- B. Examine finish surfaces, grades, and topsoil quality and topsoil depth for suitability. Notify contractor of unsuitable conditions. Do not commence work until unsatisfactory conditions corrected.
- C. Beginning of installation means acceptance of existing site conditions as being acceptable for the performance of work herein specified.

3.03 REDISTRIBUTION OF TOP SOIL

- A. Contractor redistribute existing topsoil across all areas of site where not indicated covered by building, pavement or other improvement.
- B. Topsoil currently stock piled on site; redistribute as to provide a minimum average depth of top soil of 4".
- C. Determine thickness of topsoil available. If thickness less than 4" provide additional top soil necessary to achieve an

average min. thickness of 4".

- D. Topsoil shall be mechanically screened to remove organic material prior to placement.

3.04 PREPARATION FOR PLANTING LAWNS

- A. Top soil preparation: Prior to mixing or fertilizing, remove roots, plants, stones, clay lumps and extraneous materials from top soil.
1. Loosen topsoil to min. depth of 4".
 2. Remove stones measuring over 1 inch in any dimension.
 3. Remove sticks, roots, rubbish, and other extraneous matter.
 4. Limit preparation to areas planted promptly after preparation.
- B. Fine grade lawn areas to smooth, even surface with loose, uniformly fine texture.
1. Roll, rake, and drag lawn areas, remove ridges and fill depressions, required to meet finish grades and as required to drain.
 2. Limit fine grading to areas planted immediately after grading.
 3. Where sod indicated to be installed allow for sod thickness.
- C. Moisten prepared lawn areas before planting if soil dry.
1. Water thoroughly and allow surface moisture to dry before planting lawns.
 2. Do not create a muddy soil condition.
- D. Restore lawn areas to specified condition, if eroded or otherwise disturbed, after fine grading and prior to planting.
- E. Before sowing grassing operations commence, loosen soil to a min. 12" depth using 'Knife Point Type Sub-Soiler attachment (max. 8" o.c. spacing of tines).
1. Prepare bed by thoroughly cultivating, discing, hand raking, etc, as necessary to produce smooth even grade free of hollows and other inequalities.

3.05 FERTILIZING AND LIMING

- A. General: Apply fertilizer in accordance with manufacturer's instructions but in no case less than the amounts listed herein.
1. Apply specified commercial fertilizer at rates indicated and thoroughly mix into upper 4 inches of topsoil.
 2. Delay application of fertilizer if lawn planting will not follow within a few days.
- B. Liming: Approximately two days prior to the start of grassing operations apply ground limestone or slag at the rate of 100 lbs/1000 s.f. of lawn area.
1. Work lime into top 6" of ground.
- C. Initial Fertilization: Either in conjunction with application of lime, or immediately after, apply specified commercial fertilizer over lawn areas at the rate of 50 lbs./1000 s.f..
1. Work fertilizer into top 4" of ground.
 2. Apply after smooth raking of soil and prior to installation of seed, plugs or sod.
 3. Apply fertilizer no more than forty-eight (48) hours before laying seed, plugs or sod.
- D. Additional Fertilizations: Three to four weeks after planting or after germination, apply 1.25 lbs. of nitrogen (4 lbs. of ammonium nitrate) per 1,000 square feet to grassed area.
1. Repeat ammonium nitrate every three to four weeks until mid August.
 2. Mid-August to early September a complete fertilizer such as used for the initial fertilization shall be installed to promote root growth throughout the winter.

3.06 EROSION CONTROL MAT

- A. Install erosion control mat on earthen slopes where slope exceeds 3:1 (3 feet horizontal for 1 foot vertically).
 - 1. Installation to be in accordance with manufacturers written instructions.

3.07 SEEDING

- A. Seed all areas disturbed as a result of construction operations unless area indicated to be grassed with plugs or sod, or unless area to be covered with paving or building.
- B. Do not use wet seed or moldy seed or otherwise damaged in transit or storage.
- C. Do not seed when wind velocity exceeds 5 miles per hour or when poor results obtained due to adverse soil or weather conditions.
- D. Sow grass seed evenly by hand or mechanical broadcast in two operations in equal amounts, at right angles to each other.
 - 1. After sowing seed lightly rake or drag, either by hand or mechanical equipment, to cover seed to a maximum depth of 1/4".
 - 2. Immediately after seeding water areas seeded with fine spray.
- E. Sow not less than quantity of seed specified or scheduled.
 - 1. Centipede: 25# to 40# Per Acre.
 - 2. Princess 77 hulled bermuda: 4 lbs. per 1,000 square feet.
 - 3. Princess 77 unhulled bermuda: 5 lbs. per 1,000 square feet.
 - 4. Sahara hulled bermuda: 2 lb. per 1,000 square feet.
- F. Protect seeded areas against erosion by spreading specified lawn mulch after completion of seeding operations.
 - 1. Spread uniformly to form a continuous blanket not less than 1-1/2" loose measurement over seeded areas.
 - 2. Anchor mulch by spraying with asphalt emulsion at the rate of 10 to 13 gallons per 1000 sq. ft.
 - 3. Take precautions to prevent damage or staining of construction or other plantings adjacent to mulched areas.

3.08 PLUGGING

- A. All work to be in accordance with recommendations provided by the Cooperative Extension Service, The University Of Georgia Bulletin 773, revised November 1988.
- B. Areas to be plugged to be prepared in the same manner as specified for sodding and as recommended by supplier.
- C. Plug area designated on drawing using 2" plugs of grass of type indicated planted at 6" to 8" on center each was to a depth of 1" to 2".
- D. After placing the plugs in furrow, cover part of plug with soil and compact using a roller. Commence watering of plugs immediately.
- E. Maintain plugs as described for sod.

3.09 LAYING SOD

- A. Allow for sod thickness in areas to be sodded.
- B. Roll areas to receive sod prior to placing sod and after sod has been laid with a roller with a minimum weight of 200 lbs

- C. Lay Sod within 24 hours from time of stripping.
 - 1. Do not plant dormant sod or if ground is dormant.
- D. Lay sod to form a smooth solid mass with tightly fitted joints complying with the following:
 - 1. Butt ends and sides of sod strips; do not overlap.
 - 2. Stagger strips to offset joints in adjacent courses.
 - 3. Work from boards to avoid damage to subgrade or sod.
 - 4. Tamp or roll lightly to ensure contact with subgrade.
 - 5. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.
 - 6. Anchor sod on slopes with wood pegs to prevent slippage.
- E. Water sod thoroughly with a fine spray immediately after planting.
- F. After sod and soil has dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding thirty (30) gallons.
- G. Protect sodded areas against erosion with erosion control mat or other methods acceptable to the Architect.
 - 1. Install erosion control mat in accordance with manufacturers recommendations.

3.10 MULCHING

- A. Place straw mulch on seeded areas within 24 hours after seeding.
- B. Place straw mulch uniformly in continuous loose (not matted) blanket at the rate of 2-1/2 tons per acre, or (2) 50 pound bales per 1,000 square feet of area.
 - 1. A mechanical blower may be used for straw mulch application when acceptable to Architect.
- C. Crimp straw into soil by mechanical means.
- D. Anchor straw mulch with asphaltic emulsion binder applied uniformly at the rate of not less than 100 gallons per acre for erosion prone areas.
- E. Protect buildings, paving, plantings, and all non-seeded areas from asphaltic emulsion over-spray.
- F. Provide straw bale checking in ditches or problem swales at intervals required to adequately slow water velocity and impede soil loss.

3.11 WATERING

- A. General: Watering is the contractor's responsibility until grass is accepted by the architect.
 - 1. Contractor to provide all watering materials to include but not limited to hoses, sprayers, piping, and timers.
 - 2. If irrigation is installed as part of the contract, the contractor shall operate and maintain the irrigation system until grass is established.
- B. Soak mulch and seed bed to a min. depth of 6"; 4" for plugs and sod immediately after grassing.
- C. Water lawns daily to maintain adequate surface soil moisture for proper seed germination.
 - 1. Continue daily watering for not less than 30 days.
 - 2. Thereafter apply 1/2" of water twice weekly until acceptance.
 - 3. Use only fine spray nozzles.
 - 4. Do not wash away soil, seed, plugs, or sod.

3.12 MAINTENANCE

- A. Maintenance shall consist of watering, weeding, fertilizing, liming, weeding, disease and insect pest control, mowing, protective spraying, replacement of unacceptable material, and any other procedure consistent to insure normal, horticultural practice necessary to insure normal, vigorous, and healthy growth of all work.
- B. Maintenance shall begin immediately after each portion of grass is installed and shall continue until acceptance.
- C. Maintain lawns for not less than the period stated below, and longer as required to establish an acceptable lawn.
 - 1. Seeded and plugged lawns, not less than 120 days after substantial coverage is obtained.
 - 2. If seeded or plugged in fall and not given full 120 days of maintenance, or if not considered acceptable at that time, continue maintenance following spring until acceptable lawn established.
 - 3. Sodded lawns, not less than 120 days after substantial coverage is obtained.
- D. Mowing Grass: Mow lawn areas as soon as lawn top growth reaches a 3" height. Mow grass at regular intervals to maintain at a maximum height of 2". Do not cut more than one-third (1/3) of grass blade at any one mowing. Mowing shall be done at a minimum of once every two weeks during the maintenance period.
 - 1. Neatly trim edges and hand clip where necessary.
 - 2. Immediately remove clippings after mowing and trimming.
- E. Weeding: Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy and damage resulting from improper use of herbicides.
- F. Lawn Establishment:
 - 1. Roll surface to remove minor depressions or irregularities.
 - 2. Immediately replace areas which show deterioration or bare spots.
 - 3. Re-grade and re-seed washed areas or eroded areas as required until a suitable ground cover is obtained.
 - 4. The contractor shall be responsible for all damages to the lawn areas during the maintenance period.

3.13 PLANTING SEASON

- A. Perform seeding between August 15 and October 15 or between May 1 and June 1 or during season or seasons normal for such work as determined by weather conditions and accepted practice in locality.
- B. Perform plugging and sodding only in seasons from May 1 and September 1; if seasonal or other conditions permit, and with written approval by the Architect, start grassing activities earlier and/or continue later than specified dates.
- C. Temporary vegetative cover required if seasonal requirements for planting not correct at time grading operation complete.
 - 1. Seed annual rye grass at rate of 3 bu/acre.
 - 2. Perform seeding in manner outlined in this section.
 - 3. Before permanent grassing begun, Contractor shall restore and prepare ground surface as required by this section.

3.14 CLEANUP AND PROTECTION

- A. During landscape work, keep pavements clean and work area in orderly condition.
- B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers.
 - 1. Maintain protection during installation and maintenance periods.
 - 2. Treat, repair, or replace damaged landscape work as directed.

3. Immediately repair eroded or damaged areas, regardless of cause, by reseeding, plugging or sodding as required.

3.15 INSPECTION AND ACCEPTANCE

- A. When landscape work completed, including maintenance, Architect will, upon request, make inspection to determine acceptability.
 1. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by Architect and found acceptable.
 2. Remove rejected materials promptly from project site.
- B. Conditions for Acceptance for areas sodded, plugged and seeded.
 1. Architect has issued a final certificate of completion for the entire project.
 2. Grass shall exhibit vigorous growth.
 3. Grass shall be mowed by contractor a minimum of three (3) times. Last mowing shall be within seven (7) days prior to final inspection.
 4. Maximum weed or foreign grass count shall not exceed 50 weeds or foreign grass per 100 sq. ft.
 5. No erosion shall exist.
 6. Stand of grass:
 - a. Seeded: 75% coverage of growing viable grass with no bare spots over one square foot in size.
 - b. Plug: 75% coverage of growing viable grass with no bare spots over 3" in size.
 - c. Sod: 100% covering of growing viable sod, with no bare spots over 3" in size.

END SECTION 02920

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Provide all cast-in-place concrete, complete, in place, as indicated on the Drawings, specified herein and required for the complete installation.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.
- B. Cast-in-place concrete includes the following:
 - 1. Foundations and footings.
 - 2. Slabs-on-grade.
 - 3. Fill for steel deck.
 - 4. Foundation walls.
 - 5. Load-bearing building walls.
 - 6. Equipment pads and bases.
 - 7. Fill for steel pan stairs.

1.04 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others if requested by Architect.
- C. Shop drawings for Concrete Reinforcement:
 - 1. Shop drawings shall be submitted by the Contractor to the Architect and review action received prior to fabrication. When corrections are required, copies will be returned noting such. Drawings shall then be corrected and resubmitted until final review action is received. Coordination of shop drawing shall be such that corrections noted on one sheet that affects another drawing will be transmitted and made on all sheets and also resubmitted.
 - 2. Shop drawings shall also include:
 - a. Location of all proposed construction joints, keying and waterstops;

- b. Location of all openings, depressions, construction and control joints, trenches, sleeves, inserts and items affecting the reinforcement and placing of concrete.
 3. The Contractor shall be responsible for checking quantities and dimensions in accordance with contract drawings. Where discrepancies in dimensions are noted, the Contractor shall notify the Architect of such discrepancies and corrected dimensions will then be furnished by the Architect. Corrected dimensions shall be reflected on shop drawings.
 4. Contract drawings receive precedence over shop drawings unless otherwise authorized in writing.
 5. Shop drawings furnished for reinforcing steel shall contain fabrication details as well as placement drawings which are to be used in conjunction with contract drawings.
 6. Detailing and fabrication of reinforcing shall conform to ACI "Manual of Standard Practice for Detailing Reinforced Concrete Structures", (ACI 315-05).
- D. Samples of materials as requested by Architect, including names, sources, and descriptions, as follows:
 1. Color finishes.
 2. Normal weight aggregates.
 3. Reglets.
 4. Vapor barrier.
 5. Form liners.
- E. Submit 5 copies of laboratory test reports for concrete materials and mix design test. All concrete mix designs shall be prepared by a qualified testing laboratory.
- F. Material certificates in lieu of material laboratory test reports when permitted by Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.
- G. Review Action: Submittals are reviewed for general conformance with the design concept only and are subject to all requirements of the contract documents. Contractor is responsible for dimensions, quantities and coordination with other trades. Reviews do not authorize any changes involving additional cost unless stated in separate letter or change order.

1.05 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 2. ACI 311.4R-05, "Guide for Concrete Inspection."
 3. ACI 318, "Building Code Requirements for Reinforced Concrete."
 4. ACI 304R-00, "Guide for Measuring, Mixing, Transporting and Placing Concrete."
 5. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Concrete Testing Service:
 1. All testing services specified in this section of these specifications shall be performed by a recognized, independent laboratory approved by the Architect.
 2. All expenses of the testing agency shall be borne by the Contractor.

3. The Contractor shall furnish to the testing agency samples of all proposed material to be used which requires testing.
 4. Testing agency shall check and review proposed materials to be used for compliance with these specifications, perform all testing in accordance with referenced standards and provide all reports.
 5. Contractor shall furnish all project specifications, testing material, mill reports, design mixes and cylinders, and shall notify laboratory of concrete pouring schedules so as not to delay progress of the work.
 6. No material or mixes shall be used on project unless approved by the Architect.
 7. Materials and installed work may require testing and retesting, as directed by the Architect, at anytime during the progress of the work. Allow free access to material stockpiles and facilities at all times. Retesting of rejected material and installed work, shall be provided at the Contractor's expense.
- C. Tests for Concrete Materials:
1. Portland cement shall be sampled and tested to determine the properties in accordance with ASTM C 150-05.
 2. Aggregates shall be sampled and tested in accordance with ASTM C 33-92 (normal weight).
- D. Supervision: All reinforced concrete construction shall be performed under the personal supervision of the contractor's superintendent. This superintendent shall keep a record of all concrete poured on the job. The record shall show in detail the area poured, the time and date of the pour and weather conditions which existed at the time of the pour. Upon completion of the work, this record shall be turned over to the Architect.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Textured Finish Concrete: Units of face design, size, arrangement, and configuration to match Architect's control sample. Provide solid backing and form supports to ensure stability of textured form liners.
- D. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- E. Form Ties:
1. Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.

2. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.
- D. Deformed-Steel Welded Wire Fabric: ASTM A 497.
- E. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.
 1. For slabs-on-grade, including thickened slab areas, use supports with sand plates or horizontal runners where base material will not support chair legs.
 2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).
 3. For foundations, support reinforcing in bottom at footings with whole concrete bricks at 4'-0" on center.

2.03 CONCRETE MATERIALS

- A. Portland Cement:
 1. Comply with ASTM C 150, Type I.
 2. Use one brand of cement throughout Project unless otherwise acceptable to Architect.
- B. Fly Ash: ASTM C 618, Type F.
- C. Normal-Weight Aggregates:
 1. Comply with ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.
 2. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
 3. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.
 4. Do not use aggregates containing soluble salts, iron sulphide, pyrite, marcasite or ochre which can cause strains on exposed concrete surfaces.
 5. Dune sand, bank run sand and manufactured sand are not acceptable.
 6. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam or foreign matter, as follows:
 - a. Crushed stone, processed from natural rock or stone.
 - b. Washed gravel, either natural or crushed. Use of pit or bank run gravel is not permitted.
 - c. Maximum Aggregate Size: Not larger than one-fifth of the narrowest dimension between sides of forms, one-third of the depths of slabs nor three-fourths of the minimum clear

spacing between individual reinforcing bars or bundles of bars nor over 1" in max. size except for block fill where max. size shall not exceed ½".

These limitations may be waived if, in the judgement of the Architect, workability and methods of consolidation are such that concrete can be placed without honeycomb or voids.

- D. Lightweight Aggregates: ASTM C 330.
- E. Water: Potable.
- F. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
- G. Air-Entraining Admixture:
 - 1. Comply with ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- H. Water-Reducing Admixture:
 - 1. Comply with ASTM C 494, Type A.
- I. High-Range Water-Reducing Admixture:
 - 1. Comply with ASTM C 494, Type F or Type G.
- J. Water-Reducing, Accelerating Admixture:
 - 1. Comply with ASTM C 494, Type E.
- K. Water-Reducing, Retarding Admixture:
 - 1. Comply with ASTM C 494, Type D.
- L. Calcium Chloride: Calcium chloride will not be permitted in concrete.

2.04 RELATED MATERIALS

- A. Preformed Expansion Joint Fillers: Premolded fillers shall meet "Specifications for Premolded Expansion Joint Fillers for Concrete Paving and Structural Construction", ASTM D 1751-04.
- B. Reglets: Where sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 0.0217-inch-thick (26-gage) galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.
- C. Slab on Grade Floor Joint Forms:
 - 1. Interior spaces: 24 ga., pre-shaped keyed type galvanized steel joint forms and stakes. Galvanizing shall be hot-dipped conforming to ASTM A 653-03 Grade E Steel G90 coating class.
 - 2. Exterior spaces: Wood or metal removable tongue and groove joint forms.

- D. Chemical Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 pounds of fluosilicates per gallon.
- E. Sand Fill: Clean, manufactured or natural sand.
- F. Membrane-Forming Curing Compound: ASTM 1315, 30% solids content minimum, Type 1, Class A.
- G. Nonslip Aggregate Finish: Provide fused aluminum oxide granules or crushed emery as the abrasive aggregate for a nonslip finish, with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide. Use material that is factory-graded, packaged, rustproof, nonglazing, and unaffected by freezing, moisture, and cleaning materials.
- H. Colored Wear-Resistant Finish:
 - 1. Use packaged dry combination of materials consisting of portland cement, graded quartz aggregate, coloring pigments, and plasticizing admixture. Use coloring pigments that are finely ground nonfading mineral oxides interground with cement. Color as selected by Architect from manufacturers' standards, unless otherwise indicated.
- I. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- J. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.
 - 3. Polyethylene-coated burlap.
- K. Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A.
- L. Epoxy Adhesive:
 - 1. ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.

2.05 PROPORTIONING AND DESIGNING MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
 - 1. Limit use of fly ash to not exceed 25 percent of cement content by weight.
- B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.

- C. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:
1. Formed Concrete: 4000-psi, 28-day compressive strength; 564 lbs. cement per cubic yard, minimum; Air-entrained.
 2. Foundations: 3000-psi, 28-day compressive strength; (non-air-entrained).
 3. Slabs on Grade: 3000-psi, 28-day compressive strength; (air-entrained).
 4. Concrete Masonry Fill: 2500-psi, 28-day compressive strength.
- D. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
1. Ramps, slabs, and sloping surfaces: Not more than 4 inches.
 2. Reinforced foundation systems: Not less than 1 inch and not more than 4 inches.
 3. Concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches after adding admixture to site-verified 2-to-3-inch slump concrete.
 4. Other concrete: Not more than 4 inches.
- E. Lightweight Structural Concrete: Lightweight aggregate and concrete shall conform to ASTM C 330. Proportion mix to produce concrete with a minimum compressive strength of 4000 psi at 28 days and a calculated equilibrium unit weight of 110 pcf plus or minus 3 pcf as determined by ASTM C 567. Concrete slump at the point of placement shall be the minimum necessary for efficient mixing, placing, and finishing. Maximum slump shall be 6 inches for pumped concrete and 5 inches elsewhere. Air entrain concrete exposed to weather according to ACI 301 requirements.
- F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in Work. No water shall be added to concrete mix at job site unless approved by Architect.

2.06 ADMIXTURES

- A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
- B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).
- C. Use high-range water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water-cement ratios below 0.50.
- D. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:
1. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure:
 - a. 4.5 percent (moderate exposure); 5.5 percent (severe exposure) for 1-1/2-inch maximum aggregate.

- b. 4.5 percent (moderate exposure); 6.0 percent (severe exposure) for 1-inch maximum aggregate.
 - c. 5.0 percent (moderate exposure); 6.0 percent (severe exposure) for 3/4-inch maximum aggregate.
 - d. 5.5 percent (moderate exposure); 7.0 percent (severe exposure) for 1/2-inch maximum aggregate.
2. Other concrete not exposed to freezing, thawing, or hydraulic pressure, or to receive a surface hardener: 2 to 4 percent air.
- E. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.07 CONCRETE MIXING

- A. Job-Site Mixing:
- 1. Mix concrete materials in appropriate drum-type batch machine mixer. For mixers of 1 cu. yd. or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than 1 cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd.
 - 2. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
- B. Ready-Mixed Concrete:
- 1. Comply with requirements of ASTM C 94, and as specified.
 - 2. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 GENERAL

- A. Coordinate the installation of joint materials, vapor barrier, and other related materials with placement of forms and reinforcing steel.

3.02 FORMS

- A. General:
- 1. Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:
 - 2. Provide Class A tolerances for concrete surfaces exposed to view.
 - 3. Provide Class C tolerances for other concrete surfaces.

- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.
- D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.03 PLACING REINFORCEMENT

- A. General:
 - 1. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.
 - 2. Avoiding cutting or puncturing vapor barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.
- D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

- E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- F. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at all points of contact between slabs-on-grade and vertical surfaces column pedestals, foundation walls, grade beams and elsewhere as indicated on the drawings.

3.04 JOINTS

- A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.
- B. Provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
- D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. Construction Joints in Slabs-on-Grade:
 - 1. Construction joints for slab-on-grade (floor joints) shall be tongue and groove key type wood or steel joint form. Prefabricated metal floor joint forms shall be installed as per manufacturer's instructions.
 - 2. All floor joints to be removed shall be painted on one side with grease or mastic to prevent bond.
 - 3. Galvanized steel interior floor joint forms may be set to permit simultaneous pouring of concrete on both sides. Metal form to be left in place.
- F. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

3.05 INSTALLING EMBEDDED ITEMS

- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- B. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
- C. Install dovetail anchor slots in concrete structures as indicated on drawings.

- D. Edge Forms and Screed Strips for Slabs: Set edge forms, or bulkheads and intermediate screed strips for slabs to obtain the elevations and contours in the finished slab surface. Provide and secure units to support the type of screed strips by the use of strike-off templates or accepted compacting type screeds. Screed strips are to be constructed, supported and set to avoid displacement of reinforcing steel positions.

3.06 PREPARING FORM SURFACES

- A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.
- B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.
 - 1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.07 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.
- D. Placing Concrete in Forms:
 - 1. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 - 2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
- E. Placing Concrete Slabs:
 - 1. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
 - 2. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.

3. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 4. Maintain reinforcing in proper position on chairs during concrete placement.
- F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- G. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
 4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.08 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. Smooth-Rubbed Finish: Provide smooth-rubbed finish on scheduled concrete surfaces that have received smooth-formed finish treatment not later than 1 day after form removal.

1. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Grout-Cleaned Finish:
1. Provide grout-cleaned finish on scheduled concrete surfaces that have received smooth-formed finish treatment.
 2. Combine one part portland cement to one and one-half parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to form the consistency of thick paint. Blend standard portland cement and white portland cement in amounts determined by trial patches so that final color of dry grout will match adjacent surfaces.
 3. Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.
- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.09 MONOLITHIC SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.
1. After placing slabs, finish surface to tolerances of F(F) 15 (floor flatness) and F(L) 13 (floor levelness) measured according to ASTM E 1155. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
- B. Float Finish:
1. Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.
 2. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTM E 1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish:
1. Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.
 2. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface.

Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 25 (floor flatness) and F(L) 20 (floor levelness) measured according to ASTM E 1155. Grind smooth any surface defects that would telegraph through applied floor covering system.

EXCEPTION: For slab surfaces scheduled to receive terrazzo, thin-set ceramic, or rubber type gymnasium flooring, finish surfaces to tolerances of F(F) 50 (floor flatness) and F(L) 30 (floor levelness) measured according to ASTM E 1155. Grind smooth any surface defects that would telegraph through applied floor covering system.

- D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.
- E. Nonslip Broom Finish:
1. Apply a nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 2. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- F. Nonslip Aggregate Finish:
1. Apply nonslip aggregate finish to concrete stair treads, platforms, ramps, sloped walks, and where indicated.
 2. After completing float finishing and before starting trowel finish, uniformly spread 25 lb of dampened nonslip aggregate per 100 sq. ft. of surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface. After broadcasting and tamping, apply trowel finishing as specified.
 3. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose nonslip aggregate.
- G. Chemical Hardener Finish:
1. Apply chemical hardener finish to all exposed dry interior concrete floors exposed to view.
 2. Apply liquid chemical hardener after complete curing and drying of the concrete surface.
 3. Dilute the liquid hardener with water and apply three coats:
 - First Coat: 1/3 strength
 - Second Coat: 1/2 strength
 - Third Coat: 2/3 strength
 4. Evenly apply all coats and allow 24 hours drying time between coats.
 5. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instruction.
 6. After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.
- H. F(L) and F(F) Exceptions:
1. F(L) tolerances and testing specified herein shall not be applicable to formed elevated concrete slab surfaces.
 2. F(L) and F(F) tolerances and testing specified shall not be applicable to surfaces within two feet of any floor joints, pre-positioned embedments, or any types of full-depth penetrations in accordance with ASTM E-1155.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels, bond beams and vertically reinforced cells where indicated on the drawings or as scheduled. Maintain accurate location of reinforcing steel during concrete placement. All masonry voids to be kept clean of mortar fins or obstructions to ensure complete filling of designated cells.
- E. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in safety inserts and accessories as shown on drawings. Screen, tamp, and trowel-finish concrete surfaces.

3.11 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
- D. Provide moisture curing by the following methods:
 - 1. Keep concrete surface continuously wet by covering with water.
 - 2. Use continuous water-fog spray.
 - 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
- E. Provide moisture-retaining cover curing as follows:
 - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape

or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

- F. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:
1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
- G. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- H. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.
1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.12 SHORES AND SUPPORTS

- A. General: Comply with ACI 347 for shoring and reshoring in multistory construction, and as specified.
- B. Extend shoring from ground to roof for structures four stories or less, unless otherwise permitted.
- C. Extend shoring at least three floors under floor or roof being placed for structures over four stories. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.
- D. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.
- E. Keep reshores in place a minimum of 15 days after placing upper tier, or longer, if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.13 REMOVING FORMS

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg. F (10

deg. C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
- C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.14 REUSING FORMS

- A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Architect.

3.15 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.
- B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.
 - 1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
 - 2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- C. Repairing Formed Surfaces:
 - 1. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.
 - 2. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
2. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
3. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
4. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.
5. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

E. Repair isolated random cracks and single holes 1 inch or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

F. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

G. Repair methods not specified above may be used, subject to acceptance of Architect.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: The Contractor will employ a testing agency to perform tests and to submit test reports.

B. Sampling and testing for quality control during concrete placement may include the following, as directed by Architect.

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 - c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.

- d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 - e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
- 2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 - 3. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
 - 4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 - 5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- C. Test results will be reported in writing to the Architect within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION 03300

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SECTION 03450
ARCHITECTURAL PRECAST CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of architectural precast concrete work is shown on drawings.
 - 1. Scope includes "Cast-stone" sills, lintels, copings, caps and bands.
- B. Architectural precast concrete includes the following:
 - 1. Plain smooth-faced concrete units.
- C. Precast prestressed structural concrete units are specified under another Section of Division 3.
- D. Caulking, sealants, and gaskets are specified in Division 7.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Submit fabricator's specifications, data and instructions for manufactured materials and products.
 - 2. Include mix designs, certifications and laboratory test reports as required.
 - 3. Include water absorption test reports for units with exterior exposure.
- B. Shop Drawings:
 - 1. Submit shop drawings showing complete information for fabrication and installation of precast concrete units.
 - 2. Indicate member dimensions and cross-section; fabrication tolerances; location, size and type of reinforcement, including special reinforcement and lifting devices necessary for handling and erection.
 - 3. Include erection procedure for precast units, sequence of erection, and erection tolerances.
 - 4. Show layout, dimensions, and identification of each precast unit corresponding to sequence and procedure of installation.
 - 5. Indicate welded connection by AWS standard symbols.
 - 6. Detail inserts, connections, and joints, including accessories and construction at openings in precast units.
 - 7. Show caulked joints, including expansion joints ("soft" type) and grouted joints ("rigid" type).
- C. Samples:
 - 1. Submit samples approximately 12" x 12" x 2" to illustrate quality, color, and texture of surface finish.
 - 2. Submit samples of cast-in gaskets, anchorages, and other attachments and accessories as requested by Architect.
 - 3. Prepare full-size sample of each type architectural precast concrete unit for Architect's inspection at production plant or on site prior to start of installation work, and after Architect review of finish samples.
 - a. Acceptable full-size samples may be incorporated in job installation.
 - 4. In presence of Architect, damage area on exposed face surface and demonstrate materials and methods proposed for repair of surface blemishes.
 - a. Patching of damaged exposed face surfaces permitted when acceptable to Architect.
 - b. Otherwise, remove and replace damaged units when patching repairs unacceptable to Architect.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except as otherwise indicated:
 - 1. ACI 318 "Building Code Requirements for Reinforced Concrete".
 - 2. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
 - 3. Prestressed Concrete Institute MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products".
 - 4. American Welding Society D1.4, "Structural Welding Code - Reinforcing Steel."
- B. Fabricator Qualifications:
 - 1. Firms with min. of 5 years successful experience in fabrication of architectural precast concrete units, similar to units required for this project, acceptable.
 - 2. Fabricator to have sufficient production capacity to produce, transport, and deliver required units without causing delay in Work.
 - 3. Fabricator: Producer member of Precast Concrete Institute (PCI) and/or participate in its Plant Certification Program.
- C. Fabrication Qualifications:
 - 1. Produce precast concrete units at fabricating plant engaged primarily in manufacturing of similar units, unless plant fabrication or delivery to site impractical.
 - 2. If units not produced at precast concrete fabricating plant, maintain procedures and conditions for quality control equivalent to plant production.
- D. Design modifications made only as necessary to meet field conditions and ensure proper fitting of work, and only as acceptable to Architect.
 - 1. Maintain general design concept shown without increasing or decreasing sizes of members or altering profiles and alignment shown.
 - 2. Provide complete design calculations and drawings prepared by professional engineer registered in State where project located, if design modifications anticipated.
- E. Qualifications of Erector: Min. 5 years successful experience in erection of architectural precast concrete units, similar to units required for Project.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver precast concrete units to project site in quantities and times to assure continuity of installation.
 - 1. Store units at project site to prevent cracking, distortion, warping, staining, or other physical damage and so markings visible.
 - 2. Lift and support units only at designated lifting or supporting points shown on final shop drawings.

PART 2 - PRODUCTS

2.01 FORMWORK

- A. Provide forms and, where required, form facing materials of metal, plastic, wood, or other acceptable material non-reactive with concrete, producing required finish surfaces.
- B. Accurately construct forms, mortar-tight, and of sufficient strength to withstand pressures due to concrete placing operations, temperature changes and, when prestressed pre-tensioning and de-tensioning operations.
 - 1. Maintain form work to provide completed precast concrete units of shapes, lines and dimensions indicated, within specified fabrication tolerances.
 - 2. Unless forms for plant-manufactured prestressed concrete units stripped prior to de-tensioning, design forms so stresses not induced in precast units due to deformation of concrete under prestress or to movement during de-tensioning.

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

- B. Galvanized Reinforcing Bars: ASTM A 767 II (2.0 oz. zinc psf), hot-dipped galvanized after fabrication and bending.
- C. Steel Wire: ASTM A 82, plain, cold-drawn, steel.
- D. Welded Wire Fabric: ASTM A 185.
- E. Welded Deformed Steel Wire Fabric: ASTM A 497.
- F. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement.
 - 1. For exposed-to-view concrete surfaces, where legs of supports in contact with forms, provide supports with plastic protected legs (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III.
 - 1. Use only one brand, type, and source of supply of cement throughout Project, unless otherwise acceptable to Architect.
 - 2. Use "white" portland cement for facing concrete mix to match Architect's control sample.
 - 3. Use standard "gray" portland cement for non-exposed back-up concrete.
- B. Coarse Aggregate for Facing Mixes: ASTM C 33 for "Severe Weathering Region"; hard, durable, carefully selected and graded; free of material causing staining or reacting with cement and with max. 5% magnesium sulfate soundness loss unless min. 5 years historical experience indicates satisfactory durability.
- C. Fine Aggregate for Facing Mixes: ASTM C 33; manufactured sand of same material as coarse aggregate, unless otherwise acceptable to Architect.
- D. Pigments: Non-fading, resistant to lime and other alkalis.
- E. Water: Drinkable, free from foreign materials in amounts harmful to concrete and embedded steel.
- F. Air-Entraining Admixture: ASTM C 260.
- G. Water-Reducing Retarding, Accelerating Admixtures: ASTM C 494, Type as selected by Fabricator and containing not more than 0.1% chloride ions.

2.04 CONNECTION MATERIALS

- A. Steel Plates: Structural quality, hot-rolled carbon steel, ASTM A 283, Grade C.
- B. Steel Shapes: ASTM A 36.
- C. Anchor Bolts: ASTM A 307, low-carbon steel bolts, regular hexagon nuts and carbon steel washers.
- D. Electrodes for Welding: Comply with AWS Code.
- E. Finish of Steel Units: Exposed units hot-dip galvanized after fabrication, ASTM A 153; inserts cast into precast units hot-dip galvanized, electro-galvanized or cadmium coated, others shop painted with rust-inhibitive primer.

2.05 GROUT MATERIALS

- A. Cement Grout:
 - 1. Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 404.
 - 2. Mix at ratio of 1.0 part cement to 3.0 parts sand, by volume, with min. water required for placement and hydration.

- B. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C 621 specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
 - 1. Nonshrink Nonmetallic Grouts:
 - a. "Bonsal Construction Grout"; W.R. Bonsal Co.
 - b. "Diamond-Crete Grout"; Concrete Service Materials Co.
 - c. "Euco N-S Grout"; Euclid Chemical Co.
 - d. "Kemset"; Chem-Masters Corp.
 - e. "Crystex"; L & M Construction Chemicals, Inc.
 - f. "Masterflow 713"; Master Builders.
 - g. "Sealtight 588 Grout"; W.R. Meadows, Inc.
 - h. "SonogROUT"; Sonneborn Building Products Div., Rexnord Chemical Products, Inc.
 - i. "Stoncrete NM1"; Stonhard, Inc.

2.06 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type of concrete required.
- B. Independent testing facility or qualified precast manufacturing plant personnel prepare design mixes, at precast fabricator's option.
- C. Proportion mixes by either laboratory trial batch or field experience methods, using materials employed on Project for each type concrete required, complying with ACI 318.
- D. Facing Mix: Standard-weight concrete consisting of specified portland cement, aggregates, admixtures, and water to produce following properties:
 - 1. Compressive Strength: 5,000 psi minimum at 28 days.
 - 2. Total Air Content: Not less than 4% nor more than 6%.
 - 3. Water Absorption: Max. 5% to 6% by weight; except between 3% to 4% for sloping surfaces (sills), for improved weathering staining resistance.
- E. Back-up Concrete: Standard-weight concrete with compressive strength of 5,000 psi at 28 days.
- F. Submit written reports to Architect of proposed mix for each type of concrete min. 15 days prior to start of precast unit production.
 - 1. Do not begin concrete production until mixes and evaluations reviewed by Architect.
- G. Adjustment to Concrete Mixes:
 - 1. Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant.
 - 2. Laboratory test data for revised mix designs and strength results submitted to and accepted by Architect before using in Work.
- H. Admixtures:
 - 1. Use air-entraining admixture in strict compliance with manufacturer's directions.
 - 2. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete, may be used subject to Architect's acceptance.
 - 3. Use amounts recommended by admixture manufacturer for climatic conditions prevailing at time of placing.
 - 4. Adjust quantities of admixtures required to maintain quality control.

2.07 FABRICATION

- A. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and following dimensional tolerances, unless otherwise indicated.

- B. Dimensional Tolerances of Finished Units:
1. Overall height and width measured at face adjacent to mold at time of casting:
 - a. 10' or under: $+1/8"$.
 - b. 10' to 20': $+1/8"$, $-3/16"$.
 - c. 20' to 30': $+1/8"$, $-1/4"$.
 - d. Each additional 10': $+1/16"$ per 10'.
 2. Angular deviation of plane of side mold: $1/32"$ per 3" depth, or $1/16"$ total, whichever greater.
 3. Openings within one unit: $+1/4"$, except $+1/8"$ for windows and door frames.
 4. Out of square (differences in length of two diagonal measurements): $1/8"$ per 6' or $1/4"$ total, whichever greater.
 5. Thickness: $-1/8"$, $+1/4"$.
 6. Tolerances of other dimensions not otherwise indicated: Numerically greater of $+1/16"$ per 10', or $+1/8"$.
 7. Position Tolerances: For cast-in items measured from datum line locations shown on reviewed shop drawings:
 - a. Anchors and inserts: Within $3/8"$ of centerline location.
 - b. Blockouts and reinforcements: Within $1/4"$ of position shown on shop drawings, where such positions have structural implications or affect concrete cover; otherwise within $+1/2"$.
- C. Fabricate units straight, smooth, and true to size and shape, with exposed edges and corners precise and square unless otherwise indicated.
- D. Warped, cracked, broken, spalled, stained, or otherwise defective precast units not acceptable.
- E. Expansion Joints:
1. Free of grout, mortar, or other obstructions to expansive movement, with expansion joint filler where indicated.
 2. Sills: Midpoint between mullions, with expansion filler strip.
 3. Copings: Every joint between units, unless otherwise indicated; align joints with vertical expansion joints in adjacent brick.
 4. Mullions: Provide for expansion at top connectors to rigid building structural members.
- F. Built-In Items:
1. Provide reglets, slots, holes, and other accessories in units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work indicated.
 2. Provide inserts and anchorages cast into units, for attachment of loose hardware required.
- G. Anchorages: Provide loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other miscellaneous steel shapes not provided by other trades, necessary for securing precast units to supporting and adjacent members.
- H. Surface Finish: Fabricate precast units and provide exposed surface finishes as follows:
1. Smooth sand textured surface finish free of pockets, sand streaks, and honeycomb, with uniform color and texture to match Architect's control sample.
- I. Profile and Shape: Fabricate units of sizes and dimensions indicated on drawings and as follows:
1. Edges: Chamfered min. $3/4"$.
 2. Corners: Square, unless noted.
 3. Water Drip: Form a triangular shaped water drip at underside of each horizontal member. Drips to be min $3/4"$ deep.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Deliver anchorage items to be embedded in other construction before start of such work.
 - 2. Provide setting diagrams, templates, instructions and directions as required for installation.
- B. Do not install precast units until concrete attained its design compressive strength.
- C. Install precast concrete members plumb, level, and in alignment within PCI MNL-117 specified limits of erection tolerances.
 - 1. Provide temporary supports and bracing required to maintain position, stability and alignment when members being permanently connected.
 - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
- D. Accessories: Install clips, hangers, and other accessories required for erection of precast units to supporting members and back-up materials.
- E. Anchor units in final position by bolting, welding, grouting, or as otherwise indicated.
 - 1. Remove temporary shims, wedges, and spacers soon as possible after anchoring completed.
 - 2. At bolted connections use lock washers or other acceptable means to prevent loosening of nuts.
 - 3. At welded connections apply rust-inhibitive coating on damaged areas, same as shop-applied material.
 - 4. Use galvanizing repair coating on galvanized surfaces.
- F. Cleaning:
 - 1. Clean exposed facings to remove dirt and stains on units after erection and completion of joint treatments.
 - 2. Wash and rinse in accordance with precast manufacturer's recommendations.
 - 3. Protect other work from damage due to cleaning operations.
 - 4. Do not use cleaning materials or processes which could change character of exposed concrete finishes.

3.02 ERECTION TOLERANCES

- A. Warpage: Fabricate and install wall panels so that each panel after erection complies with following dimensional requirements:
 - 1. Bowing (concave or convex) of any part of a flat surface not to exceed length of bow/360, with max. of 3/4" up to 30'.
 - 2. Maximum warpage of one corner out of plane of other three, greater of 1/16" per foot distance from nearest adjacent corner, or 1/8".
- B. Tolerances for Location of Precast Units: Fabricate and erect precast units so that joints between panels meet following:
 - 1. Face width of joints: $\pm 3/16"$.
 - 2. Joint taper: 1/40" per foot length, with max. length of tapering in one direction of 10'.
 - 3. Step in face: 1/4".
 - 4. Jog in alignment of edge: 1/4".
 - 5. Alignment for exterior panels is outside face.
 - 6. Variation from plumb: $\pm 1/2"$ in any 40' run.
 - 7. Variation from level: $\pm 1/2"$ in any 40' run.

3.03 PERFORMANCE REQUIREMENTS

- A. Conduct inspections, perform testing, and make repairs or replace unsatisfactory precast units as required.
- B. Limitations of amount of patching permitted subject to acceptance of Architect.
- C. In addition to above, in-place precast units rejected for any one of following:
 - 1. Exceeding specified installation tolerances.
 - 2. Damaged during construction operations.
 - 3. Exposed-to-view surfaces which develop surface finish deficiencies.
 - 4. Other defects as listed in PCI MNL-117.

END OF SECTION 03450

**SECTION 03510
CEMENTITIOUS ROOF DECK**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

- A. Extent of each type of cementitious wood fiber decking, hereby defined to include structural board-type decking of re-composed fibrous material (any type binder), shown on drawings.
- B. The work consists of furnishing all labor, materials, accessories and equipment necessary to cover all areas shown on the drawings and specified herein with cementitious wood fiber decking.
- C. Following types and applications of fiberboard decking specified in this section:
 - 1. Structural cement-fiber roof deck

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM): Products of this section to comply with applicable reference standards. Applicable standards include:
 - 1. ASTM C177 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - 2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - 3. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - 4. ASTM D1621 Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
 - 5. ASTM D2842 Standard Test Method for Water Absorption of Rigid Cellular Plastics.
 - 6. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
- B. Underwriters Laboratories, Inc. (UL):
 - 1. UL 580 Standard for Safety for Tests for Uplift Resistance of Roof Assemblies.

1.04 SYSTEM PERFORMANCE

- A. Performance Requirements:
 - 1. Comply with requirements of Factory Mutual Class I Roof Deck.
 - 2. Roof deck material shall be capable of supporting an average uniformly distributed load of 50 pounds per square foot minimum over maximum 72" spans.
 - 3. Provide a roof deck system which has been manufactured, fabricated and installed to provide deflection of Less than L/240 at design load.
 - 4. The roof deck system as installed shall conform to a published Underwriters Laboratories UL 580 (UL Class 90 Design) wind uplift design.
- B. The overall "R" value of the deck in place shall be 6.76 (heat flow up).
- C. Structural cement fiber plank substrate shall be composed of extra-long fine wood fibers, and waterproof portland cement. Substrate shall be allowed by ICBO-ES for use where noncombustible materials are required by the U.B.C. Substrate shall be allowed by ICBO-ES, and SBCCI-PST & ESI, for use where fire retardant treated wood is required by the U.B.C. and the Standard Building Code respectively. Substrate shall be classified in accordance with Federal Specification SS-S-118a as type IX, class 25.

- D. The cement fiber substrate shall have been tested in accordance with ASTM E-84 and found to have a flame spread of 25 or less for the exposed interior surface.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Company with min. 5 years successful experience and regularly engaged in the manufacture of cementitious roof deck systems of type specified, with record of installed projects min. of 5 years successfully in place.
- B. Installer: Firm with min. 5 years successful experience and regularly engaged and equipped for the in installation of cementitious roof deck systems similar to those required for project and acceptable to and/or licensed by manufacturer of primary roofing materials.
- C. Obtain fiberboard decking from single source, and produced in uniform texture and density.
- D. Provide decking of nominal thickness shown, but not less than thickness tested by manufacturer for support system shown, to withstand design loads indicated.
- E. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- F. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.06 SUBMITTALS

- A. Submittals: Shop drawings, produced by the manufacturer of the decking, sufficiently detailed to show entire scope of work of this section. Manufacturer's technical literature sufficient to verify compliance with performance requirements.
- B. Submittal Procedures Section.
 - 1. Product Data: Submit manufacturer's product data and installation instructions.
 - 2. Shop Drawings: Provide drawings indicating locations and spacing of planks and purlins.
- C. Samples: Submit selection and verification samples as follows:
 - 1. Set of 12" (305 mm) square samples for each wood fiber deck unit required, showing full range of exposed texture to be expected in completed work.
- D. Quality Assurance/Control Submittals: Submit the following:
 - 1. Test Reports: Upon request, submit certified test reports from recognized test laboratories.
 - 2. Certificates: Submit manufacturer's certificate that products meet or exceed specified requirements.
- E. Closeout Submittals: Submit the following:
 - 1. Warranty documents specified herein.

1.07 DELIVERY, STORAGE & HANDLING

- A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Provide labels indicating brand name, deck style, plank size and plank thickness.

- C. Storage and Protection:
 - 1. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
 - 2. Store on adequate level blocking and be protected from weather.
 - 3. Protect edges and surfaces of decking shall be protected during storage and erection.
 - 4. Portland cement bound structural cement fiber products may stain when exposed to rain or melting snow. Stained plank may require additional painting. Protect panels from soiling or abrasion on surfaces which will be exposed to view in the final construction. Discard damaged plank.
 - D. Coordinate roofing installation with installation of decking system so as to insure that the deck is not exposed to precipitation or condensation, which may cause water staining or reduce the structural strength of the deck with extended exposure.
 - E. Prevent soiling, physical damage or wetting.
 - F. Store cartons open at each end to stabilize moisture content and temperature.
- 1.08 WARRANTY
- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.
 - B. Wood fiber roof deck manufacturer assumes full responsibility for its products and systems when installed in accordance with the published recommendations. The warranty period shall be for fifteen (15) years and warrant against loss of structural strength, which shall not fall below eighty percent of the published values. The roof membrane shall be maintained in a watertight condition

PART 2 - PRODUCTS

2.01 STRUCTURAL CEMENT-FIBER DECKING

- A. Provide manufacturer's standard structural precast panels; composed of long, chemically-processed wood fibers mixed with portland cement or other approved binder, pressure bonded with uniform bottom face texture to provide shapes and sizes required.
- B. Products/Manufacturers: Provide one of following:
 - 1. Heraklith, Heraklith AG
 - 2. Lamit Industries- Columbus, OH.
 - 3. Tectum Corp.; National Gypsum Co.

2.02 ROOF DECK PANEL COMPONENTS

- A. Material: Aspen wood fibers bonded with inorganic hydraulic cement, bonded.
 - 1. Where the roof deck will remain exposed in the finished building, the roof deck shall be provided with a factory applied coat of primer paint. Light reflectance of mill primed deck shall not be less than 60%.
 - 2. The roof deck panels shall have tongue and groove sides and end joints must occur over supports, ends of panels shall be square. All panels shall be manufacturer's standard width.
- B. The roof deck material shall be uniformly 3" thick with tolerance not to exceed plus or minus 1/8", and approximate weight of 5.5 psf.
- C. The roof deck shall have an NRC value of .60 .

2.03 ACCESSORIES

- A. The roof deck material shall have a tongue and grooved and beveled edge with a 16 gauge hot dipped galvanized steel channel inserted to span up to 72".
- B. Tectum Screws shall be #15 minimum, galvanized as protection against corrosion, or shall be size as recommended by manufacturer to meet structural requirements. Screws shall be sized to penetrate and thread into steel, or to penetrate wood 1.5". Washers for use with screws shall be 2" dia., min. 19ga., galvanized washers.
- C. Construction Adhesive: Of type recommended by roof deck manufacturer.
- D. Perimeter support including framing for openings, support for longitudinal, and transverse edges of decking, as well as support at all hips, valleys, and ridges, or other major discontinuities in the surface of the deck shall be provided by the structural fabricator, and installed by the erector of the structural frame. Such support shall be as called out by the architect or engineer and shall be adequately sized to resist loads superimposed on it, or transferred to it by the deck.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. The roof deck installer shall inspect the structural support system before the start of this work. Any defects, deficiencies or deviation from structural or approved fabricator's drawings, shall be corrected by the structural contractor at this time.
- B. When laying out deck panels, walk directly over structural supports until the deck has been securely attached. Where heavy objects are placed upon or transported over the deck or where material is repeatedly landed on the deck, planking or plywood shall be used to distribute the loads.
- C. Roof deck panels shall be cut to fit neatly at walls or curbs and around openings as shown on approved shop drawings. Perimeter edges of roof deck, as well as cut edges, shall be supported by walls or other structural supports. Openings greater than 6" in any direction shall be framed by the steel erector or trade requiring the opening.
- D. Do not install any panel which has a crack or break in the top or bottom surface. Likewise, do not rout or gouge-out the top or bottom surface for any reason. The nailable top surface is slippery when wet or dusty and special care should be exercised under these conditions.

3.02 INSPECTION

- A. Installer examine support system upon which fiberboard decking installed and conditions under which work performed and notify Contractor in writing of unsatisfactory conditions.
 - 1. Do not proceed with work until unsatisfactory conditions corrected in manner acceptable to Installer.

3.03 INSTALLATION

- A. Standards: Comply with decking manufacturer's recommendations, except as otherwise indicated.
- B. Arrange panels, except as otherwise indicated, with long dimension at 90° with supports and with end joints centered and staggered over supports.
- C. On sloping supports, install panels from bottom to top with tongued edge leading.

3.04 SYSTEM INSTALLATION

- A. All roof deck panels to be mechanically attached, with minimum #15 heavy duty deck screw, to the steel to achieve an FM I-90 wind uplift rating. Screws shall be of sufficient length to penetrate the roof deck and the supporting steel a minimum of 3/4". 2" washers must be used in conjunction with the screws. In addition to mechanical fasteners, adhesive must be placed on joist, and in tongue and groove joints as required for desired diaphragm. The adhesive must meet the requirements of AFG-01 or an approved equal. See structural drawings for attachment pattern of roof deck system.

3.05 PROTECTION AND FINISHING

- A. Protect bottom surfaces from soiling and damage during entire process of handling and construction, including other construction work after installation of decking.
- B. Protect top surfaces from damage due to construction operations, by use of wood planking or plywood or other suitable means of distributing heavy loads and traffic.
 - 1. Remove and replace damaged decking panels as directed.
- C. Clean bottom (inside) surfaces of completed decking work, and touch-up minor damage to surfaces and factory finish (if any).
- D. Remove and replace work which cannot be successfully repaired to permanently eliminate evidence of structural damage.
- E. Painting: Refer to Division-9 sections for field application of painted finish.

END OF SECTION 03510

SECTION 03521
LIGHTWEIGHT INSULATING CONCRETE ROOF DECK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division-1 Specifications, apply to work of this Section.

1.02 SUMMARY

- A. General: Furnish labor, materials, equipment, and service to complete the lightweight insulating concrete roof deck including rigid insulation vent board in accordance with this section and the requirements of the specifications. Extent of lightweight insulating concrete shown on drawings.
- B. Scope: This specification section includes the use of lightweight insulating over metal decking (System 1) and wood fiber decking (System 2).
 - 1. System 1 will be installed over metal decking. The system will include, metal decking, lightweight insulating concrete and insulation board to produce a minimum "R" of 20.
 - 2. System 2 will be installed over a wood fiber roof deck specified in a separate Division 3 Section. The system will include the lightweight insulating concrete and insulation board to produce a minimum "R" of 20.

1.03 QUALITY ASSURANCE

- A. Insulating Concrete Applicator: Firm shall meet the following requirements:
 - 1. Firm specializing in installation of lightweight concrete roof decks with minimum 5 years experience in applications similar to requirements of this Project.
 - 2. Regularly engaged and equipped for application of lightweight insulating concrete, and as acceptable by aggregate producer.
- B. Insulating Concrete Supplier: Regularly engaged in production of lightweight insulating concrete.
- C. Codes and Standards: Comply with provisions of following codes and standards, except as otherwise shown or specified:
 - 1. AISI "Specification for the Design of Cold-Formed Steel Structural Members".
 - 2. AWS "Structural Welding Code".
 - 3. SDI "Design Manual for Floor Decks and Roof Decks".
- D. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
 - 1. Welded decking in place subject to inspection and testing.
 - 2. Expense of removing and replacing portions of decking for testing purposes borne by Owner if welds found satisfactory.
 - 3. Remove work found defective and replace with new acceptable work.
- E. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- F. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

- G. Warranty: Provide a twenty (20) year written guarantee from the manufacturer for the lightweight insulating concrete roof deck system to include the insulating concrete and the insulation board.

1.04 PERFORMANCE REQUIREMENTS

- A. Uplift Loading: Unless more stringent requirements specified on structural drawings, provide and install and anchor roof deck assembly to resist gross uplift loading of 45 lbs./sq. ft. at eave overhang and 30 lbs./sq. ft. for other roof areas.
 - 1. Failures of work in bond or anchorage to substrate or between courses of materials, or within concrete work considered failures of materials or workmanship.
- B. Complete roof deck assembly including metal decking shall be tested, approved and listed in Factory Mutual Approved Guide for FM Class 1, I-90 Windstorm Construction.

1.05 SUBMITTALS

- A. Catalog Data:
 - 1. Submit manufacturer's current standard published catalog and technical data and details describing product and methods of mixing and application.
 - 2. Submit manufacturer's installation instructions.
 - 3. Include data substantiating that materials comply with specified requirements.
- B. Shop Drawings:
 - 1. Submit complete plans including elevations and details to clearly indicate location and installation of specified products.
 - 2. Submit detailed drawings showing layout and types of deck panels, anchorage details, and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories.
 - 3. Shop drawings in form of reproducibles of Contract Drawings prohibited.
 - 4. Provide roof plan showing slope and thickness of insulation.
 - 5. Provide calculations showing Insulation average "R" value.
- C. Certificates: Submit test reports certified by independent testing laboratory stating that materials and mix meet specified requirements.
 - 1. Upon completion of roof deck installation, Vermiculite Manufacturer submit certificate stating that application certified and vermiculite concrete prepared and applied in accordance with specifications of Vermiculite Institute in effect at time of installation and in accordance with the "guide for cast-in-place low density concrete ACI-523, IR-67 Revised 1982."
 - a. Certification shall be signed jointly by light weight aggregate manufacturer and approved applicator.
 - 2. Vermiculite Manufacturer shall certify in writing that the products supplied for this project are 100% free from asbestos containing materials.

1.06 PRODUCT HANDLING

- A. Delivery: Deliver bulk materials in manufacturers original undamaged package or containers with manufacturers name and contents legibly indicated.
 - 1. Upon arrival at jobsite, Contractor inspect materials for damage and stains.
 - 2. Remove damaged or permanently stained materials from site and replace at no cost to Owner.
- B. Protection: Do not allow cementitious materials to become wet or soiled.
 - 1. Do not expose insulation to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect insulation against ignition at all times.
- C. Job Inspection: Contractor shall inspect the products and containers for damage. All damaged products shall be immediately removed from the site and replaced with new products at no additional cost to the contract.
- D. Comply with manufacturer's recommendations for handling, storage and protection during installation.

- E. Deliver materials in manufacturer's original undamaged packages or acceptable bulk containers.
- F. Store packaged materials to protect them from elements or physical damage.
- G. Do not use cement which shows indications of moisture damage, caking, or other signs of deterioration.
- H. Do not overload building structure with storage of materials or use of installation equipment on deck.

1.07 JOB CONDITIONS

- A. Do not place lightweight insulating concrete when ambient temperature below freezing (32°F, 0°C).
- B. During low humidity conditions, sprinkle water over concrete surface to aid hydration and curing.
- C. When air temperature fallen or expected to fall below 40°F (4°C), heat water to max. 120°F (48°C) before mixing to attain concrete at point of placement with temperature of 50°F (10°C) min. and 80°F (27°C) max.
- D. Do not place lightweight insulating concrete on surfaces covered with standing water, snow, or ice.

1.08 FIELD QUALITY CONTROL

- A. The contractor shall engage an independent testing laboratory acceptable to Architect to take samples and conduct tests to evaluate lightweight insulating concrete.
 - 1. Costs for tests shall be paid by contractor.
- B. Samples shall be in accordance with ASTM C 172, except as modified by ASTM C 495.
 - 1. Make at least 6 molds during each placement.
 - 2. Determine wet density in accordance with ASTM C 138.
 - 3. Determine compressive strength and oven dry density in accordance with ASTM C 495.
- C. Report test results to Architect, Contractor, and lightweight insulating concrete producer within 24 hours of completion of each test.

1.09 WARRANTY

- A. Provide Manufacturer's roof system warranty against defects in materials and workmanship.
 - 1. Warranty Period: Twenty (20) years.
 - 2. The warranty shall be provided to the general contractor by the roofing subcontractor. The warranty fee shall be paid by the roofing subcontractor.

1.10 SYSTEM DESCRIPTION

- A. System based on Siplast Roof Insulation Systems "Zonolite Roof Insulation"
 - 1. "ZIC" system consisting of vented insulation set in slurry of insulating concrete and covered with insulating concrete.
- B. Manufacturers: Subject to conformance with requirements, provide products of one of following:
 - 1. Siplast
 - 2. Strong-Lite, Inc.
 - 3. Air-Lite Processing - Vero Beach, FL.

PART 2 - PRODUCTS

2.01 INSULATION BOARD

- A. Insulation Board:
 1. To be size and configuration as approved by system manufacturer and as follows:
 2. Premium, cellular, self-extinguishing, expanded, rigid polystyrene boards or formed units complying with ASTM C 578, Type I, minimum density of 0.95 pounds per cubic foot.
 3. Provide units with venting holes which approximate 3% of board gross surface area.
 4. Insulation to have Factory Mutual Label on each bundle.
- B. Minimum thickness of board: 2" thick.
- C. Approved manufacturers, subject to compliance with specifications:
 1. Siplast Roof Insulation System's Insulperm,
 2. Strong-Lite, Inc
 3. Aire-Lite Processing; Vero Beach, Florida

2.02 METAL DECKING

- A. Steel for Galvanized Metal Deck Units: ASTM A 446, Grade E; 80 ksi minimum yield strength.
- B. Miscellaneous Steel Shapes: ASTM A 36.
- C. Galvanizing: ASTM A 525, G60.
- D. Corrugated Metal Forms: Metal deck shall be fabricated of corrugated galvanized high strength steel of shape, weight and gauge to support all construction loads that may be imposed during installation of insulating concrete.
 1. Metal deck shall be slotted / perforated (unless noted otherwise) to provide a minimum of 1.5% min. free open area. Where mechanically attached roofing specified, min. 0.5% min. free area.
 2. Design complete deck to be capable of supporting not less than 50 lb./s.f. total dead and live load with safety factor of 2.
- E. Metal Deck Accessories: Furnish with all accessories, fasteners and clips, Corrugated slotted/perforated galvanized high strength steel of shape, weight and gauge to support any construction loads imposed during installation of vermiculite concrete.
- F. Minimum section properties, unless specifically scheduled or noted otherwise, **or unless heavier gages required by manufacturer to achieve design criteria specified (including uplift)** for 3 span (minimum) continuous conditions shall be as follows:

<u>SPAN</u> <u>IN FT.</u>	<u>GAUGE</u>	<u>DEPTH</u>	<u>MOMENT</u> <u>OF INERTIA</u>	<u>SECTION</u> <u>MODULUS</u>
Max. 6'-0"	22	1 1/2"	0.101 in ⁴ .	0.145 in ³ .

2.03 INSULATING CONCRETE DESIGN MIX

- A. ZIC System: 1:4 mix (1 bag portland cement to 4 c.f aggregate).
 1. Wet Density: 53-63 pcf when tested in accordance with ASTM C 138.
 2. Dry Density: 24 pcf, plus-or-minus 3 pcf, when tested in accordance with ASTM C 495.
 3. Compressive Strength: Min. 200 psi, when tested in accordance with ASTM C 495.
 4. Do not exceed max. air content recommended by aggregate manufacturer.
 5. Use min. amount of water necessary to produce workable mix.

2.04 RELATED MATERIALS

- A. Portland Cement: ASTM C 150, Type I, Type 1A, Type III, or Type IIIA.
- B. Aggregate: Zonolite, ASTM C 332, Group I, vermiculite.
- C. Water: Clean, potable, and free of deleterious amounts of acid, alkali, and organic materials.
- D. Air Entraining Admixture: ASTM C 260

PART 3 - EXECUTION

3.01 DECK FABRICATION

- A. General: Form deck units in lengths to span 3 or more supports, with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps, unless otherwise indicated.
- B. Roof Deck Units: Provide deck configurations complying with SDI "Roof Deck Specifications", of metal thickness, depth and width shown.
- C. Except where noted otherwise metal decking to be perforated.
 - 1. Deck exposed to view shall be non-perforated type with vent clips or vented side laps.

3.02 INSPECTION OF SUBSTRATE

- A. Installer shall examine substrate and conditions under which work performed, and notify Architect and Contractor in writing of unsatisfactory conditions including substrates not properly leveled or sloped.
 - 1. Do not proceed with installation work until unsatisfactory conditions corrected in manner acceptable to Installer.
 - 2. Installation of new light weight decking shall be construed as acceptance of decking as being a suitable substrate for new materials.

3.03 METAL DECKING

- A. General: Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein.
- B. Application: Metal forms (corrugated slotted metal deck): Decking shall be slotted / perforated type except where underside is to be left exposed.
 - 1. Deck to be left exposed shall be unperforated and fabricated with vent type edges or provided with manufactured vent clips.
- C. Cut, arrange and install metal forms to conform with the following:
 - 1. Metal forms shall be installed over a minimum of 3 spans.
- D. Placement of Metal Panels: Ends of metal forms shall be centered over supporting members.
 - 1. Bottom sheet shall not extend beyond edge of support flange.
 - 2. Top sheet shall lap 2" minimum at end.
 - 3. Provide minimum of 1 corrugation lap at sides.
 - 4. Place sheets with corrugation edges up and with corrugations perpendicular to supporting members. Place end to end and align and match corrugations.
 - 5. Metal forms shall be placed and connected to supports before parapets or fascia panels are placed.
- E. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened.
- F. Do not stretch or contact side lap interlocks.

- G. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.
 - H. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
 - I. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
 - J. Fastening Deck Units: Attach metal forms to structural support as follows:
 - 1. Fasten roof deck units to steel supporting members and steel edge members by min. 5/8" diameter puddle welds through welding washers, spaced max. 12" o.c. with min. of four welds at each support (30" wide sheet) for interior supports and 6" o.c. at perimeter supports.
 - 2. In addition, secure deck to each supporting member in ribs where side laps occur.
 - K. Attach metal forms to structural support as follows:
 - 1. At end laps weld top sheet in valley of side lap (through four sheet thickness).
 - 2. At end laps weld top sheet in valleys (through 2 sheet thickness) at maximum 12" on center.
 - 3. At intermediate supports and or sheet to support at 10" on center.
 - 4. At perimeter of roof and at all roof openings anchor sheet to support at 6" on center.
 - L. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
 - 1. Keep interiors of cells used as raceways free of welds having sharp points or edges.
 - 2. Mechanically fasten side-Laps of adjacent deck units between supports at mid span or at intervals of 36" o.c., which ever is smaller, using galvanized self-tapping 10-16 x 3/4" or larger hex-head screws, Teks/i or equal.
 - M. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to decking, as shown.
 - N. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.
 - 1. At openings 4" and smaller provide additional layer of decking (4'-0" x 4'-0") for necessary reinforcing.
 - O. Touch-Up Painting:
 - 1. After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on **bottom** surface of decking units and supporting steel members.
 - 2. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
- 3.04 GENERAL-LIGHT WEIGHT INSULATING CONCRETE SYSTEM
- A. General: Comply with manufacturer's instructions for particular conditions of installation in each case, including treatment (if any) at edges of each insulated area.
 - 1. If printed instructions not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
 - B. "R" Value: Set the combined thickness of insulating concrete and the insulation board to provide a **Minimum "R" (Resistance) of 20**. Do not include other roofing components (roofing, deck, air films, etc.) in "R" value calculations.
 - 1. Ceilings and roof membrane shall not be included in calculation.

- C. Developing Roof Slope: Vary thickness of vent board and light weight concrete to provide min. 1/4" per foot slope of completed deck.
 - 1. Provide positive slopes to drains, eaves, and scuppers as indicated or required.
 - 2. **Absolute MINIMUM** slope, at any point of roof to be 1/4" per foot. The roof slope shall be calculated along valleys (greatest distances). Roofs or portions of roof failing to comply shall be removed and replaced.
 - 3. Contractor shall set high point base on mathematical calculations using initial low point, width of building, and a slope of 1/4" per foot. Pour concrete uniformly from low to high point.
 - 4. Construct crickets around roof top equipment to direct water around said equipment.
- D. Minimum Thickness: The minimum thickness of the lightweight concrete roof system shall be:
 - 1. At roof drains, scuppers, and eaves: 4" (2" concrete and 2" insulation).
- E. Maximum Thickness: The maximum thickness of the lightweight concrete roof system shall be:
 - 1. At any point on roof: Maximum thickness of 6".
 - 2. Over Conc., Cementitious, or Existing decks: Maximum thickness of 3-1/2".

3.05 INSULATION BOARD

- A. Insulation Board:
 - 1. Install insulation board in accordance with manufacturers recommendation. Thickness of insulation board indicated on drawings and indicated above.
 - 2. Pour slurry of insulating concrete 1/8" over highest point of substrate
 - 3. Place insulation in wet slurry within 30 minutes after pouring with joints staggered in brick-like pattern.
 - 4. Place insulation board in slurry in manner to provide full filling of locking/keying openings in vent board.

3.06 INSULATING CONCRETE

- A. General:
 - 1. Place in accordance with manufacturer's instruction, using equipment and procedures to avoid segregation of mix and loss of air content.
 - a. Deposit and screed in continuous operation until entire panel or section of roof area completed. Do not vibrate or work mix except for screeding or floating.
 - b. Construct crickets around roof top equipment to provide positive slope. Form crickets out of lightweight insulating concrete.
- B. Placing Slurry:
 - 1. Pour slurry of insulating concrete 1/8" over highest point of substrate (decking).
 - 2. Placed in slurry in manner to provide full filling of locking/keying openings in vent board.
 - 3. Where metal forms are utilized fill form corrugations with light weight concrete.
- C. Thickness:
 - 1. Pour to min. thickness of 2" over top of insulation board. Increase thickness of insulation board to maintain lightweight concrete with this range.
 - 2. Provide minimum coverage of 2"; use 2-1/2" screed to maintain minimum.
 - 3. Depth of pour and slopes shall be as shown on drawings.
 - 4. Provide a **minimum** of 1/4" per foot slope through out roof area. Roof slopes shall be calculated along the greatest distance (valleys).
- D. Screed:
 - 1. Screed all surfaces to smooth, dense, even plane or slope suitable for the application of the roofing membrane.
 - 2. Finished surface shall be free from ridges, protrusions or depressions.
- E. Curing:
 - 1. Air cure for no less than 72 hours in strict accordance with manufacturers written instructions.
 - 2. No foot traffic on deck until curing time has lapsed.

3.07 ROOF TOP HVAC EQUIPMENT

- A. At roof top mechanical equipment (Roof top Units, RTUs; Energy Recovery Units, ERUs and similar equipment) new roof deck and roof deck insulation to extend under roof top equipment. Omit decking and insulation only where ducts penetrate roof system.
 - 1. Roof decking to extend under entire area of roof top unit except where duct penetrate roof system. At duct penetrations provide perimeter angles for support of roof decking.
 - 2. Roof insulation to extend under entire surface of roof top unit except where ducts penetrate roof system. Roof insulation to be of thickness and slope to match areas outside of roof curb. Minimum 'R' value of roof deck insulation shall be no less than 'R-20'.

3.08 QUALITY CONTROL - SYSTEM SLOPE

- A. Contractor shall check roof slope by verifying elevation of ridges in relation to low areas (drains and/or eaves) at 10'-0" on center along ridge.
 - 1. Non-complying areas to be reworked.
- B. Prior to roofing the contractor shall conduct flood (water) tests. The maximum acceptable puddle for surface of light weight to be:
 - 1. Maximum 2'-0" diameter; maximum 1/16" deep; elapsed time - 0.
 - 2. Contractor shall note that test shall be performed immediately after wetting.
- C. Contractor shall correct non-conforming areas and re-conduct flood test.

3.09 ACCEPTANCE OF DECK

- A. Light weight Insulating Concrete Roof Deck and Roof System Manufacturer shall jointly inspect deck to verify suitability for roofing membrane and for both parties to issue the required warranties.
 - 1. Noted deficiencies shall be corrected prior to installation of roofing membrane.
- B. The finished roof shall provide an absolute minimum slope of 1/4" per foot.
 - 1. No Standing or ponding water, acceptable.

3.10 PROTECTION

- A. Do not permit construction-period traffic over completed work, except as required for roofing or waterproofing.

3.11 DEFECTIVE WORK

- A. Refinish or remove and replace lightweight insulating concrete surfaces too rough to receive finish roofing, or where physical properties do not meet specified requirements, as determined by Architect.

END OF SECTION 03521

**SECTION 03650
CEMENTITIOUS UNDERLAYMENT**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of underlayments indicated herein. Underlayments to be provided in the following locations:
 - 1. Where flooring type VCT (vinyl composition tile) specified to be installed.
 - 2. Where new and/or existing floor slabs are not level to tolerances required by new finishing flooring materials and as indicated herein.
 - 3. Where floor slab is out of level by 1/8" in 12 feet or greater the area which is out of level beyond these limits exceeds 2 square feet, level area using materials specified herein.
 - 4. Where existing walls removed and adjacent floor slabs are not level.
- B. Types of concrete floor toppings include:
 - 1. Self-leveling, portland cement-based underlayment.
- C. Concrete work specified in Division-3 Section of specification.
- D. Removal of existing bituminous roofing system part of Section 02090.

1.03 QUALITY ASSURANCE

- A. Installer: Firm specializing in installation of self-leveling cementitious underlayments with min. 3 years experience in applications similar to requirements of this Project.
- B. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- C. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.
- D. Asbestos Certificates: Manufacturer of cementitious underlayment shall certify in writing that materials furnished for this project are 100% free of asbestos containing materials.

1.04 SUBMITTALS

- A. Manufacturer's Data: Submit manufacturer's product data and installation instructions.
 - 1. Include data substantiating that materials comply with specified requirements.
 - 2. Material list of items proposed to be provided under this section.
 - 3. Manufacturer's specifications, current product literature and other data needed to prove compliance with the specified requirements.
 - 4. Manufacturer's certification that the product is cement-based having an inorganic binder content which is a minimum 80% Portland cement when tested per ASTM C150: Standard Specification for Portland Cement.

5. Manufacturer's certification that the product specified is suitable for the intended use when installed according to the manufacturer's printed installation instructions.

1.05 TEST SAMPLES

- A. Contractor shall conduct a series of tests to verify that materials being furnished are compatible with both the substrate and finished flooring materials to be applied to underlayment.
 1. Conduct one test for each type of substrate on which underlayment is to be placed.
 2. Conduct one test for each type of flooring and adhesive to be installed on underlayment.
- B. Test areas shall be of size recommended by manufacturer, but not less than 5'-0" X 5'-0".
- C. The test area shall be installed using procedures and under conditions which reflect the actual installation. Sample installation, including finish to be representative of quality of completed work and shall be used to determine acceptability of remainder of work.

1.06 PRODUCT HANDLING

- A. Delivery: Deliver bulk materials in manufacturers original undamaged, unopened package or containers with manufacturers name and contents legibly indicated.
 1. Upon arrival at jobsite, Contractor inspect materials for damage and stains.
 2. Remove damaged or permanently stained materials from site and replace at no cost to Owner.
- B. Protection: Do not allow cementitious materials to become wet or soiled.
 1. Store packaged materials to protect them from elements or physical damage.
 2. Do not use cement which shows indications of moisture damage, caking, or other signs of deterioration.
- C. Job Inspection: Contractor shall inspect the products and containers for damage. All damaged products shall be immediately removed from the site and replaced with new products at no additional cost to the contract.
- D. Comply with manufacturer's recommendations for handling, storage and protection during installation.
- E. Do not overload building structure with storage of materials or use of installation equipment on deck.

1.07 INSPECTION OF SUBSTRATE

- A. Examination of Substrate: Installer examine substrate and conditions under which work performed, and notify Contractor in writing of unsatisfactory conditions including substrates not properly leveled or sloped.
 1. Do not proceed with installation work until unsatisfactory conditions corrected in manner acceptable to Installer.
 2. Installation of materials herein specified shall be construed as acceptance of existing floor/ roof deck as being a suitable substrate for new materials.

1.08 JOB CONDITIONS

- A. Substrate on which cementitious underlayment to be installed currently consists of a cold process bituminous roofing system on a concrete slab.
 1. Removal of roofing system specified in Section 02090.
 2. Preparation of surface, including removal of bituminous residue, part of this section.
- B. Do not place cementitious underlayment when ambient temperature below freezing (32°F. 0°C).
- C. During low humidity conditions, sprinkle water over concrete surface to aid hydration and curing.
- D. When air temperature fallen or expected to fall below 40°F (4°C), heat water to max. 120°F (48°C) before mixing to attain concrete at point of placement with temperature of 50°F (10°C) min. and 80°F (27°C) max.

1.09 FIELD QUALITY CONTROL

- A. The contractor shall engage an independent testing laboratory acceptable to Architect to take samples and conduct tests to evaluate cementitious underlayment.
 - 1. Costs for tests shall be paid by contractor.
- B. Samples shall be in accordance with applicable ASTM standards.
 - 1. Make at least 6 molds during each placement.
 - 2. Determine compressive strength in accordance with ASTM C 109/Mod.
 - 3. Determine flexural strength in accordance with ASTM C348.
- C. Report test results to Architect, Contractor, and cementitious underlayment producer within 24 hours of completion of each test.
- D. Minimum Strength:
 - 1. Compressive Strength:
 - a. One (1) Day: 2630 PSI
 - b. Twenty Eight (28) Days: 4100 PSI
 - 2. Flexural Strength:
 - a. One (1) Day: 770 PSI
 - b. Twenty Eight (28) Days: 1000 PSI

1.010 SYSTEM DESCRIPTION

- A. General: Provide semi-proprietary wet-poured-cementitious self-leveling underlayment, complying with manufacturer's recommendations; using portland cement, water and aggregate/additive system.
- B. System to consist of primer and mix of special cements and binders which, when mixed with water, becomes a highly liquid cement compound that seeks its own level and produces a flat, smooth surface. Surface shall be true to plane within 1/16" maximum deviation under a 10' straight edge in accordance with ACI 302 1R-89, Flatness Tolerance.
- C. Manufacturers: Subject to conformance with requirements, provide products of one of following:
 - 1. ARDEX INC., 1155 Stoops Ferry Road, Coraopolis, PA 15108.
 - 2. Custom Building Products
 - 3. Laticrete International, Inc
 - 4. Mapei Corporation
 - 5. Quikrete
 - 6. W.R. Bonsal Company

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C 150, Type I, Type 1A, Type III, or Type IIIA as recommended by manufacturer.
- B. Water: Clean, potable, and free of deleterious amounts of acid, alkali, and organic materials and sufficiently cool (not warmer than 70°F) for proper mixture and flow.
- C. Aggregate shall be well-graded, washed gravel (1/8" to 1/4" or larger) for use when underlayment is installed over 1 1/2" thick.
 - 1. Sand shall not be used as an aggregate.
- D. Primer: Primer for standard absorbent concrete, for non-porous subfloors, asphaltic roofing materials, cutback and other adhesive residues, and metal shall of type recommended by cementitious underlayment manufacturer.
- E. Additives: Where recommended or required by manufacturer provide special mix additives of type and in quantities recommended by manufacturer.

2.02 UNDERLAYMENT MIX DESIGN

- A. Cementitious Underlayment: Design mix as recommended by product manufacturer to produce material with following characteristics:
 - 1. Flow Time: Approx. 10 minutes at 70°F
 - 2. Initial Set, ASTM C191: Approx. 30 minutes at 70°F
 - 3. Final Set, ASTM C191: Approx. 2 hours at 70°F
 - 4. Compressive Strength; ASTM C109/mod: Approx. 4100 psi after 28 days
 - 5. Flammability, ASTM E84:
 - a. Flame Spread -0-
 - b. Fuel Contribution -0-
 - c. Smoke Development -0-
- B. Underlayment shall be able to be installed from 1/8" to any thickness in one pour, and may be feathered to match the existing elevation(s).
- C. Underlayment shall be walkable after 2 hours and allow floor covering to be installed after 16 hours at 70°F.

2.03 MIXING

- A. Provide batch type mechanical mixer for mixing topping material at project site.
 - 1. Equip batch mixer with suitable charging hopper, water storage tank, and water-measuring device.
 - 2. Use only mixers capable of mixing aggregates, cement, and water into uniform mix within specified time, and discharging mix without segregation.
 - 3. Mix each batch for min. period of time recommended by product manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

- A. In addition to the general procedures described herein, refer to the manufacturer's current published product literature for complete installation details for the material being installed.
 - 1. Comply with manufacturer's instructions for particular conditions of installation in each case.
 - 2. If printed instructions not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

3.02 INSPECTION

- A. Installer examine areas and conditions under which work installed and notify Contractor in writing of conditions detrimental to proper and timely completion of work.
- B. Inspect substrate for moisture or any other conditions which could affect the performance of the underlayment or the finish coating. Notify contractor of conditions encountered which are detrimental to proper installation of materials herein specified.
- C. Do not proceed with work until unsatisfactory conditions corrected in manner acceptable to Installer.

3.03 NOTIFICATION OF IMPERFECTIONS

- A. Prior to installation of cementitious underlayment notify architect of any imperfections in substrate. Absence of such notification shall denote acceptance of substrate.

3.04 PREPARATION

- A. Topping Applied to Hardened Concrete: Remove dirt, loose material, oil, grease, asphaltic or bituminous material, paint, or contaminants leaving clean surface.

- B. When base slab surface unacceptable for good bonding, roughen surface by shot-blasting, sand blasting, chipping or scarifying before cleaning.
 - 1. Acid etching and the use of sweeping compounds and solvents are not acceptable.
- C. For reinforced toppings, provide necessary chairs or supports, and maintain position of reinforcing mesh as shown on drawings.
- D. Joints: Mark locations of joints in base slab so joints in top course placed directly over them.
- E. Non-porous subfloors such as ceramic and quarry tile as well as terrazzo shall be clean and free of waxes and sealers.
- F. Cracks in the subfloor shall be repaired to minimize telegraphing through the underlayment. Methods of repair to be in accordance with manufacturers recommendations.

3.05 PRIMING

- A. Application of primer: Provide primer type and of quantities recommended by manufacturer for specific application required.
 - 1. Do not leave any bare spots.
 - 2. Remove all puddles and excess primer.
 - 3. Allow to dry to a clear, thin film.
 - 4. Underlayment shall not be applied until the primer is dry.
 - 5. Where necessary, due to absorbency of substrate, apply multiple applications of primer as required by underlayment manufacturer.

3.06 CEMENTITIOUS BASED MATERIALS

- A. Placement and handling of cementitious based materials to be in accordance with recognized methods and procedures and shall be consistent with requirements contained in Section 03300, Cast-In-Place Concrete.
- B. Materials furnished under this section are cement based products.
 - 1. Observe the basic rules of concrete work.
 - 2. Do not install below 50°F surface temperature.
 - 3. Install quickly if floor is warm and follow hot weather precautions available from manufacturer.

3.07 PLACEMENT

- A. Pumping: Mix using Automatic Mixing Pump as recommended by manufacturer.
 - 1. Start the pump at 210 gallons of water per hour, then adjust downward to the minimum water reading which still allows self-leveling properties. **DO NOT OVERWATER!**
 - 2. Check the consistency of the product on the floor to ensure a uniform distribution of the sand aggregate at both the top surface and bottom of the pour. If settling is occurring, reduce the water amount and recheck.
- B. Where underlayment over 1 1/2" thick contractor may add aggregate to mix. If contractor elects to use aggregate an additional "finished" layer of underlayment shall be installed over first "rough" layer.
- C. Level finished surface of underlayment to 1/16" in 10'-0".

3.08 PROTECTION

- A. Do not permit traffic, of any kind, over completed work for a min. of 72 hours (or greater if recommended by manufacturer) after installation of underlayment system.

3.09 PERFORMANCES

- A. Failure of concrete topping to bond to substrate (as evidenced by hollow sound when tapped), or disintegration or other failure of topping to perform as floor finish, considered failure of materials and workmanship.
- B. Repair or replace toppings in areas of failures, as directed.

END OF SECTION 03650

SECTION 04200
UNIT MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Requirements of this section apply to masonry work specified in Division-4 section "Reinforced Unit Masonry".

1.02 DESCRIPTION OF WORK

- A. Extent of each type of masonry work indicated on drawings.
- B. Types of masonry work required include:
 - 1. Concrete unit masonry.
 - 2. Split Face Concrete Masonry unit masonry.
 - 3. Brick masonry.
- C. Reinforced unit masonry specified in other Division-4 Section 'Reinforced Unit Masonry'
- D. Masonry Dampproofing is specified in Division-7 section "Bituminous Dampproofing".
- E. Rigid Cavity Insulation is specified in Division-7 section "Insulation".
- F. Brick vents are specified in a Division-10 section "Louvers and Vents".

1.03 QUALITY ASSURANCE

- A. General: Where codes, standards or regulations referenced in this section, compliance with such codes, standards or regulations shall be considered the minimum applicable standards. Where requirements of this sections exceed the requirements of the referenced standard the requirements of this section shall govern.
 - 1. Where reference is made to ASTM standards, such reference shall exclude reference to provisions related finish of concrete masonry units.
- B. Codes and Standards: Comply with provisions of following, except as otherwise indicated herein:
 - 1. National Concrete Masonry Association (NCMA): 'Specifications for Design and Construction of Load Bearing Concrete Masonry' latest edition.
 - 2. American Concrete Institute (ACI): ACI 530.1 'Specifications for Masonry Structures' and ACI 531' Building Code Requirements for Masonry Structures'
- C. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire endurance determined by testing in compliance with ASTM E 119 by recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction. In addition to compliance with ASTM standards the contractor shall furnish verification that units comply with one of the following:
 - 1. U.L. (Underwriters Laboratory) certification from concrete masonry manufacturer showing that manufacturer is certified to make U.L. rated masonry.
 - 2. Certification by Georgia licensed professional engineer (P.E.) that concrete masonry used in fire walls meets minimum requirements for Underwriters Laboratories Publication UL618, Class D-2, C-3 and B-4 masonry units for minimum physical dimensions, minimum equivalent thickness, procedure of manufacture, quality of materials used and mix design quantities.

- D. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from **ONE** manufacturer for each different product required for each continuous surface or visually related surfaces.
 - E. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
 - F. Field Constructed Mock Ups: Prior to installation of masonry work, erect sample wall panels to further verify selection made for color and textural characteristics, under sample submittals of masonry units and mortar, and to represent completed masonry work for qualities of appearance, materials and construction; build mock-ups to comply with following requirements:
 - 1. Locate mock-ups on site in locations indicated or, if not indicated, as directed by Architect.
 - 2. Build mockups for the following types of masonry in sizes of approximately 6' long by 4' high by full thickness, including face and back-up wythes as well as accessories.
 - a. Separate mock-up for each specified brick, typical exterior brick wall, each backed by one or more types of concrete masonry units specified so that each is represented, using specified mortar(s), damproofing, insulation and joint reinforcing.
 - b. Typical interior partition of concrete masonry units.
 - c. Provide examples of the following joint types:
 - 1) "V" joint at brick.
 - 2) "V" and concave joint at standard concrete masonry.
 - 3) Concave joint at split face concrete masonry.
 - 3. Where masonry is to match existing, erect panels parallel to existing surface.
 - 4. Erect mock-ups in presence of Architect.
 - 5. Protect mock-ups from the elements with weather resistant membrane.
 - 6. Retain mock-ups during construction as standard for judging completed masonry work.
 - 7. When directed, demolish mock-ups and remove from site.
 - 8. Approved mock-ups shall be utilized to establish the acceptable standard of quality to be utilized throughout the project.
 - G. Pre-Commencement Conference: Prior to laying masonry and performing associated work, meet at project site with general contractor mason, installers of related work, and other entities concerned with performance of masonry systems, including test agencies, governing authorities, Architect, and Owner.
 - 1. Record discussions and agreements and furnish copy to each participant.
 - H. Masonry Preconstruction Testing Service:
 - 1. Contractor shall employ and pay for services of testing laboratory acceptable to Architect and experienced in performing types of preconstruction masonry tests indicated.
 - 2. Engage a testing laboratory complying with ASTM E 329.
 - 3. Preconstruction Tests by Prism Methods: For each type of wall construction indicated for testing, test masonry prisms per ASTM C1314-03B and as follows:
 - a. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.
 - b. Fabricate brick prisms with height-to-thickness ratio of 5, unless otherwise indicated.
 - c. Fabricate concrete masonry prisms with height-to-thickness ratio of not less than 1.33 nor more than 3.0.
 - 4. Flexural Bond Strength Tests: Where indicated also test prisms per ASTM C 518; place prisms with tooled joints facing downward.
- 1.04 SUBMITTALS
- A. Product Data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements.
 - B. Samples for Initial Selection Purposes: Submit samples of following materials:
 - 1. Unit masonry samples in small scale form showing full extent of colors and textures available for each type of exposed masonry unit required.
 - 2. Colored masonry mortar samples showing full extent of colors available.

- C. Samples for Verification Purposes: Submit the following samples:
 - 1. Unit masonry samples for each type of exposed masonry unit required; include in each set full range of exposed color and texture expected in completed work.
 - a. Include size variation data verifying that actual range of sizes for brick falls within ASTM C 216 dimension tolerances for brick where modular dimensioning indicated.
 - b. Concrete masonry samples shall include samples of each block type and size utilized. Block types to include: stretcher, bull nose, double bull nose, lintel, spandrel, non-fire rated, and fire rated units.
 - 2. Colored masonry mortar samples for each color required showing full range of color expected in finished work.
 - a. Label samples to indicate type and amount of colorant used.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.
- C. Store cementitious materials off ground, under cover and in dry location.
- D. Store aggregates where grading and other required characteristics can be maintained.
- E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.06 PROJECT CONDITIONS

- A. Protection of Work:
 - 1. During erection, cover top of walls with heavy waterproof sheeting at end of each day's work.
 - 2. Cover partially completed structures when work not in progress.
 - a. Extend cover min. of 24" down both sides and hold cover securely in place.
 - 3. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.
 - 4. Do not apply concentrated loads for minimum 3 days after building masonry walls or columns.
 - 5. Staining: Prevent grout or mortar or soil from staining face of masonry to be exposed or painted.
 - 6. Remove immediately grout or mortar in contact with masonry to be exposed or painted.
 - 7. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
 - a. Extend covering up face of wall a minimum of 3'-0".
 - b. Do not place covering in mortar joint for anchorage.
 - c. Maintain protective covering for duration of project.
 - 8. Protect sills, ledges and projections from droppings of mortar.
 - 9. Protect adjoining finished materials and products from staining or disfigurement resulting from exposure to mortar, cement, lime or acid.
- B. Cold Weather Protection:
 - 1. Do not lay masonry units which are wet or frozen.
 - 2. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface dry to touch.
 - 3. Remove masonry damaged by freezing conditions.
 - 4. Do not lay masonry when air temperature below 40°F on falling thermometer, or when probable that temperatures below 40°F will be encountered before mortar set, unless adequate means provided for protecting work from freezing.
 - 5. For clay masonry units with initial rates of absorption (suction) which require them to be wetted before laying, comply with following requirements.
 - a. For units with surface temperatures above 32°F (0°C), wet with water heated to above 70°F (21°C).
 - b. For units with surface temperatures below 32°F (0°C), wet with water heated to above 130°F (54°C).

6. Perform following construction procedures while work progressing.
 - a. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout.
 - b. For grout, temperature ranges apply to anticipated min. night temperatures.
 - c. In heating mortar and grout materials, maintain mixing temperature selected within 10°F (6°C).
 - (1) 40°F (4°C) to 32°F (0°C):
 - (a) Mortar: Heat mixing water to produce mortar temperature between 40°F (4°C) and 120°F (49°C).
 - (b) Grout: Follow normal masonry procedures.
 - (2) 32°F (0°C) to 25°F (-4°C):
 - (a) Mortar: Heat mixing water and sand to produce mortar temperatures between 40°F (4°C) and 120°F (49°C); maintain temperature of mortar on boards above freezing.
 - (b) Grout: Heat grout materials to 90°F (32°C) to produce in-place grout temperature of 70°F (21°C) at end of work day.
 - (3) 25°F (-4°C) to 20°F (-7°C):
 - (a) Mortar: Heat mixing water and sand to produce mortar temperatures between 40°F (4°C) and 120°F (49°C); maintain temperature of mortar on boards above freezing.
 - (b) Grout: Heat grout materials to 90°F (32°C) to produce in-place grout temperature of 70°F (21°C) at end of work day.
 - (c) Heat both sides of walls under construction using salamanders or other heat sources.
 - (d) Use windbreaks or enclosures when wind is in excess of 15 mph.
 - (4) 20°F (-7°C) and below:
 - (a) Mortar: Heat mixing water and sand to produce mortar temperatures between 40°F (4°C) and 120°F (49°C).
 - (b) Grout: Heat grout materials to 90°F (32°C) to produce in-place grout temperature of 70°F (21°C) at end of work day.
 - (a) Masonry Units: Heat masonry units so that they are above 20°F (-7°C) at time of laying.
 - (b) Provide enclosure and auxiliary heat to maintain an air temperature of at least 40°F (4°C) for 24 hours after laying units.
 - d. Do not heat water for mortar and grout to above 160°F (71°C).
7. Protect completed masonry and masonry not being worked on in following manner.
 - a. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry.
 - b. For grouted masonry temperature ranges apply to anticipated minimum night temperatures.
 - (1) 40°F (4°C) to 32°F (0°C): Protect masonry from rain or snow min. 24 hours by covering with weather-resistive membrane.
 - (2) 25°F (-4°C) to 20°F (-7°C): Completely cover masonry with weather-resistive insulating blankets or similar protection for min. 24 hours, 48 hours for grouted masonry.
 - (3) 20°F (-7°C) and below:
 - (a) Except as otherwise indicated, maintain masonry temperature above 32°F (0°C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory.
 - (b) For grouted masonry maintain heated enclosure to 40°F (4°C) for 48 hours.

PART 2 - PRODUCTS

2.01 BRICK

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of brick required.
 1. Brick shall be uniform in appearance and free from chipped, broken, crazed or otherwise damaged units.
- B. Size: Provide bricks manufactured to following actual dimensions:
 1. Standard Utility: 3-5/8" x 3-5/8" x 11-5/8."
 2. Face Brick shall be uniform in size.
- C. Provide special molded shapes where indicated and for application requiring brick of form, size and finish on

- D. For sills, caps, soldiers, pierced screen walls, and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view, provide uncured or unfroged units with all exposed surfaces finished.
- E. Facing Brick: ASTM C 216 as follows:
 - 1. Grade SW; Type FBS (normal size and color variations).
 - 2. Compressive Strength: 8,000 psi, average, per ASTM C 67.
 - 3. Application: Use where brick exposed, unless otherwise indicated.
 - 4. Products: Provide samples of the following for mock-ups specified in Part 1 of this section, from which a final selection will be made.
 - 5. Provide face brick of matching color, texture and size as existing adjacent brickwork.
- F. Building Common Brick: ASTM C 62, and as follows:
 - 1. Grade SW.
 - 2. Application: Use where brick indicated for concealed locations.

2.02 CONCRETE MASONRY UNITS

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.
 - 1. Concrete Masonry units shall be free of surface and edge imperfections, irregularities, chippage, and other defects.
 - 2. Edges of block shall be smooth, straight and square and free from irregularities.
 - 3. Face texture of block shall be dense, smooth and regular in appearance. Course or irregular textured block unacceptable.
 - 4. The face texture of each specialty unit (lintels, bull nose, solid, half size units, ect) shall match the face texture of the stretcher blocks.
- B. Provide special shapes where required for corners, jambs, sash, control joints, headers, bonding and other special conditions.
 - 1. Face texture of specialty blocks to match stretcher blocks.
- C. Pre-Cast Masonry 'U-Lintels': Masonry lintels shall be pre-cast type masonry lintels, designed and engineered by pre-cast masonry lintel manufacturer. Design in accordance with the requirements stated herein and as noted on the structural drawings. If a conflict in requirements exists the more stringent requirement shall govern.
 - 1. Design: Precast masonry lintels to be designed and constructed by the manufacturer to safely support the weight of the wall above the opening and the roof dead and live tributary loads for each location without excessive deflection.
 - a. Each precast lintel shall have a depth of no less than 8" with 2 #5 bars at top and bottom of *precast* section with section grouted solid.
 - b. Where span of lintel requires a depth of greater than 8", as indicated on structural drawings, a composite member consisting of a precast section at the bottom and unit masonry section(s) at the top. The portion of the lintel above the precast section to be reinforced as indicated on structural drawings.
 - c. Provide minimum bearing for precast and unit masonry portions of lintels as indicated on structural drawings for width of open over which lintel is placed.
 - d. Lintels to be designed to center over openings. Bearing at each end of lintel to be equal.
 - 2. Reinforcing:
 - a. Deformed Reinforcing: ASTM A615, Grade 40 or 60.
 - b. Prestressing Strand: ASTM A416 270 ksi LL
 - 3. Fabrication:
 - a. Unless specified otherwise, conform to PCI MNL-116.
 - b. Non-prestressed units to be fabricated with concrete with a minimum 28 day compressive strength of 3,500 psi.
 - c. Prestressed units to be fabricated with concrete with a minimum 28 day compressive strength of 6,000 psi.
 - d. Units shall have a sand block finish.
 - 4. High Strength Pre-cast pre-stressed concrete as manufactured by Cast Crete, Corp (813) 621-4641; www.castcrete.com

- D. Provide bull nosed units for outside corners, except where indicated as square edged.
- E. Concrete Masonry Units (CMU): Provide units complying with characteristics indicated below for Grade, Type, face size, exposed face and, under each form included, for weight classification.
 - 1. Grade N; Type II Non-moisture controlled units.
 - 2. Size: Nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thicknesses indicated.
 - 3. Exposed Faces: Provide the following as indicated on drawings:
 - a. Primary Block: Manufacturer's standard gray color and smooth uniform face texture, if not otherwise indicated. Face of block to be free of cracks, chips and other imperfections.
 - b. Split Face Block: Manufacturer's integral color as selected by Architect with split face texture exposing aggregate of color to match existing.
 - 4. Fire rated units:
 - a. Fire rated units: Face texture to match that of non-fire-rated walls.
 - b. Block in a smoke, 20 minute, 1 hour and 2 hour rated partitions shall meet requirements for a Class D-2 (2 hour) rated block.
 - c. Block in a 3 hour rated partitions shall meet requirements for a Class C-3 (3 hour) rated block.
 - d. Block in a 4 hour rated partitions shall meet requirements for a Class B-4 (4 hour) rated block.
 - 5. Hollow Loadbearing Block: ASTM C 90 and as follows:
 - a. Weight Classification: Lightweight.
 - 6. Solid Loadbearing Block: ASTM C 145 and as follows:
 - a. Weight Classification: Lightweight.
 - 7. Concrete Building Brick: Provide units complying with ASTM C 55 and characteristics indicated below for grade, type, size and weight classification.
 - a. Grade: Same as indicated for concrete block.
 - b. Type: Same as indicated for concrete block.
 - c. Size: As indicated.
 - d. Size: Non-Modular Standard: 2-1/4" x 3-3/4" x 8"; unless noted otherwise.
 - e. Weight Classification: Lightweight.

2.03 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C 91.
 - 1. For colored aggregate mortars use masonry cement of natural color or white as required to produce mortar color indicated.
 - 2. Mortar utilized in fire rated partitions shall comply with applicable requirements of specified U.L. Design number.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregates for Mortar: ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing No. 16 sieve.
 - 1. White Mortar Aggregates: Natural white sand or ground white stone.
 - 2. Colored Mortar Aggregates: Ground marble, granite or other sound stone, as required to match Architect's sample.
- D. Aggregate for Grout: ASTM C 404, Size No. 2.
- E. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes.
 - 1. Use only pigments with record of satisfactory performance in masonry mortars.
 - 2. Color Range:
 - a. Brick Masonry: Gray, white or buff range.
 - b. Integrally Colored Concrete Masonry: Match masonry.
 - c. Natural (gray) Masonry: No mortar pigment required.
 - 3. Products: Subject to compliance with technical provisions, provide one of the following:
 - a. "Magnolia", Blue Circle Inc.
 - b. "SGS Mortar Colors"; Solomon Grind-Chem Service Inc.
 - c. "True Tone Mortar Colors"; Davis Colors; A subsidiary of Rockwood Industries, Inc.

- F. Powdered Waterproofing for Mortar: Powder waterproofing shall be a dry mixture of stearates, water-reducing agents, and processed dry aggregates that coat the internal pores and channels of cementitious mixes with a water repellent compound and impart a reduced capillary action, thereby minimizing the entrance and transmission of water without decreasing strength.
1. Approved Manufacturer, subject to conformance with specification:
 - a. Sonneborn, Hydrocide Powder.
 - b. Addiment Incorporated
 - c. Krete Industries, Inc.
- G. Water: Clean, and potable.

2.04 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

- A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:
1. Mill Galvanized Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 641 for zinc coating of class indicated below:
 - a. 0.10 oz. per sq. ft. of wire surface.
 - b. Application: Use for masonry not exposed to exterior or earth.
 2. Hot-Dip Galvanized Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 153, Class B-2 (1.5 oz. per sq. ft. of wire surface) for zinc coating applied after prefabrication into units.
 - a. Application: Use for masonry exposed to exterior and in contact with earth.
 3. Austenitic Stainless Steel Wire: ASTM A 580, AISI Type 304 (UNS S30400) alloy.
 - a. Application: Use where indicated.
 4. Zinc-Coated (Galvanized) Steel Sheet: Carbon steel with zinc coating complying with ASTM A 525, Coating Designation G90.
 - a. Application: Use for dovetail slots and where indicated.
 5. Hot-Dip Galvanized Carbon Steel Sheet: ASTM A 366, Class 2 or ASTM A 635; hot dip galvanized after fabrication to comply with ASTM A 153; Class B.
 - a. Application: Use for anchors.
- B. Joint Reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:
1. Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 1/2" elsewhere.
 2. Wire Size for Side Rods: 9 ga. (0.1483") diameter.
 3. Wire Size for Cross Rods: 9 ga. (0.1483") diameter.
 4. For **single-wythe** masonry provide type as follows with single pair of side rods:
 - a. Truss design with diagonal cross rods spaced max. 16" o.c. Provide products of one of following:
 - 1) AA Wire Products Co.; AA600 "Blok-Truss".
 - 2) Dur-O-Wall, Inc.; "Truss" Single Wythe.
 - 3) Hohmann & Barnard, Inc.; #120 "Truss-Mesh".
 - 4) Masonry Reinforcing Corporation of America; Series 300, 2 wire single wythe truss type.
 - 5) National Wire Products Industries; single wythe truss type.
 - 6) Southern Construction Products, Inc.; single wythe truss type.
 5. For **multi-wythe** masonry provide type as follows:
 - a. Truss design with diagonal cross rods spaced not more than 16" o.c..
 - 1) **Brick with Concrete Masonry Back-up (no cavity):** One side rod for each face shell of concrete masonry backup and one rod for brick wythe. Provide products of one of following:
 - a) AA Wire Products Co.; AA610 "Tri-Lok".
 - b) Dur-O-Wall, Inc.; "Composite Truss Trirod"
 - c) Hohmann & Barnard, Inc.; #130 "Truss-Tri-Mesh"
 - d) Masonry Reinforcing Corporation of America; Series 300, 3-wire composite truss type.
 - e) National Wire Products Industries; 3-wire composite truss type.
 - f) Southern Construction Products, Inc.; truss 3-wire style.

- 2) **Brick with Concrete Masonry Back-up (uninsulated cavity):** One side rod for each face shell of concrete masonry backup and one rod for brick wythe with crimped moisture drip in cross rods at center of cavity. Provide products of one of following:
 - a) AA Wire Products Co.; AA610 "Tri-Lok" with moisture drip.
 - b) Dur-O-Wall, Inc.; "Cavity Truss Trirod"
 - c) Hohmann & Barnard, Inc.;#135 "Cavity Truss-Tri-Mesh"
 - d) Masonry Reinforcing Corporation of America; Series 300, 3-wire cavity truss type with moisture drip.
 - e) National Wire Products Industries; 3-wire cavity truss type with moisture drip.
 - f) Southern Construction Products, Inc.; truss 3-wire style with moisture drip.
 - 3) **Brick with Concrete Masonry Back-up (insulated cavity):** One side rod for each face shell of concrete masonry backup and adjustable pintel/eye type or winged loop/box type tie 16" o.c. extending into brick wythe. Provide products of one of following:
 - a) AA Wire Products Co.; AA625 "Econo-Eye-Blok-Truss" or AA675 "Econo-Cavity Blok-Truss III"
 - b) Dur-O-Wall, Inc.; "Dur-O-Eye"
 - c) Hohmann & Barnard, Inc.;#170 "Adjustable Eye-Wire" or #AF- "Ajustoflex Truss".
 - d) Masonry Reinforcing Corporation of America; Series 900, cavity hook and eye.
 - e) National Wire Products Industries; double hook and eye truss or truss adjustable tab tie.
 - f) Southern Construction Products, Inc.; "double-eye" truss - rectangular type.
 - 4) **Two Wythe Concrete Masonry:** One side rod for each face shell of concrete masonry back-up and of concrete masonry facing wythe. Provide products of one of following:
 - a) AA Wire Products Co.; AA630 4-wire "Blok-Truss"
 - b) Dur-O-Wall, Inc.; "Truss - Double"
 - c) Hohmann & Barnard, Inc.;#140 "Truss-Twin-Mesh"
 - d) Masonry Reinforcing Corporation of America; Series 300, 4-wire composite truss type.
 - e) National Wire Products Industries; truss double side rod.
 - f) Southern Construction Products, Inc.; truss 4-wire style.
 - 5) **Two Wythe Brick:** Two side wire truss design with diagonal cross rods spaced max. 16" o.c. Provide products of one of following:
 - a) AA Wire Products Co.; AA600 "Blok-Truss".
 - b) Dur-O-Wall, Inc.; "Truss" Single Wythe.
 - c) Hohmann & Barnard, Inc.;#120 "Truss-Mesh".
 - d) Masonry Reinforcing Corporation of America; Series 300, 2 wire single wythe truss type.
 - e) National Wire Products Industries; single wythe truss type.
 - f) Southern Construction Products, Inc.; single wythe truss type.
- C. Bent-Wire Ties: Where indicated only provide individual prefabricated bent-wire units complying with requirements indicated below:
1. Wire Size: 0.1875" diameter.
 2. Length: Provide units of length indicated but not less than required for embedment into each wythe of 1.5" for solid units and for embedment of tie end into face shells of hollow units, with min. 5/8" mortar cover on exterior face joints, 1/2" elsewhere.
 - a. Ties to be of a width approximately 2" less than overall wall thickness.
 3. Tie Shape for Hollow Masonry Units Laid with Cells Vertical: Rectangular with ends welded close and not less than 4" wide. Provide products of one of following:
 - a. AA Wire Products Co.; AA304.
 - b. Dur-O-Wall, Inc.; D/A 510.
 - c. Hohmann & Barnard, Inc.;#BWT
 - d. Masonry Reinforcing Corporation of America; 1501.
 - e. National Wire Products Industries; Series 650.
 - f. Southern Construction Products, Inc.; Series 500 box tie (without drip).
 4. Tie Shape for Solid Masonry Unit Construction: Z-shaped ties with ends bent 90° to provide hooks min. 2" long. Provide products of one of following:
 - a. AA Wire Products Co.; AA309.
 - b. Dur-O-Wall, Inc.; D/A 500.
 - c. Hohmann & Barnard, Inc.;#ZWT
 - d. Masonry Reinforcing Corporation of America; 1600.
 - e. Southern Construction Products, Inc.; Series 500 zee tie (without drip).

5. Type for Masonry Where Coursing Between Wythes Do Not Align: Adjustable ties composed of two parts, one with pintle, the other with an eye. Provide products of one of following:
 - a. AA Wire Products Co.; AA303.
 - b. Dur-O-Wall, Inc.; D/A 515.
 - c. Hohmann & Barnard, Inc.; 750.
 - d. Masonry Reinforcing Corporation of America; 1801.
 - e. National Wire Products Industries; Series 915.
 - f. Southern Construction Products, Inc.; pintle and eye adjustable wall tie.

- D. Flexible Anchors: Where flexible anchors are indicated for connecting masonry to structural framework, provide 2-piece anchors as described below which permit vertical or horizontal differential movement between wall and framework parallel to, but resist tension and compression forces perpendicular to, plane or wall.
 1. For anchorage to concrete framework, provide manufacturer's standard anchors with dovetail anchor section formed from 0.1046" (12 gage) thick sheet metal and triangular-shaped wire tie section sized to extend within 1" of masonry face.
 - a. Wire Size: 0.1875" diameter.
 - b. Provide products of one of following:
 - 1) AA Wire Products Co.; AA100 + AA200 or AA200V as applicable.
 - 2) Dur-O-Wall, Inc.; D/A 100 + D/A 720 or D/A 723 as applicable.
 - 3) Hohmann & Barnard, Inc.; 305 + 315.
 - 4) Masonry Reinforcing Corporation of America; 2102.
 - 5) National Wire Products Industries; Series 500 + Series 506 or Series 506 as applicable.
 - 6) Southern Construction Products, Inc.; 10802 + Series 700.
 2. For anchorage to steel framework, provide manufacturer's standard anchors with welded anchor section formed from 0.1046" (12 gage) thick sheet metal and triangular-shaped wire tie section sized to extend within 1" of masonry face.
 - a. Wire Size: 0.1875" diameter.
 - b. Provide products of one of following:
 - 1) AA Wire Products Co.; AA401B + AA400.
 - 2) Dur-O-Wall, Inc.; D/A 207 + D/A 702.
 - 3) Hohmann & Barnard, Inc.; 359F + #VWT.
 - 4) Masonry Reinforcing Corporation of America; 1000 + 1100.
 - 5) National Wire Products Industries; No. 102 + No. 650
 - 6) Southern Construction Products, Inc.; 703 + Series 700.
 3. Refer to structural drawings for rigid masonry ties at some structural steel members.

- E. Masonry Veneer Anchors: Two-piece assemblies which permit vertical or horizontal differential movement between wall and framework parallel to, but resist tension and compression forces perpendicular to, plane of wall; consisting of wire tie section and metal anchor section for attachment over sheathing to metal studs and complying with the following requirements.
 1. Wire Size: 0.1875" diameter.
 2. Wire Tie Length: As required to extend within 1" of masonry veneer face.
 3. Triangular Ties: Provide products of one of following:
 - a. AA Wire Products Co.; AA401S-1 tie + AA401S anchor.
 - b. Dur-O-Wall, Inc.; D/A 702 tie + D/A 213 anchor.
 - c. Hohmann & Barnard, Inc.; V-tie + DW-10 anchor.
 - d. Masonry Reinforcing Corporation of America; 1100 tie + 1001 anchor.
 - e. National Wire Products Industries; Series 200 tie + No. 125 anchor.
 - f. Southern Construction Products, Inc.; Series 700 tie + 710 anchor.
 4. Metal Fasteners for Steel Studs: Steel drill screws, #10 diameter x length required to penetrate steel stud flange by not less than 3 exposed threads, complying with ASTM C 954 except with hex washer head and neoprene washer, cadmium-plated.

- F. Lateral Wall Ties: Provide straps of form and length indicated, fabricated from sheet metal strips of following width and thickness, unless otherwise indicated.
1. Width: 1-1/2".
 2. Thickness: 14-ga.
 3. Size: 20" long with 2" vertical bend each end.
 4. Configuration: "Z" shaped, corrugated.
 5. Provide products of one of following:
 - a. AA Wire Products Co.; AA211Z
 - b. Dur-O-Wall, Inc.; D/A 301C.
 - c. Masonry Reinforcing Corporation of America; 300Z.
 - d. National Wire Products Industries.
 - e. Southern Construction Products, Inc.
- G. Corrugated Wall Ties: Provide straps of form and length indicated, fabricated from sheet metal strips of following width and thickness, unless otherwise indicated.
1. Width: 7/8".
 2. Thickness: 22-ga.
 3. Size: As required; penetrate brick 2"; turn up face of wall 2".
 4. Provide products of one of following:
 - a. AA Wire Products Co.; AA211Z
 - b. Dur-O-Wall, Inc.; D/A 301C.
 - c. Masonry Reinforcing Corporation of America; 300Z.
 - d. National Wire Products Industries.
 - e. Southern Construction Products, Inc.
 5. Metal Fasteners for Steel Studs: Steel drill screws, #10 diameter x length required to penetrate steel stud flange by not less than 3 exposed threads, complying with ASTM C 954 except with hex washer head and neoprene washer, cadmium-plated.
- H. Anchor Bolts: Provide steel bolts with hex nuts and flat washers complying with ASTM A 307, Grade A, hot-dip galvanized to comply with ASTM C 153, Class C, in sizes and configurations indicated.

2.05 CONCEALED FLASHING MATERIAL

- A. Composite Wall Flashing: Composite waterproof flashing membrane consisting of min. 32 mil pliable, highly adhesive rubberized asphalt compound bonded to an 8 mil min. high density, cross-laminated polyethylene film.
1. Application: It is the intent that Composite Wall Flashing be used for all exterior wall masonry applications other than those indicated to be Vinyl Sheet Flashing.
 - a. Provide at all applications other than at base of masonry walls at grade.
 2. Self-sealing, self-healing, gully adhering, composite flexible flashing
 3. Bonded integrally and completely to high density four ply cross-laminated polyethylene film
 4. Protected by silicone coated release sheet removed immediately before installation.
 5. Remain flexible, waterproof in concealed masonry
 6. Color: Black
 7. Thickness: Min. 40 mils total thickness.
 8. Products: Subject to compliance with requirements, provide one of the following:
 - a. Grace Masonry Products, Perma-A-Barrier wall flashing
 - b. "Mel-Rol", W. R. Meadows
 - c. "MiraDRI 860/861", TC MiraDRI
 - d. Hyload
 - e. Aqua-Flash
 - f. Sandell Manufacturing Company
 - g. York Manufacturing Inc.
- B. Vinyl Sheet Flashing: Flexible sheet flashings especially formulated from virgin polyvinyl chloride with plasticizers and other modifiers to remain flexible and waterproof in concealed masonry applications, black in color and of thickness indicated below:
1. Application: Sill/thru wall flashing at base of masonry walls at grade only.
 - a. For other applications use Composite wall flashing.
 2. Thickness: 30 mils.

3. Application: Provide where concealed flashing referenced, unless otherwise noted.
 4. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Vi-Seal Plastic Flashing"; Afco Products Inc.
 - b. "Nervastral" Rubber and Plastic Compound Co.
 - c. "Nuflex"; Sandell Manufacturing Co., Inc.
 - d. "Wascoseal"; York Manufacturing, Inc.
- C. Adhesive/Cements for Flashings: Of type recommended by manufacturer of flashing material for use indicated.
- 2.06 MISCELLANEOUS MASONRY ACCESSORIES
- A. Reinforcing Bars: Deformed steel, ASTM A 615, Grade 60.
- B. Non-Metallic Expansion Joint Strips: Premolded, flexible cellular neoprene rubber filler strips complying with ASTM D 1056, Grade RE41E1, capable of compression up to 35%, of width and thickness indicated.
- C. Premolded Control Joint Strips: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
 1. Polyvinyl chloride complying with ASTM D 2287, General Purpose Grade, Designation PVC-63506 **OR**
 2. Styrene-butadiene rubber compound complying with ASTM D 2000, Designation 2AA-805.
- D. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- E. Weepholes: Provide weepholes of the following type:
 1. Plastic Tubing: Medium density polyethylene, outside diameter and length as indicated below:
 - a. 3/8" X 4".
- 2.07 MASONRY CLEANERS
- A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2 cup dry measure) and laundry detergent (1/2 cup dry measure) dissolved in one gallon of water.
- B. Acidic Cleaner: Manufacturer's standard strength general purpose cleaner designed for new masonry surfaces of type indicated; composed of blended organic and inorganic acids combined with special wetting systems and inhibitors; expressly approved for intended use by manufacturer of masonry units being cleaned.
 1. Products: Subject to compliance with requirements, provide following:
 - a. "Sure Kleen" No. 600 Detergent; ProSoCo, Inc.
 - b. "DC-6 Brick Cleaner"; Acme Brick Co.
 - c. "Series 800"; Superior
 - d. "Brick Bath"; Goldblatt
 - e. "202" or "202V"; Diedrich
- 2.08 MORTAR AND GROUT MIXES
- A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
- B. Scheduling: Mortar shall be placed in final location within 2-1/2 hours from time of initial mixing.
 1. Re-tempering of mortar prohibit.
 2. Mortar not in place within time period listed to be discarded.
- C. Mixing:
 1. Combine and thoroughly mix cementitious, water and aggregate in mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.
 2. Accurately measure all ingredients using appropriate measuring devices to assure proper proportions and to achieve uniform color, texture and quality.
 3. Measuring by "shovel" not acceptable.

4. For masonry located in **Exterior Walls** (both veneer and backup), add one pound of powder waterproofing additive in each bag of masonry cement.
- D. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specifications, for types of mortar required, unless otherwise indicated.
 1. Use Type N (750 PSI) mortar for above grade non-load bearing brick veneer, interior non-load bearing masonry and for other applications where another type not indicated.
 2. Use Type S (1800 PSI) mortar for above grade interior and exterior load bearing (reinforced an non-reinforced) masonry and where indicated.
 3. Use Type M (2500 PSI) mortar for masonry below grade and in contact with earth, and where indicated.
- E. Colored Pigmented Mortar:
 1. Select and proportion pigments with other ingredients to produce color required.
 2. Do not exceed pigment-to-cement ratio of 1-to-10, by weight.
- F. Grout for Unit Masonry: Use ready-mixed grout of strength and consistency indicated.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. In addition to the requirements contained herein, masonry work shall comply with the Current Edition of the Brick Institute of America, Technical Notes, Section 7A and 7B and ACI 530.1 Current Edition.
 1. Where conflicts exist between the requirements of this Section, the Technical Notes, and the requirements of ACI, the more stringent of the requirements shall govern.
- B. Lay brick and block as described herein and as follows:
 1. 'Cull' units which are damaged, chipped, cracked, or otherwise defective.
 2. Broken, Chipped, Cracked, irregular or otherwise defective units shall not be utilized in construction of building. Such units placed in construction shall be removed and replaced without cost to the owner.
 3. Do not lay units with irregular (rough) edges or non-uniform face texture. Where such units are placed in wall, contractor to remove and replace without additional cost.
- C. Wetting Clay Brick:
 1. Wet brick made from clay or shale which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute.
 2. Use wetting methods which ensure each clay masonry unit being nearly saturated but surface dry when laid.
- D. Do not wet concrete masonry units.
- E. Cleaning Reinforcing: Before placing, remove rust, scale, earth and other coatings from reinforcing.
- F. Unless noted or detailed otherwise masonry coursing shall be based on finished floor elevation, with top of first course of CMU masonry being 8" above finished floor.
 1. Should elevation of footing(s) require, cut first course of block as necessary to ensure that the top of block aligns with finished slab elevation.
 2. Do NOT attempt to "level" top of footing using excess mortar or grout.
- G. Unless noted or detailed otherwise every three brick courses shall align with CMU coursing.
 1. Should elevation of footing(s) require, cut first course of brick as necessary to ensure that the top of brick aligns with finished slab elevation.
 2. Do NOT attempt to "level" top of footing using excess mortar or grout.
- H. Thickness:
 1. Build cavity and composite walls, floors and other masonry construction to full thickness shown.
 2. Build single-wythe walls (if any) to the actual thickness of masonry units, using units of nominal thickness indicated.

- I. Build chases and recesses shown or required for work of other trades.
 - 1. Provide min. 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
- J. Build full height masonry pilasters where indicated and where required.
 - 1. Construct full height masonry pilaster at each recessed fire extinguisher cabinet where cabinet is shown to be placed on (or in) a fire rated partition.
 - 2. Construct full height masonry pilaster at each column located in a masonry wall. Pilaster shall fully conceal column and comply with fire rating requirements noted herein.
- K. Leave openings for equipment to be installed before completion of masonry work.
 - 1. After installation of equipment, complete masonry work to match work immediately adjacent to opening.
- L. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges.
 - 1. Cut units as required to provide continuous pattern and to fit adjoining work.
 - 2. Use full-size units without cutting where possible.
 - 3. Use dry cutting saws to cut concrete masonry units.
- M. Matching Existing Masonry Work:
 - 1. Match coursing, bonding, color and texture of new masonry work with existing work.

3.02 CONSTRUCTION TOLERANCES

- A. Variation from Plumb:
 - 1. For vertical lines and surfaces of columns, walls, and arises do not exceed $\pm 1/8$ " in any story height or 12' max.
 - 2. For vertical alignment of head joints do not exceed $\pm 1/8$ " in any story height or in 12'-0" ..
- B. Variation from Level:
 - 1. For bed joints and lines of exposed lintels, sills, parapets, and other conspicuous lines do not exceed $\pm 1/8$ " in any bay or 20' max.
 - 2. For top surface of bearing walls do not exceed $\pm 1/8$ " in 10' max. or 1/16" within length and width of any single unit.
- C. Variation of Linear Building Line: For position shown in plain and related portion of columns, walls and partitions, do not exceed 1/8" in any bay or 20' max.
- D. Variation in Cross-Sectional Dimension: For columns and walls do not exceed $\pm 1/4$ ".
- E. Variation in Mortar Joint Thickness:
 - 1. Unless otherwise indicated, make all bed and head joints 3/8", $\pm 1/16$ ", with max. joint thickness of 1/2".
 - 2. Approved field mock up panel establishes acceptable masonry appearance.

3.03 LAYING MASONRY WALLS

- A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate opening, movement-type joints, returns and offsets.
 - 1. Avoid use of less-than-half-size units at corners, jambs and wherever possible at other locations.
- B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.
 - 1. Accurately space courses.
 - 2. Coordinate with other work.

- C. Pattern Bond:
1. Lay exposed masonry in bond pattern as follows:
 - a. Brick: Running bond except as otherwise indicated.
 - b. Split-faced Concrete Masonry: Running bond.
 - c. 2-, 3-, or 4-hour Fire-rated Concrete Masonry: Running bond.
 - d. All other Concrete Masonry: Stacked bond.
 2. Lay concealed masonry with all units in wythe in running bond or bonded by lapping not less than 2".
 3. Bond and interlock each course of each wythe at corners.
 4. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.
 5. At openings in walls (cased openings, doors and window) where stacked bond used, align edge of full block with each side of opening. Where necessary in order to maintain alignment, cut block to be centered above opening. Do not use cut block at jambs.
- D. Stopping and Resuming Work:
1. Rack back 1/2-unit length in each course; do not tooth.
 2. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh mortar.
- E. Built-in Work:
1. Build in work of other sections indicated to be built-in with CMUs as work progresses; include anchors, wall plugs, expansions joints, control joints, and accessories. Space and properly align built-in parts; exercise care not to disturb other materials from position.
 - a. Fill spaces around built-in items with fine grout.
 - b. Coat aluminum materials to prevent aluminum-cement chemical reaction or electrolytic action between aluminum and steel.
 - c. Where built-in items embedded in cores of hollow masonry units, place layer of metal lath in joint below and rod grout into core.
 2. Fill space between hollow metal frames and masonry solidly with fine grout, unless otherwise indicated.
 3. Lay masonry to receive flashing with smooth joints without projections which could puncture flashing materials.
 4. Install minimum 8" solid end bearing full height of wall from floor to bearing points for lintels, beams and other supporting members by filling cores with cement grout, unless otherwise indicated.
 5. Provide lintels and bond beams where indicated using lintel blocks laid with joints matching adjacent work; reinforce as indicated, fill block with concrete.
 6. Saw-cut cut-outs for electrical devices and recessed wall mounted equipment.
 - a. Cut opening size required for device; do not overcut opening size.
 - b. Cut-out in block shall not exceed the size of the item to the extent that a normal coverplate or trim device will not cover the hole.
- F. Bull Nosed Block: Where bull nosed specified, the following to apply:
1. Exposed edges of block at outside corners, jamb block at surface mounted door jambs, view windows, window frames and other locations to be bull nosed.
 2. Where bull nosed block is used provide square nosed units, one (1) course high, at floor to accommodate base and at ceiling, one course high to accommodate ceiling grid.
- G. Split Face Masonry: Where split faced block specified for interior applications the following shall apply:
1. Where wall mounted specialties and accessories specified (Markerboard, Chalkboard, Tackboard, etc.) provide "normal", non-split faced block, extending 8" beyond specialty and/or accessory, each side of such item.
 2. At door and window jambs, provide "normal" non-split faced block for lintels and jambs; width and height of one block; equal each side of opening.
 3. Where split faced block is used provide "normal" non-split faced block, one (1) course high, at floor to accommodate base and at ceiling, one course high to accommodate ceiling grid.

3.04 LAYING FIRE RATED MASONRY PARTITIONS

- A. Masonry contractor shall maintain a current U.L. System Design Manual on site for the duration of the project. Design manual shall contain a full, detailed description of design numbers referenced herein.
- B. Where specific U.L. Design numbers are referenced the contractor shall construct partition or wall in total compliance with the requirements of the listed U.L. design number.
 - 1. Concrete masonry units in fire rated partitions shall be of classifications described above (D-2, C-3, B-4).
- C. Construct fire rated walls in accordance with provisions of applicable U.L Design numbers listed below:
 - 1. Smoke, 20 and 30 minute, and 1 hour rated walls: U 905 or U 906; 1 Hour Rated
 - 2. 2-hour walls: U 905 or U 906; 2 Hour Rated
 - 3. 3-hour walls: U 904 or U 907; 3 Hour Rated
 - 4. 4-hour walls: U 901 or U 907; 4 Hour Rated
- D. Unless more stringent requirements noted, partitions and walls surrounding mechanical rooms, electrical rooms, and similar spaces shall, as a **minimum**, be considered as being **1 Hour Rated**.
- E. Where fire rated or smoke tight partitions or walls are specified the contractor shall maintain the continuity of the fire rating and smoke enclosure whether specifically shown on drawings or not.
 - 1. All openings and penetrations through fire rated partitions shall be sealed using materials and methods which will maintain the specified fire rating **AND** prevent the passage of smoke.
 - 2. All openings and penetrations through smoke rated partitions shall be sealed using materials and methods which will prevent the passage of smoke.
- F. Unless noted otherwise extend fire rated and smoke partitions to roof deck and seal as required to maintain integrity of smoke tight enclosure and required fire rating.
- G. Where steel columns occur in either fire rated or smoke partitions, the continuity of the rating shall be maintained by extending Nominal 8" concrete block across the face of the column.
 - 1. Concrete block "pilaster" shall extend a minimum of 1'-0" past each side of the column. Pilaster shall extend from finished floor to fire rated assembly or underside of roof deck.
 - 2. Where recessed devices (Switches, outlets, junction boxes, etc.) occur in fire rated partitions of two (2) hour or greater ratings, seal around recessed device completely using grout. No voids or openings shall exist.
 - 3. Unless noted otherwise, where fire rated ceiling assemblies are specified or noted, where assembly has a rating equal to or greater than adjacent wall(s), the specified fire rated and smoke partitions to be extended from finished floor to 8" above fire rated assembly. Seal intersection of partition or wall to assembly to maintain specified fire rating **AND** prevent the passage of smoke.
 - 4. Unless noted otherwise, where **NO** fire rated ceiling assemblies are detailed or specified, or where rating of walls is greater than ceiling assembly, extend fire rated and smoke partitions from finished flooring to roof deck and seal with materials and methods which will maintain specified fire rating **AND** prevent the passage of smoke and as approved by the Local Fire Marshal.

3.05 MORTAR BEDDING AND JOINTS

- A. Lay solid brick-size masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place.
 - 1. Do not slush head joints.
- B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells.
 - 1. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities reinforced or filled with concrete or grout.
 - 2. For starting course on footings where cells not grouted, spread out full mortar bed including areas under cells.
- C. Maintain joint widths shown, except for minor variations required to maintain bond alignment.
 - 1. If not shown, lay walls with 3/8" joints.

- D. Cut joints flush for masonry walls concealed or covered by other materials, unless otherwise indicated.
 - E. Tool exposed joints when mortar thumb-print hard using jointer slightly larger than joint thickness to produce smooth, dense finish with straight lines of uniform depth and appearance throughout entire project; provide following types:
 - 1. Brick Joints: "V" Type.
 - 2. Concrete Masonry Joints:
 - a. Generally: "V" joint or concave joint selected by Architect from mock-up.
 - b. Kitchen, serving lines, and Toilets: Concave type joint.
 - F. Remove masonry units disturbed after laying; clean and reset in fresh mortar.
 - 1. Do not pound corners or jambs to shift adjacent stretcher units set in position.
 - 2. If adjustments required, remove units, clean off mortar and reset in fresh mortar.
 - G. Collar Joints: After each course laid, fill in vertical longitudinal joint between wythes solidly and with mortar for following masonry work:
 - 1. All exterior walls, except cavity walls, and interior walls and partitions.
 - 2. Exterior walls, except cavity walls.
 - 3. Nonloadbearing interior walls or partitions where metal ties or horizontal reinforcing indicated for structural bonding and nominal thickness of wall or partition required to meet code requirements for height-to-thickness ratio.
- 3.06 CONCRETE TIE BEAMS
- A. Where horizontal reinforced concrete beams and bond beams shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars.
 - 1. Place small mesh expanded metal lath or wire screening in mortar joints under beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.
 - 2. Do not use sheet metal, felt, or building paper.
 - B. Provide concrete block bond beams where detailed. Provide as a minimum concrete block bond beams, reinforced continuously with 2 each #5 rebars, fill solid with grout in the following locations:
 - 1. Where shown on drawings.
 - 2. At top of all interior and exterior walls.
 - 3. In walls over 10'-0" high provide at approximately 8'-0" on center vertically in all interior and exterior walls.
 - C. Interrupt concrete bond beam and reinforcing at each expansion and control joint located in masonry wall. Do not run bond beam through control or expansion joint.

3.07 STRUCTURAL BONDING OF MULTI-WYTHE MASONRY

- A. Use continuous horizontal joint reinforcement installed in horizontal mortar joints for bond tie between wythes.
 - 1. Install max. 16" o.c. vertically.
- B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.
- C. For horizontally reinforced masonry, provide continuity at corners with prefabricated "L" units, in addition to masonry bonding.
- D. Intersecting and Abutting Walls (Load Bearing and Non-Load Bearing): Unless vertical expansion or control joints shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
 - 1. Provide individual **lateral wall** ties max. 16" o.c. vertically. If used in hollow masonry units, ends to be embedded in mortar-filled cells (cores).
 - 2. Provide continuity with horizontal joint reinforcement using prefabricated "T" units.

- E. Load-Bearing Interior Partitions:
 - 1. Build full height of story to underside of solid floor or roof structure above, unless otherwise shown.
- F. Non-Load-Bearing; Fire Rated Interior Partitions:
 - 1. Build full height of story to underside of solid floor or roof structure above, unless otherwise shown.
- G. Non-bearing; Non-Fire Rated Interior Partitions:
 - 1. Build wall to 8" above "upper" ceiling level or if no ceiling exists (on one or both sides) to underside of solid floor or roof structure above, unless noted or detailed otherwise.
 - 2. Where partitions terminate below roof or floor structure provide lateral bracing of partition at maximum of 15'-0" on center; minimum two per section of wall. Bracing to consist of minimum 1-1/2" steel angle extending from top of partition to underside of structure above. Weld angle to plate attached to top of partition and to steel structure.
- H. Concrete Block Chases:
 - 1. Where chases are less than 16" clear width, tie chase walls together with box type wall ties at 16" on center each way.

3.08 HORIZONTAL JOINT REINFORCEMENT

- A. General:
 - 1. Provide continuous horizontal joint reinforcement as indicated.
 - 2. Install longitudinal side rods in mortar for entire length with min. cover of 5/8" exterior side of walls, 1/2" elsewhere.
 - 3. Lap reinforcing min. of 6".
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted omitted.
- D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections.
 - 1. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
 - 2. Space continuous horizontal reinforcement as follows:
 - a. For multi-wythe walls (solid or cavity where continuous horizontal reinforcement acts as structural bond or tie between wythes, space reinforcement as required by code but max. 16" o.c. vertically.
 - b. For single-wythe walls, space reinforcement at 16" o.c. vertically, unless otherwise indicated.
 - c. For parapets, space reinforcement at 8" o.c. vertically, unless otherwise indicated.
- E. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above lintel and immediately below sill.
 - 1. Extend reinforcement min. of 2'-0" beyond jambs of opening except at control joints.
- F. In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with above.

3.09 ANCHORING MASONRY WORK

- A. General: Provide anchor devices of type indicated.
- B. Anchor masonry to structural members where masonry abuts or faces structural members to comply with following:
 - 1. Provide open space min. 1" in width between masonry and structural member, unless otherwise indicated.
 - 2. Keep open space free of mortar or other rigid materials.
 - 3. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
 - a. Space anchors as indicated, but max. 24" o.c. vertically and 36" o.c. horizontally.

- C. Anchor single wythe masonry veneer to metal studs with masonry veneer anchors to comply with following requirements:
 - 1. Fasten each anchor section through sheathing to metal studs with 2 metal fasteners of type indicated.
 - 2. Embed tie section in masonry joints.
 - 3. Provide min. 1" air space between back of masonry veneer wythe and face of sheathing.
 - 4. Locate anchor section relative to course in which tie section embedded to allow max. vertical differential movement of tie up and down.
 - 5. Space anchors as indicated but not more than 16" o.c. vertically and 24" o.c. horizontally.
 - 6. Install additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 3'-0".

3.10 CONTROL AND EXPANSION JOINTS

- A. General:
 - 1. Provide vertical and horizontal expansion, control and isolation joints in masonry where shown.
 - 2. Build-in related items as the masonry work progresses.
- B. Expansion Joints:
 - 1. Expansion joints to be 1" wide unless noted otherwise.
 - 2. Maintain expansion joint clear of mortar by temporarily filling with fiberboard as wall is laid.
 - 3. Discontinue horizontal masonry joint reinforcing 1" from expansion joint.
 - 4. Install elastomeric flashing full height of joint; extend into joint 1" and each side of joint minimum of 6" and secure to wall with metal band and mechanical fasteners at 6" on center vertically. Seal joint between flashing and wall with dampproofing.
 - 5. Leave exterior side open and clean for installation of baking rod and sealant.
 - 6. Install prefabricated metal expansion joint cover over interior joints.
- C. Control Joints:
 - 1. Build in rubber control joints in rabbet furnished in CMU to secure shear flange of joint filler where joints occur in running walls at locations indicated.
 - 2. Unless noted otherwise, brick and CMU control joints to be 3/8" wide, raked out to a depth of 3/4" while the mortar is still plastic.
 - 3. Filled control joint with a non-metallic compressible filler and seal with sealant.
 - a. Compressible filler and sealant in smoke and rated partitions shall be rated and resist the passage of smoke.
 - 4. Discontinue horizontal wall reinforcing 1" from control joint.
 - 5. Unless closer spacing indicated on drawings, provide control joints in following locations.
 - a. Brick and concrete masonry units (CMU) walls at 30'-0".
 - b. Intersecting walls where either one is more than 10'-0" long.
 - c. Structural steel columns.
 - d. Intersection of masonry and structural slabs, beams and decks.
 - e. Changes in wall thicknesses.
 - f. Abrupt changes in wall height.
 - 6. Do not provide control joints in the following locations:
 - a. Through lintels.
 - b. Through openings in masonry walls.
 - c. Within 8" of bearing for a structural member.
 - 7. Where control joints are run adjacent to door or window openings, run as follows:
 - a. Extend joint up at jamb of door or window to underside of lintel.
 - b. Extend joint horizontally under lintel the distance required to achieve proper bearing (8"; 16", etc; see lintel schedule) using a "bond breaker".
 - c. At end of bond beam bearing turn vertically and extend to top of wall.
 - d. Extend control joint through bond beam. Bond beam to be discontinued at control joints.
- D. Build in horizontal pressure relieving joints where indicated; construct joints by either leaving an air space or inserting non-metallic compressible joint filler of width required to permit installation of sealant and backer rod.
- E. Locate horizontal pressure relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.11 LINTELS

- A. Provide masonry lintels:
 - 1. Where shown on drawings.
 - 2. Where openings of more than 1'-0" for brick size units and 2'-0" for block size units shown without structural steel or other supporting lintels.
 - 3. Where continuity of bearing wall required to support roof structure.
- B. Masonry Lintels to comply with:
 - 1. Provide precast concrete block lintels unless otherwise indicated.
 - 2. Cure precast lintels before handling and installation.
 - 3. Temporarily support formed-in-place lintels.
 - 4. For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout.
 - 5. Provide min. bearing of 8" at each jamb, unless otherwise indicated.
 - 6. Provide reinforcing indicated, if not indicated provide a minimum of 2 #5 rebars continuously.

3.12 FLASHING OF MASONRY WORK

- A. Applications:
 - 1. Base of Wall: Provide elastomeric, through wall type flashing at base of masonry wall.
 - 2. Obstructions to Flow: : Provide concealed flashing in masonry work at, or above, shelf angles, lintels, ledges and other obstructions to downward flow of water in wall to divert such water to exterior.
 - 3. Penetrations in cavity face of Concrete Block: Provide concealed flashings at all penetrations in cavity face of concrete block. Cover columns, pipes, conduits, masonry control and expansion joints full length and height
- B. Type of Flashings:
 - 1. Install Vinyl sheet flashing unless noted otherwise.
 - 2. At locations where flashing indicated to be installed where masonry occurs above a low roof, or walkway cover or where indicated provide and 'Composite Sheet Flashing'.
- C. General Installation:
 - 1. Prepare masonry surfaces smooth and free from projections which could puncture flashing.
 - 2. Place through-wall flashing on sloping bed of mortar and cover with mortar.
 - 3. Seal penetrations in flashing with mastic before covering with mortar.
 - 4. Seal laps in flashing with mastic to provide a watertight condition.
 - 5. Turn ends of flashing up to form a dam at all points of termination.
 - 6. Extend flashings through exterior face of masonry and turn down to form drip.
- D. Base of Wall (Sill) Flashing:
 - 1. Flashing to extend from 2" above finished grade or walk/pad to a point 8" above the finished floor.
 - 2. At 8" above floor turn flashing into mortar joint of concrete block a minimum of 4".
 - 3. Turn flashing out in brick at an elevation above grade. Extend flashing to exterior face of brick; trim where exposed.
 - a. Prior to placement of flashing the contractor to verify the elevation of the finished grades to ensure that the flashing and weep holes are located above finished grade.
- E. Flashing at Obstructions and Penetrations: Extend flashing full length of lintels and shelf angles and min. of 16" into masonry each end.
 - 1. Extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up min. of 4", and through inner wythe to within 1/2" of interior face of wall in exposed work.
 - a. Where interior surface of inner wythe concealed by furring, carry flashing completely through inner wythe and turn up approximately 2".
 - 2. At heads and sills turn up ends min. 2" to form pan.
 - 3. At head of openings, extend flashing a minimum of 16" past edge of opening.
- F. Install flashing to comply with manufacturers written instructions.

- G. Provide weep holes in head joints of first course of masonry immediately above concealed flashings.
 - 1. Space 24" o.c., unless otherwise indicated.
 - H. Install reglets and nailers for flashing and other related work where shown built into masonry work.
 - I. Installation of flashing to be viewed by Architect prior to covering.
 - 1. Flashing not viewed by Architect prior to covering shall be uncovered for viewing by Architect. All costs for uncovering of flashing and subsequent reconstruction of wall to be paid for by the contractor, whether flashing was originally installed correctly or not.
- 3.13 INSTALLATION OF REINFORCED UNIT MASONRY
- A. Refer to Division-4 sections "Reinforced Unit Masonry" for installation requirements applicable to reinforced unit masonry.
- 3.14 FIELD QUALITY CONTROL
- A. Contractor employ, at his own expense, testing laboratory experienced in performing types of masonry field quality control tests for masonry indicated.
 - 1. Comply with requirements for qualification and acceptance of testing laboratory specified in Part 1 for preconstruction testing service.
 - B. Prism Test Method:
 - 1. Compression Test: For each type wall construction indicated for testing, test masonry prisms by methods of sampling and testing of ASTM E 447, Method B, and as follows:
 - a. Prepare one set of prisms for testing at 7 days and one for testing at 28 days.
 - b. For brick masonry prisms provide same height-to-thickness ration (h/t) specified under preconstruction testing.
 - c. For concrete masonry prisms provide same height-to-thickness ration (h/t) specified under preconstruction testing.
 - d. Construct tests no less frequently than that required to provide sets of prisms from each 5000 sq. ft. of wall area installed.
 - 2. Report test results in writing and in form specified under each test method, to Architect and Contractor, on same day tests made.
 - C. Evaluation of Quality Control Tests:
 - 1. Masonry work, in absence of other indications of noncompliance with requirements, considered satisfactory if results from construction quality control tests comply with minimum requirements indicated.
- 3.15 PARGING
- A. Parge walls where indicated with Type S or N mortar, in thickness indicated.
 - B. Thickness: Not less than 1/2".
 - C. Trowel finish to smooth, dense surface.
 - 1. Form wash at top of parging and cove at bottom.
 - 2. Where parging applied in 2 coats, roughen first coat when partially set, let harden for 24 hours and moisten prior to application of second coat.
 - D. Damp cure parging for at least 24 hours and protect until cured.
- 3.16 REPAIR, POINTING, AND CLEANING
- A. General:
 - 1. Pointing, tooling, patching and cleaning shall be performed after the masonry mortar has thoroughly set and cured, but no latter than **one month** after the placement of the masonry

- B. Remove and replace loose, chipped, broken, stained or otherwise damaged masonry units, or if units do not match adjoining units as intended.
 - 1. Remove and replace units with non-uniform face texture or where adjacent units have differing face textures.
 - 2. Remove and replace units containing rough, irregular edges.
 - 3. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- C. Pointing:
 - 1. During tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar.
 - 2. Point-up all joints including corners, openings and adjacent work to provide neat, uniform appearance, prepared for application of sealants.
- D. Final Cleaning: After mortar thoroughly set and cured, clean masonry as follows
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes.
 - 3. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
- E. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
- F. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
- G. Use bucket and brush hand cleaning method described in BIA "Technical Note No. 20 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner indicated below.
 - 1. Detergent.
 - 2. Acidic cleaner; apply in compliance with directions of cleaner manufacturer.
- H. Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable to NCMA "Tek" bulletins.
- I. Protection: Provide final protection and maintain conditions in manner acceptable to Installer, which ensures unit masonry work being without damage and deterioration at time of Final Acceptance.

END OF SECTION 04200

**SECTION 04230
REINFORCED UNIT MASONRY**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Requirements of Section "Unit Masonry" apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of each type of reinforced unit masonry work indicated on drawings and schedules.

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:
 - 1. NCMA "Specifications for the Design and Construction of Load Bearing Concrete Masonry", latest edition.
 - 2. ACI 531 "Building Code Requirements for Concrete Masonry Structures".

1.04 SUBMITTALS

- A. Mill Certificates: Submit steel producer's certificates of mill analysis, tensile and bend tests for reinforcement steel required for Project.
- B. Shop Drawings:
 - 1. Submit complete shop drawings for fabrication, bending, and placement of reinforcement bars.
 - 2. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
 - 3. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Refer to Section "Unit Masonry" for masonry materials and accessories not included in this Section.
- B. Reinforcement Bars: Provide deformed bars complying with ASTM A 615, Grade 60.
 - 1. Shop-fabricate reinforcement bars shown bent or hooked.

PART 3 - EXECUTION

3.01 PLACING REINFORCEMENT

- A. General: Clean reinforcement loose rust, mill scale, earth, ice or other materials which reduce bond to mortar or grout.
 - 1. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.
- B. Position reinforcing accurately at spacing indicated.
 - 1. Support and secure vertical bars against displacement.
 - 2. Place horizontal reinforcing as masonry work progresses.
 - 3. Where vertical bars shown in close proximity, provide clear distance between bars of not less than nominal bar diameter or 1" (whichever is greater).

4. For columns, piers and pilasters, provide clear distance between vertical bars as indicated, but not less than 1-1/2 times nominal bar diameter or 1-1/2", whichever is greater.
 5. Provide lateral ties as indicated.
- C. Splice reinforcement bars where shown; do not splice at other points unless acceptable to Architect.
1. Provide lapped splices, unless otherwise indicated.
 2. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
 3. Provide not less than min. lap shown, or if not shown, as required by governing code.
 4. Weld splices where indicated; comply with requirements of AWS D1.4 for welding materials and procedures.
- D. Embed metal ties in mortar joints as work progresses, with min. mortar cover of 5/8" on exterior face of walls and 1/2" at other locations.
- E. Embed prefabricated horizontal joint reinforcement as work progresses, with min. cover of 5/8" on exterior face of walls and 1/2" at other locations.
1. Lap units min. 6" at ends.
 2. Use prefabricated "L" and "T" units to provide continuity at corners and intersections.
 3. Cut and bend units as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- F. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.
1. Anchor reinforced masonry walls to non-reinforced masonry where they intersect.

3.02 INSTALLATION, GENERAL

- A. Refer to Section "Unit Masonry" for general installation requirements to unit masonry.
- B. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.
1. Construct formwork to conform to shape, line and dimensions shown.
 - a. Make sufficiently tight to prevent leakage of mortar grout, or concrete (if any).
 - b. Brace, tie and support as required to maintain portion and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry member hardened sufficiently to carry their own weight and all other reasonable temporary loads placed on them during construction.
 - a. Allow not less than following minimum time to elapse after completion of members before removing shores or forms, provided suitable curing conditions obtained during curing period.
 - 1) 10 days for girders and beams.
 - 2) 7 days for slabs.
 - 3) 7 days for reinforced masonry soffits.

3.03 INSTALLATION OF REINFORCED BRICK MASONRY

- A. Mortar Jointing and Bedding:
1. Pattern Bond:
 - a. Lay exterior wythes in pattern bond to match non-reinforced masonry as specified in Section 04200.
 - b. If running bond used lay in 1/2-running bond with vertical joints in each course centered on units in courses above and below.
 - c. Lay inner wythes (if any) with all units in wythe bonded by lapping min. 2".
 - d. Bond and interlock each course of each wythe at corners and intersections.
 - e. Do not use units with less than 4" nominal horizontal face dimension at corners or jambs.
 2. Lay exterior wythes with bed (horizontal) and head (vertical) joints between units completely filled with mortar.
 - a. Slope top of bed joint mortar toward center of walls.
 - b. Butter ends of units with sufficient mortar to completely fill head joints and shove into place.
 - c. Do not furrow bed joints or slush head joints.
 - d. Remove any mortar fins which protrude into grout space.

3. Maintain joint widths shown for head and bed joints, except for minor variations required to maintain pattern bond.
 - a. If not shown, lay with 3/8" head and bed joints.
- B. Two-Wythes Wall Construction:
 1. Lay both wythes as previously specified for exterior wythes.
 2. Maintain grout space (collar or continuous vertical joint between wythes) of width indicated, but adjust, if required, to provide grout space min. 1/2" wider than sum of vertical and horizontal (if any) reinforcement bars placed in grout space.
 3. Do not parge or fill grout space with mortar.
- C. Multi-Wythe Wall Construction:
 1. Where walls of 3 or more wythes indicated, lay exterior wythes as previously specified.
 2. Maintain space between wythes as required to allow for laying of number of wythes of unit width shown with min. grout space between wythes.
 3. Allow min. 3/4" of grout between wythes if non-reinforced; if reinforced, allow for grout space min. 1/2" wider than sum of vertical and horizontal (if any) reinforcement bars placed in grout space.
 4. Place or float interior wythe units in grout poured between exterior wythes as work progresses.
 5. Position units to allow min. 3/4" grout between ends and sides of adjacent units.
- D. Limit extent of masonry construction to sections which do not exceed max. pour requirements specified hereafter.
 1. Provide temporary dams or barriers to control horizontal flow of grout at ends of wall sections.
 2. Build dams full height of grout pour.
 3. If masonry units used, do not bond into permanent masonry wythes.
 4. Remove temporary dams after completion of grout pour.
- E. Low-Lift Grouting:
 1. Use Low-Lift grouting technique with "Fine Grout" per ASTM C 476 for following:
 - a. Two-wythe walls with grout space of 2" or less in width.
 - b. Multi-wythe walls.
 - c. Columns, piers or pilasters where masonry units shown in core areas enclosed by exterior masonry units.
 2. At Contractor's option, low-lift grouting technique may be used for reinforced masonry construction with grout spaces wider than 2", except use "Coarse Grout" mix per ASTM C 476 and place in lifts not to exceed 8" in height.
 3. Construct low-lift masonry by placing reinforcement, laying masonry units and pouring grout as work progresses.
 4. Place vertical reinforcement bars and supports prior to laying of masonry units.
 - a. Extend above elevation of max. pour height as required to allow for splicing.
 - b. Place horizontal reinforcement bars progressively with laying of masonry units.
 5. Limit grout pours as required to prevent displacement of masonry by grout pressures (blowout), but do not exceed 12" pour height.
 6. Lay masonry units prior to each grout pour, but do not construct more than 12" above max. grout pour height in one exterior wythe and 4" above in other exterior wythe.
 - a. Provide metal wall ties if required to prevent blowouts.
 7. Pour grout using container with spout and consolidate immediately by rodding or puddling; do not use trowels.
 - a. Place grout continuously; do not interrupt pouring of grout for more than one hour.
 - b. If poured in lifts, place from center-to-center of masonry courses.
 - c. Terminate pour 1-1/2" below top of highest course in pour.
- F. High-Lift Grouting:
 1. Use high-lift grouting technique for following masonry construction:
 - a. Two-wythe walls with grout spaces of 2-1/2" or greater width.
 - b. Columns, piers, or pilasters when no unit masonry fill placed in reinforced grout space.
 2. Place reinforcement and support in proper position, prior to laying of masonry units, except if placed in mortar joints, place as masonry units laid.
 - a. Place horizontal bars in grout spaces on same side of vertical bars.

3. Construct high-lift masonry by laying masonry to full height and width prior to placing of grout.
 - a. Provide cleanout holes in first course of masonry, and use high-pressure water jet stream to remove excess mortar from grout spaces, reinforcement bars and top surface of structural members which support wall.
 - b. Clean grout spaces daily during construction of masonry.
4. Columns, Piers and Pilasters:
 - a. Omit every other masonry unit around perimeter of member to provide cleanout holes.
 - b. Provide reinforcing bands placed in bed joints as masonry work progresses.
 - c. Provide bands of size and vertical spacing shown, or required by code, but min. 9 gage wire spaced 12" o.c. vertically.
5. Preparation of Grout Spaces:
 - a. Prior to grouting, inspect and clean grout spaces.
 - b. Remove dirt, dust, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces.
 - c. Clean reinforcing and adjust to proper positioning.
 - d. Clean top surface of structural members supporting masonry to ensure bond.
 - e. After cleaning and inspection, close cleanout holes with matching masonry units and brace closures to resist grout pressures.
6. Do not place grout until entire height of masonry attained sufficient strength to resist grout pressure, but min. 3 days curing time.
 - a. Install shores and bracing, if required, before starting grouting operations.
7. Place grout by pumping into grout spaces, unless alternate methods acceptable to Architect.
8. Use "Coarse Grout" per ASTM C 476.
 - a. Rod or vibrate each grout lift during placing and again after excess moisture absorbed, but before plasticity lost.
 - b. Do not penetrate or damage grout placed in previous lifts or pours.
9. Limit grout pours to sections which can be completed in one working day with max. one hour interruption of pouring operation.
 - a. Limit pours so as not to exceed capacity of masonry to resist displacement or loss of mortar bond due to grout pressures.
 - b. Do not exceed 12' pour height.
 - c. Do not exceed 25' horizontal pour dimension.
10. Where pour height exceeds 4', place grout in series of lifts not exceeding 4' height.
 - a. Place each lift as continuous pouring operation.
 - b. Allow min. 30 minutes, max. one hour between lifts of given pour.
11. When more than one pour required to complete given section of masonry, extend reinforcement beyond masonry as required for splicing.
 - a. Pour grout to within 1-1/2" of top course of first pour.
 - b. After grouted masonry is cured, remove temporary dams (if any), and lay masonry units and place reinforcement for second pour section before grouting.
 - c. Repeat sequence, if more pours required.

3.04 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

A. General:

1. Do not wet concrete masonry units (CMU).
2. Lay CMU units with full-face shell mortar beds.
 - a. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to distance behind face equal to min. of thickness of longitudinal face shells.
 - b. Solidly bed cross-webs of starting courses in mortar.
 - c. Maintain head and bed joint widths shown, or if not shown, provide 3/8" joints.
 - d. Where solid CMU units shown, lay with full mortar head and bed joints.

B. Walls:

1. Pattern Bond:
 - a. Lay CMU wall units in bond indicated in Section 04200 with vertical joints in each course centered on units in courses above and below, unless otherwise indicated.
 - b. Bond and interlock each course at corners and intersections.

- c. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
 2. Maintain vertical continuity of core or cell cavities, if reinforced and grouted, to provide min. clear dimensions indicated and to provide min. clearance and grout coverage for vertical reinforcement bars.
 - a. Keep cavities free of mortar.
 - b. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
 3. Where horizontal reinforced concrete beams and bond beams shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars.
 - a. Place small mesh expanded metal lath or wire screening in mortar joints under beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms; do not use sheet metal, felt, or building paper.
 - b. Grout cells to be filled prior to placement of beam concrete.
- C. Columns, Piers and Pilasters:
 1. Use CMU units of size, shape and number of vertical core spaces shown.
 - a. If not shown, use units which provide min. clearances and grout coverage for number and size vertical reinforcement bars shown.
 2. Provide pattern bond shown, or if not shown, alternate head joints in vertical alignment.
 3. Where bonded pilaster construction shown, lay wall and pilaster units together to max. pour height specified.
- D. Grouting:
 1. Use "Fine Grout" per ASTM C 476 for filling spaces less than 4" in one or both horizontal directions.
 2. Use "Coarse Grout" per ASTM C 476 for filling 4" spaces or larger in both horizontal directions.
 3. Preparation of Grout Spaces:
 - a. Prior to grouting, inspect and clean grout spaces.
 - b. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces.
 - c. Clean reinforcing and adjust to proper position.
 - d. Clean top surface of structural members supporting masonry to ensure bond.
 - e. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.
 4. Grouting Technique:
 - a. At Contractor's option, use either low-lift or high-lift grouting techniques subject to requirements which follow.
- E. Low-Lift Grouting:
 1. Provide min. clear dimension of 2" and clear area of 8 sq. in. in vertical cores grouted.
 2. Place vertical reinforcement prior to laying of CMU.
 - a. Extend above elevation of max. pour height as required for splicing.
 - b. Secure in position at top and bottom of bar and at vertical intervals not exceeding 192 bar diameters nor 10 ft.
 3. Lay CMU to maximum pour height.
 - a. Do not exceed 4' height, or if bond beam occurs below 4' height stop pour at course below bond beam.
 4. Pour grout using chute or container with spout.
 - a. Rod or vibrate grout during placing.
 - b. Place grout continuously; do not interrupt pouring of grout for more than one hour.
 - c. Terminate grout pours 1-1/2" below top course of pour.
 5. Bond Beams:
 - a. Stop grout in vertical cells 1-1/2" below bond beam course.
 - b. Place horizontal reinforcing in bond beams; lap at corners and intersections as shown.
 - c. Place grout in bond beam course before filling vertical cores above bond beam.

- F. High-Lift Grouting:
1. Do not use high-lift grouting technique for grouting of CMU unless min. cavity dimension 3" and 10 sq. in., respectively.
 2. Provide cleanout holes in first course at all vertical cells filled with grout.
 - a. Locate clean out holes in area not exposed to view.
 - b. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.
 3. Construct masonry to full height of max. grout pour specified, prior to placing grout.
 - a. Limit grout lifts to max. height of 4' and grout pour to max. height of 12', for single wythe hollow concrete masonry walls, unless otherwise indicated.
 4. Place vertical reinforcement before grouting.
 - a. Place before or after laying masonry units, as required by job conditions.
 - b. Tie vertical reinforcement to dowels at base of masonry and secure at top and at intervals not exceeding 192 bar diameters nor 10'.
 - c. Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry laid and loosen before mortar sets.
 - d. After insertion of reinforcing bar, pull loops and bar to proper position and tie free ends.
 - e. Where reinforcement prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of size and spacing indicated.
 5. Place horizontal beam reinforcement as masonry units laid.
 6. Embed lateral tie reinforcement in mortar joints where indicated.
 - a. Place as masonry units laid, at vertical spacing shown.
 - b. Where lateral ties shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints.
 - c. Place as shown, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide min. No. 2 bars or 8 gage wire ties spaced 16" o.c. for members with 20" or less side dimensions, and 8" o.c. for members with side dimensions exceeding 20".
 7. Do not place grout until entire height of masonry attained sufficient strength to resist displacement of masonry units and breaking of mortar bond.
 - a. Install shores and bracing, if required, before starting grouting operations.
 - b. Place grout by pumping into grout spaces unless alternate methods are acceptable to Architect.
 8. Limit grout pours to sections which can be completed in one working day with max. one hour interruption of pouring operation.
 - a. Place grout in lifts which do not exceed 4'.
 - b. Allow min. 30 minutes, nor max. one hour between lifts of given pour.
 - c. Rod or vibrate each grout lift during pouring operation.
 - d. Place grout in lintels or beams over openings in one continuous pour.
 9. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1" of vertically reinforced cavities, during construction of masonry.
 10. When more than one pour required to complete given section of masonry, extend reinforcement beyond masonry as required for splicing.
 - a. Pour grout to within 1-1/2" of top course of first pour.
 - b. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting.
 - c. Repeat sequence if more pours are required.

END OF SECTION 04230

**SECTION 04818
GLASS UNIT MASONRY**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of glass unit masonry is indicated on drawings.
- B. Types of glass unit masonry installations in this Section include following:
 - 1. Interior fire rated glass panels.
- C. Steel frame for glass unit masonry specified in Division-5 section "Metal Fabrications".
- D. Non-reinforced brick and concrete unit masonry specified in Division-4 section "Unit Masonry".
- E. Reinforced brick and concrete unit masonry specified in Division-4 section "Reinforced Unit Masonry".
- F. Joint sealers specified in Division-7 section "Joint Sealers".

1.03 SUBMITTALS

- A. Product Data: Manufacturer's technical data for glass block, cementitious materials, waterproofing admixtures for mortar, and glass unit masonry accessories.
- B. Samples for Initial Selection Purposes: Submit following:
 - 1. Glass block for each form, pattern, and color indicated.
 - 2. Samples showing full range of mortar colors available.
- C. Samples for Verification Purposes:
 - 1. Sample panels consisting of 4 glass blocks with mortar joints of color indicated or selected by Architect.

1.04 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Where fire-resistance-rated glass unit masonry is indicated, provide materials and construction identical to those of window assemblies tested for fire endurance per ASTM E 163 and listed for rating indicated by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire Rating: UL-9 and UL-10b test resulting in following rating(s):
 - a. 45 min.; where indicated.
 - b. 60 min.; where indicated.
 - c. 90 min.; where indicated.
 - 2. Submit documentation verify rating of block.
- B. Field Constructed Mock-Ups:
 - 1. Erect the following mock-ups using materials indicated for final work.
 - a. Mock-up of typical exterior panel.
 - b. Mock-up of typical interior panel.
 - 2. Locate mock-ups on site in location indicated by Architect.
 - 3. Obtain Architect's acceptance of panels' visual qualities before start of glass unit masonry.
 - 4. Retain and maintain mock-ups in undisturbed condition during construction as standard for judging completed work.

- C. Single Source Responsibility: Obtain materials for glass unit masonry from single source for each type of material required.
 - D. Qualification for Welding Work:
 - 1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
 - 2. Provide certification that each welder employed in work qualified for welding processes involved by satisfactorily passing AWS qualification tests and, if applicable, by undergoing certification.
 - 3. Contractor's responsibility for retesting for recertification.
- 1.05 DELIVERY, STORAGE, AND HANDLING
- A. Protect glass block during storage and construction from damage, soiling and moisture.
 - B. Protect aggregate during storage and construction against wetting by rain, snow or ground water and against intermixture with earth or other materials.
 - C. Protect cementitious materials and metal accessories from, respectively, deterioration and corrosion by moisture and other causes.
 - 1. Store in dry location and in original packages.
- 1.06 PROJECT CONDITIONS
- A. Weather Limitations: Do not install glass unit masonry when atmospheric temperature 40°F (4°C) and falling.
- 1.07 SEQUENCING AND SCHEDULING
- A. Sequence and coordinate completion of glass unit masonry so that sealants and joint fillers installed immediately after mortar attained final set.
- 1.08 REFERENCED STANDARDS
- A. Comply with the following:
 - 1. ASTM A123 spec for zinc coatings on products fabricated from rolled, pressed and forged steel shapes, plates, bars, and strips.
 - 2. ASTM C144 specification for aggregate for masonry.
 - 3. ASTM C150 specification for portland cement.
 - 4. ASTM C207 Specification for lime.
 - 5. ASTM E163 Specification for fire test of window assemblies.
 - 6. ASTM C270 specification for mortar for unit masonry.

PART 2 - PRODUCTS

2.01 GLASS BLOCK

- A. Hollow Glass Block: Non-load bearing blocks made by fusing together two halves of clear, pressed glass to produce partial vacuum; with manufacturer's standard coating factory-applied on edge surfaces; complying with following requirements for pattern, size and other characteristics.
 - 1. Type: Type 2
 - 2. Glass Color: The architect shall select color from manufacturers standard colors of one of the following ranges:
 - a. Clear, Bronze, Gold or, Grey.
 - 3. Edge Coating Color: Comply with requirements indicated below:
 - a. Provide manufacturer's standard white color.
 - 4. Hollow Unit Sizes: Actual sizes indicated below:
 - a. 3-7/8" thick x 7-3/4" square.
 - 5. Corner Unit Sizes: Sizes to match specified designs or as indicated.

- B. Manufacturer/Pattern: Subject to compliance with requirements, provide glass block of one of following:
1. Euroglass Glassrep Corp. Saint Gobain pattern "Cloud"
 2. Glass Blocks Unlimited, Inc. pattern "Wave"
 3. Glashaus, Inc. "Weck" pattern "Nubio"
 4. New High Glass "Iperfan" pattern "DO"
 5. Solaris U.S.A. Westerwald AG pattern "W Flemish"
 6. Pittsburgh Corning Corp. pattern "Decora"

2.02 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I, color as follows:
1. Cement Color: White.
 2. Where joints indicated to be repointed, gray colored cement may be used for setting mortar.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregate for Mortar: ASTM C 144 and as follows:
1. For joints 1/4" or less in thickness provide aggregate graded for thin joints.
 2. For joints of hollow glass block with solar reflective pattern, provide aggregate free of iron compounds.
- D. Water: Drinkable, free of substances capable of having deleterious effect on mortar or glass unit masonry.
- E. Water-Repellent Admixture: Manufacturer's standard dry mixture of stearic water-repellent compounds, water reducing agents and fine aggregates intended to reduce capillarity in mortar.
1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Laticrete 8510 Admix", Laticrete International, Inc.
 - b. "Hydrocide Powder", Sonneborne Building Products.

2.03 GLASS UNIT MASONRY ACCESSORIES

- A. Panel (Joint) Reinforcement: Ladder-type welded wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', and complying with following requirements:
1. Hot-Dip Galvanized Steel Wire: ASTM A 82 for uncoated wire and ASTM A 153 for zinc coating applied by hot-dip process to products after fabrication and assembly.
 - a. Application: Use for reinforcement of exterior panels.
 2. Wire Size: 0.1483" diameter.
 3. Spacing of Side Rods: 2" center to center, unless otherwise indicated.
 4. Spacing of Cross Rods: Not more than 16" apart.
- B. Panel Anchors: Glass unit masonry manufacturer's standard perforated steel strips, 0.0359" uncoated thickness x 1-3/4" wide x 24" long, hot-dip galvanized after perforating to comply with ASTM A 153, Class B.
- C. Asphalt Emulsion: Water-based asphalt emulsion of type recommended by glass unit masonry manufacturer.
1. Products: Subject to compliance with requirements, provide Karnak 100 by Karnak Chemical Corp.
- D. Backer rod and sealant are specified in Division-7 section "Joint Sealers".
- E. Glass Fiber Expansion Strips: Glass fiber strips complying with requirements of glass block manufacturer, 3/8" thick x 24" long x width and color indicated below.
1. Width: 4" wide for panels with channel or chase construction.
 2. Width: 3" wide for panels with panel anchors.
 3. Color: White

- F. Dovetail Wire Ties: Trapezoidal-shaped ties of size indicated, fabricated from 3/16" steel wire complying with ASTM A 82 for uncoated wire and with ASTM A 641 for Class 3 zinc coating, attached to 0.0146" thick galvanized strap shaped to engage dovetail slot.
- G. Dovetail Slots: Fabricated from 0.0329" galvanized steel, with filler strips.
 - 1. For installation of dovetail slots furnished under this section see Division-3 concrete sections; advise Concrete Installer of specific requirements regarding placement of slots to support glass unit masonry work.
- H. Steel Column Anchors: Trapezoidal-shaped ties of size indicated, with anchors for welded attachment to steel columns, fabricated from 3/16" steel wire complying with ASTM A 82 for uncoated wire and with ASTM A 641 for Class 3 zinc coating.

2.04 MORTAR MIXES

- A. Do not lower freezing point of mortar by use of admixtures or anti-freeze agents; do not use calcium chloride.
- B. Mortar for Glass Unit Masonry: Comply with ASTM C 270, Proportion Specification, for Type S portland cement-lime mortar.
 - 1. For mortar in exterior panels, include waterproofing admixture in mortar mix according to directions of admixture manufacturer.
 - 2. For pointing mortar in exterior panels, include waterproofing admixture in mortar mix according to directions of admixture manufacturer.
- C. Colored-Pigmented Mortar:
 - 1. Select and proportion pigments with other ingredients to produce mortar color required.
 - 2. Do not exceed pigment-to-cement ratio of 1-to-10, by weight.
- D. Mix mortar in mechanical batch mixer to produce stiff but workable consistency drier than mortar for ordinary unit masonry; do not retemper mortar after initial set.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine sills, jambs and heads surrounding glass unit masonry panels to verify that they are complete and of correct size and location to receive glass unit masonry.
- B. Do not proceed with glass unit masonry work until conditions are satisfactory.

3.02 INSTALLATION

- A. Sill, Head and Jamb Preparation:
 - 1. Apply heavy coat of asphalt emulsion to sill; allow to dry before placing mortar.
 - 2. Adhere expansion strips to jambs and heads with gobs of asphalt emulsion, taking care to extend expansion strips to sill.
- B. Setting Glass Unit Masonry: Set first and succeeding courses of glass unit masonry with completely filled bed and head mortar joints, with no furrowing.
 - 1. Lay-up glass unit masonry plumb with courses level, accurately spaced and coordinated with other work; maintain joint widths indicated.
 - 2. Joint Widths: 1/4" unless otherwise indicated.
 - 3. Use rubber mallet to tap units into position; do not use steel tools and do not allow units to come into contact with metal accessories and frames.
 - 4. Use wedges in mortar joints of lower courses where needed to prevent mortar from being squeezed out of joints.
 - 5. Keep expansion joints free of mortar.

6. Rake out mortar from joints in exterior panels to uniform depth equal to joint width to accommodate pointing material.
 7. Fill raked joints and voids with pointing mortar, applying in layers; fully compact each layer and allow to become thumbprint hard before applying next layer.
 8. Tool exposed joints slightly concave using jointer larger than joint width; perform tooling while mortar still plastic and before final set.
 9. Remove wedges, if used, and fill voids with mortar.
 10. Remove surplus mortar from face of glass block at time joints tooled.
- C. Install panel reinforcing in horizontal joints at spacing indicated and to run continuously from end to end of panels, and to comply with the following requirements:
1. Vertical Spacing of Panel Reinforcing: As indicated below:
 - a. Max. 24" o.c. for units over 3-1/8" thick.
 - b. Max. 16" o.c. for units 3-1/8" thick.
 - c. As indicated on drawings.
 2. Do not bridge expansion joints with panel reinforcing.
 3. Place panel reinforcing in joints immediately above and below all openings within glass unit masonry panels.
 4. Lap panel reinforcing min. 6" where more than one length necessary.
 5. Embed panel reinforcing in mortar bed by placing lower half of mortar bed first, then pressing panel reinforcing into place and covering with upper half of mortar bed and then troweling smooth.
 6. Install panel anchors at locations indicated and in same horizontal joints where panel reinforcing occurs.
 - a. Extend panel anchors min. 12" into joints and bend within expansion joints at edges of panels.
 - b. Attach panel anchors as follows, to construction indicated.
 - 1) Existing Unit Masonry: Attach with 1/4" diameter steel expansion bolts, 2 per panel anchor.
 - 2) New Unit Masonry: Embed other end of panel anchor, after bending portion crossing expansion joint, in horizontal mortar joint closest in elevation to joint in glass unit masonry containing panel anchor.
 - 3) Steel Members: Attach by 1/4" diameter steel bolts in tapped holes or by welding per AWS D1.1 "Structural Welding Code".
 7. Install expansion strips at jambs, heads, mullions and other locations indicated.

3.03 CLEANING

- A. Clean glass unit masonry after mortar attained final set but before dried on block surfaces by use of scrub brush with stiff fiber bristles and damp cloth.
1. Do not use abrasive cleaners, steel wool or wire brush.

END OF SECTION 04818

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The extent of structural steel work is shown on the drawings, including schedules, notes and details to show size and location of members, typical connections and type of steel.
- B. Approval by the Owner or his representative of shop drawings prepared by the fabricator indicates the fabricator has correctly interpreted the contract requirements. Approval does not relieve the fabricator of the responsibility for accuracy of detailed dimensions on shop drawings nor the general fit-up of parts to be assembled in the field.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Work:

Miscellaneous Metal
Steel Joists

1.03 SUMMARY

- A. This Section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.
- B. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
- C. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.
- D. Refer to Division 3 for anchor rod installation in concrete, Division 4 for anchor rod installation in masonry.

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
 2. High-strength bolts (each type), including nuts and washers.
 3. Direct Tension Indicators if used.
 4. Unfinished bolts and nuts.
 5. Structural steel primer paint.
 6. Shrinkage-resistant grout.
- C. Shop drawings prepared under supervision of a licensed Structural Engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
 2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
 3. Submit shop drawings including complete details and schedule for fabrication and shop assembly of members, and details, schedules, procedures and diagrams, showing the sequence of erection.
 4. Contractor shall check, approve and stamp all shop drawings prior to submittals to Architect.
 5. The shop drawings shall be reviewed by Architect prior to fabrication. Architect's review is for design only. Contractor is responsible for dimensions, quantities, and coordination with other trades. Engineer's review and acceptance of shop drawings is subject to all contract requirements and does not authorize any changes involving additional cost to Owner.
 6. Include details of cuts, connections, splices, camber and holes. Indicate welds by standard AWS symbols, and show size, length and type of each weld.
 7. Provide setting drawings, templates, and directions for the installation of anchor bolts and anchorages to be installed by others.
 8. Shop drawings shall be made to conform to the design drawings. Contract drawings shall take precedence over Shop Drawings.
- D. Test reports conducted on shop- and field-bolted and welded connections. Include data on type(s) of tests conducted and test results.
- E. Certified copies of each survey conducted by a licensed Land Surveyor, showing elevations and locations of base plates and anchor bolts to receive structural steel and final elevations and locations for major members. Indicate discrepancies between actual installation and contract documents.
- 1.05 QUALITY ASSURANCE

A. Codes and Standards:

1. Comply with provisions of following, except as otherwise indicated:
2. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges."
3. AISC "Specifications for Structural Steel Buildings," including "Commentary."
4. "Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by the Research Council on Structural Connections.
5. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel."

6. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."
- B. Fabrication and Erection Qualifications:
1. Fabricator and erector must have a minimum of five years experience with a proven record of satisfactory work.
 2. Fabricator and erector must have had work of similar type of construction to be considered as "satisfactory work".
 3. The Architect shall be the sole judge as to whether the fabricator and erector satisfactorily meets these requirements.
 4. "Steel Fabricator" and "Steel Erector" shall be an organized steel company engaged in this type of work.
 5. If any fabricator or steel erector is doubtful as to whether he meets these requirements, he may submit information to the Architect at least 10 days before the bid opening in order to qualify.
- C. Qualifications for Welding Work:
1. Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.
 2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within the previous 12 months.
 3. If recertification of welders is required, retesting will be Contractor's responsibility and shall be at no cost to the Owner.
- D. Source Quality Control:
1. Materials and fabrication procedures are subject to inspection and tests in the mill, shop and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
 2. Remove and replace materials or fabricated components which do not comply.
- E. Design of Members and Connections:
1. All details are typical; similar details apply to similar conditions, unless otherwise indicated on the drawings. Verify dimensions at the site without causing delay in the work.
 2. Notify the Architect whenever design of members and connections for any portion of the structures is not indicated on the drawings or specified herein.
- 1.06 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and relubricate before use.

- D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.
- B. Structural Steel Wide Flange Shapes: ASTM A992 Grade 50.
- C. Other Structural Steel Shapes, Plates, and Bars: ASTM A36.
- D. Cold-Formed Steel Tubing: ASTM A500, Grade B, Grade 46.
- E. Steel Pipe: ASTM A53, Type E or S, Grade B.
 - 1. Finish: Black, except where indicated to be galvanized.
- F. Steel Castings: ASTM A27, Grade 65-35, medium-strength carbon steel.
- G. Anchor Rods: ASTM F1554, nonheaded type unless otherwise indicated.
- H. Unfinished Threaded Fasteners:
 - 1. ASTM A 307, Grade A, regular low-carbon steel bolts and nuts.
 - 2. Provide either hexagonal or square heads and nuts, except use only hexagonal units for exposed connections.
- I. High-Strength Threaded Fasteners:
 - 1. Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 - 2. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A 325.
 - 3. Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B 695, Class 50, or hot-dip galvanized complying with ASTM A 153.
- J. Direct Tension Indicators:
 - 1. ASTM F 959, type as required.
 - 2. Use on all A325 and A490 bolts.
- K. Electrodes for Welding: Comply with AWS Code.
- L. Structural Steel Primer Paint: SSPC - Paint 11.

M. Nonmetallic Shrinkage-Resistant Grout:

1. Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621.

2.02 FABRICATION

A. Shop Fabrication and Assembly:

1. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide parabolic camber in structural members where indicated.
2. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

B. Connections:

1. Weld or bolt shop connections, as indicated.
2. Provide high-strength threaded fasteners for all principal bolted connections, except unfinished bolts may be used for temporary bracing to facilitate erection. Bolts through 4" wide beam flanges shall be 5/8" diameter. Other bolts shall be 3/4" diameter.
3. Unless indicated or detailed otherwise on plans, all connections shall be detailed and designed by the fabricator under the direct supervision of a Professional Engineer, registered in the State of Georgia. Connections shall be designed as unrestrained flexible connections described as type 2 construction under Section A2 of the AISC Specifications for Structural Steel Buildings.
4. Except where otherwise detailed or specified on the contract drawings, all framed connections shall be detailed and designed by the fabricator in accordance with Part 4 of the AISC Manual of Steel Construction, 13th Edition dated 1989. Framed beam connections shall be capable of transmitting a minimum of fifty percent of total capacity of beam determined from the tables in Part 2 of AISC Manual of Steel Construction, 13th Edition for shape and span unless otherwise noted on the drawings.
5. Design calculations for the connections designed by the contractor shall be submitted for the files of the architect. Calculations shall bear the seal of a Professional Engineer registered in the State of Georgia. Shop drawings containing connections for which calculations have not been received will be returned unchecked as an incomplete submittals.
6. Connections shall be detailed and designed with provisions for eccentricities. Minimum connection capacity to be 10 kips unless otherwise noted on the drawings.

C. Bolt field connections, except where welded connections or other connections are indicated.

1. Provide high-strength threaded fasteners for all bolted connections.
2. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.

D. High-Strength Bolted Construction:

1. Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts."
2. All bolts shall have a hardened washer under the turning element.
3. Installation of direct tension indicator washers or direct tension indicator bolt systems shall be in accordance with manufacturer's instructions.

- E. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- F. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.
- G. Expansion Joints: Provide expansion joints in steel shelf angles when part of structural steel frame; locate at vertical brick expansion joints as indicated on drawings.
- H. Cooperation with Other Trades:
 - 1. Provide holes for securing other work to structural steel framing, and for the passage of other work through steel framing members, as shown on the final shop drawings. Provide threaded nut welded to framing, and other specialty items as shown to receive other work.
 - 2. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
 - 3. All loose plates, bolts and inserts between the structural steel and work of other trades are to be furnished by the fabricator and set by other trades.
 - 4. All loose lintels to be furnished by the fabricator and set by other trades.

2.03 SHOP PAINTING

- A. General:
 - 1. Shop-paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.
 - 2. Do not paint surfaces to be welded or high-strength bolted with friction-type connections.
 - 3. Do not paint surfaces scheduled to receive sprayed-on fireproofing.
 - 4. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
 - 1. SP-1 "Solvent Cleaning."
 - 2. SP-2 "Hand-Tool Cleaning."
 - 3. SP-3 "Power-Tool Cleaning."
 - 4. SP-6 "Commercial Blast Cleaning."
 - 5. SP-7 "Brush-Off Blast Cleaning."
- C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 2.0 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.
- D. Painting: Provide a two-coat, shop-applied paint system complying with Steel Structures Painting Council (SSPC) Paint System Guide No. 7.00.

2.04 SOURCE QUALITY CONTROL

- A. General:
 - 1. Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
 - 2. Promptly remove and replace materials or fabricated components that do not comply.
- B. Design of Members and Connections:
 - 1. Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.
 - 2. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 - EXECUTION

3.01 ERECTION

- A. General:
 - 1. Comply with AISC Specifications, AISC Code of Standard Practice, OSHA requirements, and as herein specified.
 - 2. All steel framing shall be considered non-self-supporting steel frames as defined by Article 7.9.3 of the AISC Code of Standard Practice dated September 1, 1986.
 - 3. Contractor shall provide all necessary temporary support until required connections or other interacting elements are complete.
- B. Surveys: Employ a licensed land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with Architect.
- C. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
- D. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.
- E. Setting Base Plates and Bearing Plates:
 - 1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
 - 2. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
 - 3. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

4. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
 5. For proprietary grout materials, comply with manufacturer's instructions.
- F. Field Assembly:
1. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 2. Level and plumb individual members of structure within specified AISC tolerances.
 3. Splice members only where indicated and accepted on shop drawings.
- G. Erection Bolts:
1. On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.
 2. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 3. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- H. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
- I. Touch-Up Painting:
1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
 2. Apply by brush or spray to provide minimum dry film thickness of 2.0 mils.
- 3.02 QUALITY CONTROL
- A. Engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
- B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
- C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- D. Testing agency may inspect structural steel at plant before shipment.
- E. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.
- F. Shop-Bolted Connections:
1. Inspect or test in accordance with AISC specifications.

2. Verify that gaps of installed Direct Tension Indicators are less than gaps specified in ASTM F 959, Table 2.
- G. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 2. Perform visual inspection of all welds.
 3. Perform tests of tension and moment resisting welds using one of the following procedures:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.
 - c. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
 - d. Ultrasonic Inspection: ASTM E 164.
- H. Field-Bolted Connections:
1. Inspect in accordance with AISC specifications.
 2. For Direct Tension Indicators, comply with requirements of ASTM F 959. Verify that gaps are less than gaps specified in Table 2.
- I. Field Welding: Inspect and test during erection of structural steel as follows:
1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 2. Perform visual inspection of all welds.
 3. Perform tests of tension and moment resisting welds using one of the following procedures:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.
 - c. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
 - d. Ultrasonic Inspection: ASTM E 164.

END OF SECTION 05120

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SECTION 05220

STEEL JOISTS

PART 1 - GENERAL

1.01 WORK INCLUDED

The extent of steel joists is shown on the drawings, including basic layout and type of joists.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Work:

Structural Steel
Miscellaneous Metal

1.03 SUMMARY

A. This Section includes steel joists and joist girders for floor and roof framing. Types of joists required include the following:

1. K-Series Open Web Steel Joists.
2. LH-Series Longspan Steel Joists.
3. DLH-Series Deep Longspan Steel Joists.
4. Joist Girders.

B. Refer to Division 3 Sections for installation of anchors set in concrete.

C. Refer to Division 4 Sections for installation of anchors set in masonry.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data and installation instructions for each type of joist and accessories.

1. Include manufacturer's certification that joists comply with SJI "Specifications."

C. Shop Drawings, Steel Joists:

1. Submit detailed drawings showing layout of joist units, special connections, jointing and accessories. Include the mark, number, type, location and spacing of joists and bridging.
2. Shop drawings shall be submitted by the Contractor to the Architect and review action received prior to fabrication. When corrections are required, copies shall be returned noting such corrections.

3. The Contractor shall be responsible for the checking of quantities and dimensions. Contract drawings receive precedence over shop drawings unless authorized otherwise in writing.
4. All connections including those made in the field shall be shown and detailed. Provide templates or location drawing for installation of anchor bolts.
5. Furnish complete design analysis of all joists with shop drawings.

1.05 QUALITY ASSURANCE

- A. General: Provide joists fabricated in compliance with Steel Joist Institute (SJI) "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with American Welding Society (AWS) "Structural Welding Code - Steel," AWS D1.1.
- C. Inspection: Inspect joists and girders in accordance with SJI "Specifications."

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle steel joists as recommended in SJI "Specifications." Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel: Comply with SJI "Specifications" for chord and web sections.
- B. Steel Bearing Plates: ASTM A 36.
- C. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon steel.
- D. Steel Prime Paint: Comply with SJI "Specifications."

2.02 FABRICATION

- A. General: Fabricate steel joists in accordance with SJI "Specification." All joists shall be designed by the joist manufacturer to support the total load-carrying capacity shown in the Steel Joist Institute tables for the joist depth, chord designations, and span length indicated on the contract drawings.
- B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.
- C. Extended End: Provide extended ends on joists where indicated, complying with SJI "Specifications" and load tables.
- D. Ceiling Extension: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord. Provide either an extended bottom chord element or a separate unit, to suit

manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.

- E. Top Chord Extension: Provide top chord extensions ("S" type) on joists where indicated, complying with SJI "Specifications" and load tables.
- F. Bridging: Provide horizontal or diagonal type bridging for joists and joist girders, complying with SJI "Specifications."
 - 1. Provide bridging anchors for ends of bridging lines terminating at walls or beams.
- G. End Anchorage: Provide end anchorages, including steel bearing plates, to secure joists to adjacent construction, complying with SJI "Specifications."
- H. Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.
- I. Shop Painting: Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint.
 - 1. Apply one shop coat of steel prime paint to joists and accessories, by spraying, dipping, or other method to provide a continuous dry paint film thickness of not less than 0.50 mil.
- J. Sloped Joists: Where roof joists slopes exceed 1/2" in 1'-0", joist manufacturer shall increase member sizes to include effects of increase and/or decrease in member loads and spans.
- K. Lateral Support:
 - 1. Joists shall be designed to receive lateral bracing only at locations and spacings specified for deck fasteners or for angle, channel bulb tee or other steel purlins or sub-purlins.
- L. Joists supporting roofs shall be designed for a net wind uplift of 20 lbs. per square foot. Provide additional lines of bridging as required by joist manufacturer.

PART 3 - EXECUTION

3.01 ERECTION

- A. Place and secure steel joists in accordance with SJI "Specifications," final shop drawings, and as herein specified.
- B. Anchors: Furnish anchor bolts, steel bearing plates, and other devices to be built into concrete and masonry construction.
 - 1. Provide unfinished threaded fasteners for anchor bolts, unless high strength bolts indicated.
- C. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.
- D. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction. Where "open-web" joist lengths are 40 feet and longer, install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines.

- E. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams. No pipes, ducts, conduits or any other mechanical or electrical component shall be suspended from joist bridging.
- F. Fastening Joists: Comply with the following:
 - 1. Field weld joists to supporting steel framework and steel bearing plates where indicated in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.
- G. Touch-Up Painting: After joist installation, wire brush welded areas, abraded or rusty surfaces, and clean with solvent. Paint field-applied bolt heads and nuts and prepared surfaces on joists and steel supporting members. Use same type of paint as used for shop painting.
- H. Mechanical Supports:
 - 1. To hang or bear equipment on the joists, all equipment loads shall be applied within 4" of a panel point at chord level with application equally divided between chord members.
 - 2. When load is over 4" from panel point, joist manufacturer shall provide additional reinforcement for load imposed.
 - 3. Contractor shall be responsible to provide joist manufacturer with location and magnitude of concentrated loads due to equipment. Joist manufacturer to indicate location loads and reinforcement on shop drawings.

END OF SECTION 05220

SECTION 05300
COMPOSITE ROOF DECK ASSEMBLY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work of this Section.
- B. Related Work Specified in other Sections Include:
 - 1. Structural Steel; Section 05120
 - 2. Section 05330 Structural Termination and Transition Assemblies.
 - 3. Pre-Engineered Light Gauge Steel Trussed Frames; Section 05450
 - 4. Asphalt Shingles, Section 07311.

1.02 SUMMARY

- A. Section includes all work and supplementary items required to complete the proper installation of the Composite Roof Deck assemblies, as indicated by the contract documents.
 - 1. The work of Section 05300, Composite Roof Deck Assembly and Section 05330, Structural Terminations and Transitions shall be designed, engineered, fabricated, and warranted by the same manufacturer.
 - 2. The work of Section 05300, Composite Roof Deck Assembly and Section 05330, Structural Terminations and Transitions shall be installed by the same contractor.

1.03 SYSTEM DESCRIPTION

- A. Composite Roof Deck Assembly: The structurally engineered and tested roof deck assemblies shall consist of fluted rib-pattern steel sections, each with its protective coating(s), as specified; rigid thermal insulation panels; high-density, fire-resistant roofing substrate panels; special screw fasteners, joint reinforcement tape, compression devices, and termination and transition members, to be assembled on the jobsite in accordance with the project plans, specifications, and manufacturer's recommendations.

1.04 ENGINEERED STRUCTURAL REQUIREMENTS

- A. Gravity Load Requirements: Submit engineering calculations establishing the gravity load carrying capacity and deflection properties of the specified structural roof deck assembly to include steel deck sheet, mineral board, and optional insulation. Individual component performance calculations are not acceptable.
- B. Diaphragm Load Requirements: Submit engineering calculations establishing the shear strength of the specified structural roof deck assembly to include steel deck sheet, mineral board, and optional insulation. Submit assembly tests establishing the assembly's performance under shear loads. Individual component performance or certification is not acceptable.
- C. Wind Uplift Requirements: Submit engineering calculations and/or assembly testing of the wind uplift performance of the specified structural roof deck assembly establishing ASCE-7 and IBC compliance. Testing must include steel deck section, mineral board, optional insulation and roof specified roof coverings. Individual component performance or certification is not acceptable.
- D. Combined Loading Performance: Submit engineering calculations and/or testing that establishes the combined shear and uplift loading capacity of the assembly and the attachment devices and patterns of attachment that achieve the required combined loading in each roof area of the project per SDI recommendations.
- E. Roof Covering Requirements: Submit a sealed statement from a structural engineer licensed in the state of the project certifying the specified roof covering has been tested with the specified structural roof deck assembly in compliance with both the wind load requirements of IBC Chapters 15 and 16 and the wind load requirements of the project.

1.05 THERMAL REQUIREMENTS:

- A. Submit manufacturer's certification of the thermal resistance value of each specified structural roof deck assembly and design details which eliminate all through joints from the steel section's surface to the top of the assembly. No through joints in the insulation medium will be allowed.

1.06 NAILABLE SUBSTRATE REQUIREMENTS:

- A. The specified roof substrate assembly shall have two layers of high-density roofing substrate board on the exposed top surface to effect a nailable substrate. Material which provides the nailable substrate shall be inorganic and non-combustible. Wood substrates will not be allowed. The high-density roofing substrate boards shall be listed in the appropriate U.L. Directory showing that both the board and the specified roof substrate assembly have been tested and listed by U.L. as a nailable substrate.

1.07 FIRE RESISTANCE REQUIREMENTS:

- A. Submit manufacturer's certification establishing the fire acceptability, hourly fire resistance and/or building code compliance of the specified structural roof deck assemblies, as appropriate. Submission and/or substitution of individual component tests is not acceptable.

1.08 CODES AND STANDARDS

- A. The work described in this Section, unless otherwise noted on the drawings, or herein specified, shall be governed by the following codes and specifications.
 1. Underwriters Laboratories, Inc. - U.L.
 2. Factory Mutual Research Corporation - FM.
 3. International Building Code - IBC.
 4. Steel Deck Institute - SDI.
 5. American Society for Testing and Materials - ASTM.
 6. American Institute of Steel Construction - AISC.
 7. American Iron and Steel Institute - AISI.
 8. American Society of Civil Engineers – ASCE.
 9. System Manufacturer Diaphragm Design Manual - DDM.

1.09 SUBMITTALS

- A. Product Data:
 1. Submit manufacturer's specifications and installation instructions for each type of decking and accessories.
 2. Include manufacturer's certification as required to show compliance with these specifications.
- B. Assembly Data: Submit complete, exact and specific design data for each specified structural roof deck assembly as follows:
 1. Submit all engineering calculations, drawings and certifications by a structural engineer, licensed in the state of the project. Manufactured Roof Panels.
 2. Submit manufacturer's specifications.
 3. Submit attachment patterns and devices for the attachment of steel sections that comply with combined loading requirements.
 4. Submit design details confirming the roofing substrate shall have no more than 33 linear feet of joints per 100 sq.ft. of surface area.
 5. Submit design details establishing the stabilization of both side and end joints against differential vertical deflection under concentrated loads.
 6. Submit design details describing the method used to seal all roofing substrate joints with a weather-resistant covering.
 7. Submit design details establishing the roofing substrate's attachment pattern which resists gravity loads, wind uplift forces, seismic and horizontal forces as well as movement due to thermal instability.
 8. Submit design details establishing the elimination of air passages and thermal gaps in all directions between all layers of materials.
 9. Submit installation sequences and instructions for the roof deck assembly.

- C. Component Data:
 - 1. Manufacturer's component data shall be clearly and specifically marked to indicate each component's use in the specific structural roof deck assembly intended for approval.
 - 2. Manufacturer's component data submitted unmarked or unclear as to its exact intended use in the specific structural roof deck assembly shall be returned unreviewed to the submitter.
- D. Shop Drawings: Submit complete shop drawings, including erection sequences, procedures, weld requirements, schedules and complete details.
 - 1. Submit detailed drawings showing layout and types of deck panels, anchorage details, edge conditions, and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories.
 - 2. Submit shop drawings, including erection sequences, procedures, weld requirements, schedules and complete details.
 - 3. Shop drawings in form of reproducibles of Contract Drawings prohibited.
 - 4. Any fabrication of material prior to the approval of drawings shall be at the risk of the contractor.

1.10 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes and standards, except as otherwise indicated or specified:
 - 1. AISI "Specification for the Design of Cold-Formed Steel Structural Members".
 - 2. AWS D1.3 "Structural Welding Code - Sheet Steel".
 - 3. SDI "Design Manual for Floor Decks and Roof Decks".
- B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS D1.1.
- C. FM Listing: Provide metal roof deck units evaluated by Factory Mutual System and listed in "Factory Mutual Approved Guide" for "Class I" fire rated construction.
- D. Manufacturer Qualifications: All components for the specified composite roof deck assembly covered under this section shall be provided by a single manufacturer, unless otherwise specified.
 - 1. Manufacturer shall submit evidence of having not less than ten (10) years successful history in the design, installation and use of the specified composite roof deck assembly.
- E. Installer Qualifications:
 - 1. The subcontractor shall be licensed by the manufacturer.
 - 2. The subcontractor shall submit evidence of skill and not less than three (3) years specialized experience with the specified composite roof deck assembly.
- F. Documentation shall be submitted on the letterhead and under the seal of a structural engineer licensed in the state the project is located certifying the compliance of all assemblies (roof deck, termination and transition assemblies specified in Section 05330 and the roof covering) with the above specification paragraphs and their compliance with Chapters 15 and 16 of applicable edition of the International Building Code. Documentation shall also include a copy of the manufacturer's warranty. Incomplete submissions or those not fully certified by a licensed structural engineer shall be rejected.
- G. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- H. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.11 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products in exact accordance with the manufacturer's latest published requirements and specifications.

1.12 PERFORMANCE WARRANTY

- A. Upon completion of the work described in this section, the manufacturer shall provide in one document a ten (10) year roof deck warranty, executed jointly by the manufacturer and the subcontractor. The limited performance warranty coverage shall include uniform load carrying capacity, diaphragm performance, wind uplift performance and the suitability of the specified structural roof deck assemblies to function as a roofing substrate. Coverage shall include the structural roof deck specified in this section and termination and transition assemblies specified in Section 05330. The roof membrane shall be insured for a minimum aggregate of \$3,000,000 against non-performance of suitability.
- B. Upon completion of the work described in this section, the manufacturer shall provide to the owner's representative an owner's manual describing the specified structural roof deck assemblies installed on each area of the project. The manual shall include cross-sectional drawings and details illustrating the construction of the roof deck assembly installed as well as recommendations for maintenance, repair and re-roofing operations.

PART 2 - PRODUCTS

2.01 ASSEMBLY REFERENCE STANDARDS

- A. Assembly shall comply with following referenced standards:
 - 1. FM 4450 - Approval standards for Class I insulated steel deck roofs.
 - 2. FM 4470 - Approval standards for Class I roof covers.
 - 3. IBC 2006 - 2006 International Building Code.
 - 4. SDI-DDM03 - Steel Deck Institute Diaphragm Design Manual, Third Edition
 - 5. UL 263 - Safety Standard for Fire Test of Building Construction and Materials.
 - 6. UL 580 - Safety Standard for Test for Wind Uplift Resistance of Roof Assemblies.
 - 7. UL 1256 - Safety Standard for Fire Test of Roof Deck Construction
 - 8. UL 1897 - Safety Standard for Uplift Tests for Roof Covering Systems.
 - 9. ASCE 7-05 - Minimum design loads for buildings and other structures.

2.02 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. The Structural roof deck assembly shall provide the following performance characteristics:
 - 1. Application #1-Roof System over Interior Spaces (Lobby, Corridor and other similar spaces):
 - a. Loadmaster: Heavy Duty (25 ga.) I-320 LTTR Insulated Nailable Roof Deck Assembly.
 - b. Uniform Total Load Capacity 121 psf @ 4'-0" o.c.
 - c. Thermal Resistance Value R = 20.10 (Summer LTTR)
 - d. Assembly Thickness: 5.2 inches
 - e. Assembly Weight: 5.8 psf
 - f. Fire Classification: Non-Combustible Structural Component
 - g. Substrate Compressive Strength: 400 psi
 - h. Nailable Substrate: Yes
 - i. Wind Uplift Rating: U.L. Class 90
 - j. Factory Mutual Classification: FM Class 1
 - k. Assembly Performance Warranty: Ten (10) Year Limited Performance Warranty

2. Application #2-Roof System over Exterior Spaces (Gymnasium, Lunchroom and Courtyard Canopies):
 - a. Loadmaster: Heavy Duty (25 ga.) Basic Nailable Roof Deck Assembly.
 - b. Uniform Total Load Capacity 121 psf @ 4'-0" o.c.
 - c. Thermal Resistance Value R = 0.90 (Summer LTTR)
 - d. Assembly Thickness: 2.0 inches
 - e. Assembly Weight: 5.2 psf
 - f. Fire Classification: Non-Combustible Structural Component
 - g. Substrate Compressive Strength: 400 psi
 - h. Nailable Substrate: Yes
 - i. Wind Uplift Rating: U.L. Class 90
 - j. Factory Mutual Classification: FM Class 1
 - k. Assembly Performance Warranty: Ten (10) Year Limited Performance Warranty

3. Structural Performance Requirements: Applications #1 and #2 above to comply with the following minimum requirements:

	Required Wind Up-Lift Pressure (psf)	Required Shear Load (psf)	Gravity Load Capacity (psf)
Zone 1 (field)	30	250	Greater than 50
Zone 2 (perimeter)	43	250	Greater than 50
Zone 3 (corner)	66	250	Greater than 50
Zone 2OH	56	250	Greater than 50
Zone 2OH	93	250	Greater than 50

2.03 COMPONENTS

- A. Steel sections shall be roll-formed cold steel, having a minimum yield strength (virgin steel) 80,000 psi with a white primer over a G-60 galvanized coating. The configuration and physical properties of the section shall conform to those established for the manufacturer's steel sections designated. Steel sections shall be installed in continuous lengths. However, the minimum length shall not be less than a two-span condition.

- B. Fasteners: Provide manufacturer's recommended fasteners at spacing required to meet design loads and as follows:
 1. Fasteners for the steel sections shall be either special screw fasteners, power driven pins, arc spot welds, or plug welds through special weld washers. Side lap connectors shall be special side lap (stitch) screw fasteners as required for diaphragm design.
 2. Fasteners for the high-density roofing substrate board shall be corrosion-resistant, Phillips bugle-head, self-driving, case-hardened screws with modified buttress threads for increased resistance to back out forces. Minimum corrosion resistance shall be passage of DIN 51008 (2.0 liters sulphur dioxide) for 40 cycles with less than 15% red rust and ASTM B117 salt spray for 750 hours or more.

- C. Roof Deck Insulation: Thermal insulation shall be U.L. Rated, Isocyanurate foam-type rigid plastic insulation, having an Underwriters Laboratories Flame Spread Rating of 35 or less. Material shall be furnished in 4' x 8' panels and in the thickness designated for assembly I-320 LTTR to achieve an overall "U" Factor of 0.03 BTU/hour/square foot/degree difference in temperature through the roof deck assembly based on summer (heat flow down) conditions.

- D. Nailable Substrate: The high-density roofing substrate board shall be a fire-resistant, weather-resistant, fiberglass-reinforced mineral core board with a minimum density of 48 lbs./c.f. and a minimum compressive strength of 400 psi. The substrate boards shall be 1/2" thick, 4'-0" in width and 12'-6" in length. The long edges of the boards shall be a V-type tongue-and-groove configuration with the ends being square cut. Guide markings shall be clearly printed on the top surface of each board to facilitate proper location and spacing of the screw fasteners. In addition, the boards shall bear the manufacturer's label.

- E. Compression discs shall be 1-1/4" hexagonal-shaped discs formed from G-90 galvanized iron or Galvalume steel.
- F. Roof Deck Plats: Roof deck plates shall be nominal 3" square plates formed from G-90 galvanized iron or Galvalume steel.
- G. Roofing Underlayment shall be a 40 mil thick, peel and stick, SBS (styrene butidyene styrene) modified, rubberized asphalt sheet waterproofing underlayment. With an internally reinforced non-woven polyester fabric, Roofing Underlayment shall have a white reflective topping for added foot safety as well as heat reduction on the deck and protection against short term Ultra Violet damage. A removable release film shall be on the membrane under side for ease of application.
- H. Joint Reinforcement Tape: Joint Reinforcement Tape shall be a weather-resistant, pressure-sensitive tape.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Visually examine and verify that the surfaces of the structure which will receive the engineered roof deck assembly have no apparent defects or errors which would result in substandard workmanship. Additionally, the following items, furnished and installed by others, shall be inspected for compliance prior to installation of the roof deck assembly.
- B. Structural Steel / Bar Joists
 - 1. All structural steel framing has been fabricated and erected in accordance with the following documents:
 - a. AISC Code of Standard Practice.
 - b. Steel Joist Institute(SJI) Code of Standard Practice
 - c. Steel Deck Institute (SDI) Code of Standard Practice
 - d. Division 5 project specifications herein.
 - 2. Where required, all shear collectors and continuous termination/transition plates, to be furnished by others, have been installed per the approved design of the engineer of record.
 - 3. All support framing for roof deck assembly shall have top chord/flange surfaces structurally designed and oriented to provide proper deck bearing surfaces in accordance with Steel Deck Institute recommendations. Special attention should be given to deck bearing surfaces which support deck sections that cannot be end lapped or common framing that supports a change in deck direction.
- C. Cold-Formed Steel Framing
 - 1. All Structural Cold Formed framing has been fabricated and erected in accordance with the following documents:
 - a. AISI Standard S200--Cold Formed Steel Framing--General Provisions
 - b. AISI Standard S210--Cold-Formed Steel Framing--Floor and Roof System Design
 - c. AISI Standard S214--Cold-Formed Steel Framing--Truss Design.
 - d. AISI Code of Standard Practice.
 - e. Steel Deck Institute(SDI) Code of Standard Practice
 - 2. Where required, all shear collectors and continuous termination/transition plates, to be furnished by others, have been installed per the approved design of the engineer of record.
 - 3. All support framing for roof deck assembly shall have top chord/flange surfaces structurally designed and oriented to provide proper deck bearing surfaces in accordance with Steel Deck Institute recommendations. Special attention should be given to deck bearing surfaces which support deck sections that cannot be end lapped or common framing that supports a change in deck direction.
 - 4. On steel support framing in excess of 5'-0" on center, all hips and valleys shall have continuous structural support provided by the cold-formed framing contractor/supplier.
 - 5. All top chord/flange deck bearing members shall be a minimum of 18 gage to comply with structural performance criteria indicated.
 - 6. Roof Penetrations and Support Curbs
 - 7. Where required, all structural steel curbs, roof penetrations and related support framing have been installed in accordance with contract documents and the above referenced documents.
- D. Report any unsatisfactory conditions to the Architect.

3.02 PREPARATION

- A. Structural Adequacy: Contractor shall prepare the structure to insure proper and adequate structural support for the materials specified

3.03 INSTALLATION:

- A. Install composite roof deck assembly and assembly components in strict compliance with manufacture's written recommendations.
 - 1. Installation sequence and instructions to be furnished by the Composite Roof Deck System manufacturer as part of shop drawing submittals.
- B. Install treated lumber as necessary to meet assembly design requirements. Treated lumber shall be completely isolated from any direct contact with steel products by using 40 mil asphaltic waterproof membrane or an equal product. Steel anchors in contact with such lumber must be stainless steel.

3.04 DECK INSTALLATION

- A. General: Install decking in accordance with manufacturer's written recommendation and as indicated below. If conflicts exist between the requirements contained herein and the manufacturer's written recommendations the more stringent requirement shall govern.
 - 1. Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein.
 - 2. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened.
 - 3. Do not stretch or contract side lap interlocks.
 - 4. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.
 - 5. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
 - 6. Do not place deck units on concrete supporting structure until concrete cured and dry.
 - 7. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
 - 8. Do not use deck units for storage or working platforms until permanently secured.
- B. Steel Sections shall be placed with the side lap configurations facing upwards and with the corrugation ribs at a true right angle to the structural supports.
 - 1. The side lap configuration shall be fully nested to maintain a straight alignment of the sections.
 - 2. Where appropriate, end laps shall be a minimum of 3" and shall always occur over the top flange of a structural support.
 - 3. At each structural support, install steel section fasteners located as needed to meet the requirements specified above, Assembly Performance Requirements.
 - 4. A minimum of 1 side lap connector shall be installed spaced at a maximum of 3'-0" o.c. in each nested steel section sidelap between adjacent structural supports.
 - 5. Additional fasteners, if required for diaphragm action, shall be indicated on the structural drawings.
- C. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.
- D. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.
- E. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units, except where taped joints required.
- F. Shear Connectors:
 - 1. Weld shear connectors to supports through decking units in accordance with manufacturers instructions.
 - 2. Do not weld shear connectors through two layers (lapped ends) of decking units.
 - 3. Weld only on clean, dry deck surfaces.

- G. Closure Strips:
 - 1. Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction.
 - 2. Weld into position to provide complete decking installation.
 - 3. Provide flexible closure strips instead of metal closures, at Contractor's option, wherever use ensures complete closure.
 - a. Install with adhesive in accordance with manufacturer's instructions.
- H. Touch-Up Painting:
 - 1. After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.
 - 2. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
 - 3. Touch-up painted surfaces with same type of shop paint used on adjacent surfaces.
 - 4. In areas where shop-painted surfaces exposed, apply touch-up paint to blend into adjacent surfaces.

3.05 CLEANING

- A. Cleaning: Upon completion of the installation, broom clean the surface of all construction debris.

3.06 FINAL INSPECTION

- A. Final Inspection: Prior to the application of the roof covering, inspect completed portions of the Roof Deck Assembly and correct any deficiencies and/or damage to the surface.

END OF SECTION 05300

SECTION 05310

STEEL DECK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes steel deck units for floor and roof applications.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data including manufacturer's specifications and installation instructions for each type of decking and accessories.
 - a. Provide test data for mechanical fasteners used in lieu of welding for fastening deck to supporting structures.
 - 2. Shop drawings showing layout and types of deck units, anchorage details, and conditions requiring closure strips, supplementary framing, sump pans, cant strips, cut openings, special jointing, and other accessories.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated:
 - 1. American Iron and Steel Institute (AISI), "Specification for the Design of Cold-Formed Steel Structural Members."
 - 2. American Welding Society (AWS), D1.3 "Structural Welding Code - Sheet Steel."
 - 3. Steel Deck Institute (SDI), "Design Manual for Composite Decks, Form Decks and Roof Decks."
- B. Qualification of Field Welding: Use qualified welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS.
 - 1. Welded decking in place is subject to inspection and testing. Owner will bear expense of removing and replacing portions of decking for testing purposes if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.
- C. Underwriters' Label: Provide metal floor deck units listed in Underwriters' Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.

- D. FM Listing: Provide steel roof deck units that have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for "Class I" fire-rated construction.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel for Painted Metal Deck Units: ASTM A 611, grade as required to comply with SDI specifications.
- B. Steel for Galvanized Metal Deck Units: ASTM A 446, grade as required to comply with SDI specifications.
- C. Miscellaneous Steel Shapes: ASTM A 36.
- D. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.
- E. Galvanizing: ASTM A 525, G90.
- F. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.
- G. Paint: Manufacturer's baked-on, rust-inhibitive paint, for application to metal surfaces that have been chemically cleaned and phosphate chemical treated.
- H. Flexible Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.
- I. Acoustic Sound Barrier Closures: Manufacturer's standard mineral fiber closures.

2.02 FABRICATION

- A. General: Form deck units in lengths to span three or more supports, with flush, telescoped, or nested 2-inch laps at ends and interlocking or nested side laps, of metal thickness, depth, and width as indicated.
- B. Roof Deck Units: Provide deck configurations that comply with SDI "Specifications and Commentary for Steel Roof Deck."
- C. Non-Composite Steel Form Deck: Provide fluted sections of metal deck as permanent forms for reinforced concrete slabs.
- D. Metal Cover Plates: Fabricate metal cover plates for end-abutting floor deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 6 inches wide.
- E. Metal Closure Strips: Fabricate metal closure strips, for cell raceways and openings between decking and other construction, of not less than 0.045-inch min. (18 gage) sheet steel. Form to provide tight-fitting closures at open ends of cells or flutes and sides of decking.

- F. Roof Sump Pans: Fabricate from single piece of 0.071-inch min. (14 gage) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3 inches wide. Recess pans not less than 1-1/2 inches below roof deck surface unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field by others.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install deck units and accessories in accordance with manufacturer's recommendations, shop drawings, and as specified herein.
- B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
- C. Align deck units for entire length of run of cells and with close alignment between cells at ends of abutting units.
- D. Place deck units flat and square, secured to adjacent framing without warp or deflection.
- E. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
- F. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- G. Do not use floor deck units for storage or working platforms until permanently secured.
- H. Fastening Deck Units:
 - 1. Fasten floor deck units to steel supporting members by nominal 5/8- inch puddle welds or elongated welds of equal strength, spaced not more than 12 inches o.c. with a minimum of two welds per unit at each support.
 - 2. Tack weld or use self-tapping No. 8 or larger machine screws at 4 feet o.c. for fastening end closures.
 - 3. Fasten roof deck units to steel supporting members by not less than 5/8-inch-diameter puddle welds or elongated welds of equal strength, spaced not more than 12 inches at every support, and at 6" at perimeter of roof and mechanical openings. In addition, secure deck to each supporting member in ribs where side laps occur.
 - 4. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
 - a. Use welding washers where recommended by deck manufacturer.
 - 5. Mechanical fasteners, either powder-actuated or pneumatically driven, may be used in lieu of welding. Locate mechanical fasteners and install in accordance with deck manufacturer's instructions.
 - 6. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 45 lbs. psf at eave overhang and 30 lbs. psf for other roof areas.
 - a. Keep the interiors of cells that will be used as raceways free of welds having sharp points or edges.

- I. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.
- J. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.
- K. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units, except where taped joints are required.
- L. Roof Sump Pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12 inches o.c. with at least one weld at each corner.
- M. Closure Strips:
 - 1. Provide metal closure strips at open uncovered ends and edges of roof decking and in voids between decking and other construction. Weld into position to provide a complete decking installation.
 - 2. Provide flexible closure strips instead of metal closures, at Contractor's option, wherever their use will ensure complete closure. Install with adhesive in accordance with manufacturer's instructions.
- N. Touch-Up Painting: After decking installation, wire brush, clean, and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members.
 - 1. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
 - 2. Touch-up painted surfaces with same type of shop paint used on adjacent surfaces.
- O. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.
- P. Touch-Up Painting: Cleaning and touch-up painting of field welds, abraded areas, and rust spots, as required after erection and before proceeding with field painting, is included in Division 9 under "Painting."

END OF SECTION 05310

SECTION 05330
COMPOSITE ROOF DECK TERMINATIONS AND TRANSITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work of this Section.
- B. Related Work Specified in other Sections Include:
 - 1. Structural Steel; Section 05120
 - 2. Section 05300 Composite Roof Deck Assembly.
 - 3. Pre-Engineered Light Gauge Steel Trussed Frames; Section 05450
 - 4. Asphalt Shingles, Section 07311.

1.02 SUMMARY

- A. Section includes all work and related items required to complete the proper installation of the Structural Roof Deck Terminations and Transitions as herein specified and as indicated by the contract documents.
 - 1. The work of Section 05330, Structural Terminations and Transitions and Section 05300, Composite Roof Deck Assembly shall be designed, engineered, fabricated, and warranted by the same manufacturer.
 - 2. The work of Section 05330, Structural Terminations and Transitions and Section 05300, Composite Roof Deck Assembly shall be installed by the same contractor.

1.03 ASSEMBLY DESCRIPTION

- A. Structural Termination & Transition Assemblies: The structurally engineered assemblies shall consist of cold rolled galvanized sheet steel components or hot rolled galvanized steel shapes where appropriate. Where used, pressure treated wood blocking shall be isolated with a minimum 40 mil asphaltic peel and stick isolation membranes to avoid direct contact between steel components and wood blocking. Also, all screw attachments into wood shall be with stainless steel screws. All other screw fasteners are to be galvanized. All assemblies are to be assembled on the jobsite in accordance with the project plans, specifications, and manufacturer's recommendations.

1.04 STRUCTURAL REQUIREMENTS

- A. Gravity Load Requirements: Submit engineering calculations establishing the gravity load carrying capacity and deflection properties of the termination and transition assemblies. Special care shall be taken with valley and hip assemblies which provide structural support for areas of the roof assembly.
- B. Diaphragm Load Requirements: Submit engineering calculations establishing the strength of each termination and transition assembly to act as a shear collector where appropriate. Assemblies must transmit the specified shear from the roof deck assembly to the appropriate shear resisting element in accordance with the structural design of the project. Engineering calculations for attachments shall be based on SDI recommendations for combined loading of shear and uplift pressures as required on each individual roof area.
- C. Wind Uplift Requirements: Submit engineering calculations of the wind uplift performance of each termination and transition assembly establishing building code compliance per ASCE-7 wind pressure loadings for Components and Cladding and the project requirements. Special care shall be taken computing gravity, uplift and shear loads for valley and hip assemblies which act as structural support members for the roof assembly. Attachments shall be engineered for combined uplift and shear loading in accordance with SDI recommendations.

1.05 CODES AND STANDARDS

- A. The work described in this Section, unless otherwise noted on the drawings, or herein specified, shall be governed by the following codes and specifications.
 - 1. Underwriters Laboratories, Inc. - U.L.
 - 2. Factory Mutual Research Corporation - FM.
 - 3. International Building Code - IBC.
 - 4. Steel Deck Institute - SDI.
 - 5. American Society for Testing and Materials - ASTM.
 - 6. American Institute of Steel Construction - AISC.
 - 7. American Iron and Steel Institute - AISI.
 - 8. American Society of Civil Engineers – ASCE.
 - 9. System Manufacturer Diaphragm Design Manual - DDM.

1.06 SUBMITTALS

- A. Assembly Data: Submit complete, exact and specific design data for each specified termination and transition assembly as follows:
 - 1. Submit all engineering calculations, drawings and certifications.
 - 2. Submit manufacturer's specifications.
 - 3. Submit attachment patterns and devices for the attachment of steel sections that comply with combined loading requirements of SDI.
- B. Component Data: Manufacturer's component data shall be clearly and specifically marked to indicate each component's use in the specific structural assembly intended for approval.
 - 1. Manufacturer's component data submitted unmarked or unclear as to its exact intended use in the specific structural assembly shall be returned unreviewed to the submitter.
- C. Shop Drawings: Shop drawings, including erection sequences, procedures, attachment types and patterns, schedules and complete details, shall be submitted to the architect and structural engineer for approval. Any fabrication of material prior to the approval of drawings shall be at the risk of the contractor.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All components covered under this section and for the Composite Roof Deck Assembly specified in Section 05300 shall be provided by a single manufacturer, unless otherwise specified.
- B. Subcontractor/Installer:
 - 1. The subcontractor shall be licensed by the manufacturer.
 - 2. The subcontractor shall submit evidence of skill and not less than three (3) years specialized experience with the specified structural roof deck assembly and structural termination and transitions.
- C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- D. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products in exact accordance with the manufacturer's latest published requirements and specifications.

1.09 PERFORMANCE WARRANTY

- A. Upon completion of the work described in this section, the manufacturer shall provide in one document a ten (10) year roof deck limited warranty, executed jointly by the manufacturer and the subcontractor. The limited performance warranty coverage shall include uniform load carrying capacity, diaphragm performance, wind uplift performance and the suitability of the specified structural roof deck assemblies to function as a roofing substrate. Coverage shall include the termination and transition assemblies specified in this section and Composite Roof Deck specified in Section 05300. The roof membrane shall be insured for a minimum aggregate of \$3,000,000 against non-performance of suitability.
- B. Upon completion of the work described in this section, the manufacturer shall provide to the owner's representative an owner's manual describing the specified structural roof deck assemblies installed on each area of the project. The manual shall include cross-sectional drawings and details illustrating the construction of the roof deck assembly installed as well as recommendations for maintenance, repair and re-roofing operations.

PART 2 - PRODUCTS

2.01 ASSEMBLY REFERENCE STANDARDS

- A. Assembly shall comply with following referenced standards:
 1. ASCE 7-05 - Minimum design loads for buildings and other structures.
 2. FM 4450 - Approval standards for Class I insulated steel deck roofs.
 3. FM 4470 - Approval standards for Class I roof covers.
 4. IBC 2006 - 2006 International Building Code.
 5. SDI-DDM03 - Steel Deck Institute Diaphragm Design Manual, Third Edition
 6. UL 263 - Safety Standard for Fire Test of Building Construction and Materials.
 7. UL 580 - Safety Standard for Test for Wind Uplift Resistance of Roof Assemblies.
 8. UL 1256 - Safety Standard for Fire Test of Roof Deck Construction
 9. UL 1897 - Safety Standard for Uplift Tests for Roof Covering Systems.
 10. ASCE 7-05 - Minimum design loads for buildings and other structures.

2.02 ASSEMBLY PERFORMANCE STANDARDS:

- A. Structural Terminator system shall comply with the following performance criteria:

	Required Wind Up-Lift Pressure (psf)	Required Shear Load (psf)	Gravity Load Capacity (psf)
Terminations	93	250	Greater than 50
Transitions	93	250	Greater than 50

2.03 STRUCTURAL TERMINATION AND TRANSITION ASSEMBLIES:

- A. Structural Self-supporting and Supported Assemblies: Self-supporting assemblies shall be designed to act as flexural members that resist concentrated and uniform positive and negative loading and shear loading. Supported assemblies shall have uniform support, designed and furnished by others. Where possible, both self-supporting and supported assemblies shall be designed to transfer diaphragm shear to their immediate supports and to shear collectors as provided by others.

- B. Termination Assemblies:
1. Edges, Eaves and Rakes: All termination assemblies shall provide flanges or wood blocking for screw attachment of sheet metal flashings and trim. The vertical web in all eave or rake assemblies shall be plumb. Termination assemblies may transfer design diaphragm shear to the supporting purlin when the purlin cantilever over the shear wall does not exceed 12 inches or to shear collectors provided by others. Self-supporting termination assemblies shall be designed for positive and negative loads and shear loading as follows:
 2. Positive load designs shall be 300 lbs concentrated load or a 200 lb. concentrated load plus a 25 lb/lf uniform gutter load, whichever is more critical. Deflection shall be limited to L/180.
 3. Negative uniform loads shall be those established for Zones 1, 2 and 3 of the roof deck area per ASCE 7 as appropriate. Tributary area shall be 6 inches wide and negative load deflection limits shall be limited to L/180.
 4. Shear load designs shall be as required by the structural drawings and as specified herein.
 5. Parapet Walls: Termination assemblies at parapet walls shall be designed and detailed to provide independent movement of the steel deck with respect to the parapet wall. Assemblies shall form two intersecting planes ready for the application of roofing underlayment at the transition point. Self-supporting assemblies at parapet walls shall be designed for positive, negative and shear loading criteria the same as for edge, eave & rake locations; except the uniform gutter load is not considered.
 6. Expansion Joints: Self-supporting expansion joints shall be designed for positive, negative and shear loading criteria the same as for edge, eave & rake locations, except the uniform gutter load is not considered.
- C. Structural Transition Assemblies:
1. Ridges: Self-supporting ridge transition assemblies shall be designed to meet the most critical of the four loading combinations:
 - a. Dead Load + Roof Live Load + Snow Load + Shear Load
 - b. Dead Load + Positive Wind Pressure + Shear Load
 - c. Dead Load + Negative Wind Pressure + Shear Load
 - d. Dead Load + Concentrated 200 Pound Load + Shear Load
 2. Tributary area for uniform loads shall be 12 inches wide and the live load deflection shall not exceed L/240 of the span. Negative load deflection shall not exceed L/180.
 3. Hips and Valleys: Self-supporting hip & valley assemblies are critical structural load supporting members and shall be designed to meet the most critical of the loading combinations listed above for ridge transition assemblies. The supporting tributary area for the uniform gravity loads and uplift loads shall be based on intersection geometry. Gravity live load deflection shall not exceed L/240 of the span and negative live load deflection shall not exceed L/180.
- D. Roof Deck At Shear Walls: (Applies to both Self-supported and Supported Terminations) Design considerations shall be made to transfer the design diaphragm shear from the roof deck assembly to the supporting members at all exterior and interior shear walls. Where termination assemblies are inadequate or unable to function as a collector, shear collectors shall be designed and furnished by others. Consult with the Structural Engineer of record where found to occur.

2.04 COMPONENTS

- A. Light gage steel sections shall be roll-formed from cold rolled steel, having a minimum yield strength (virgin steel) 33,000 psi with a G-90 galvanized finish and must conform to the latest editions of the AISI Cold-Formed Steel Design Manual. The configuration and physical properties of the section shall conform to those established for the manufacturer's designated design. Steel shapes where used shall be hot rolled, having a minimum yield strength of 33,000 psi and galvanized with a minimum G-90 finish. Steel shapes shall be installed in continuous lengths with expansion joints provided at maximum 40 ft. intervals. The minimum length shall not be less than a two-span condition.
- B. Fasteners for the steel shapes shall be either special screw fasteners, arc spot welds or plug welds through special weld washers. As specified earlier in the specification, all fasteners shall be engineered for combined uplift and shear loading. Attachments for wood blocking will be stainless steel screws.
- C. Support blocks shall be A-36 minimum steel prime painted. All steel shall be 33,000 psi. minimum yield. Screw fasteners where required shall be corrosion-resistant, Phillips wafer head, self-drilling fasteners, specifically suited for structural steel connections.

- D. When required, wood nailers and blocking shall be pressure treated, grade A lumber.
- E. Peel and stick asphaltic membrane for corrosion separators shall be minimum 40 mil thickness.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Visually examine and verify that the surfaces of the structure which will receive the engineered roof deck assembly have no apparent defects or errors which would result in substandard workmanship. Additionally, the following items, furnished and installed by others, shall be inspected for compliance prior to installation of the roof deck assembly.
- B. Structural Steel / Bar Joists
 - 1. All structural steel framing has been fabricated and erected in accordance with the following documents:
 - a. AISC Code of Standard Practice
 - b. Steel Joist Institute(SJI) Code of Standard Practice
 - c. Steel Deck Institute (SDI) Code of Standard Practice
 - d. Division 5 project specifications herein.
 - 2. Where required, all shear collectors and continuous termination/transition plates, to be furnished by others, have been installed per the approved design of the engineer of record.
 - 3. All support framing for roof deck assembly shall have top chord/flange surfaces structurally designed and oriented to provide proper deck bearing surfaces in accordance with Steel Deck Institute recommendations. Special attention should be given to deck bearing surfaces which support deck sections that cannot be end lapped or common framing that supports a change in deck direction.
- C. Cold-Formed Steel Framing
 - 1. All Structural Cold Formed framing has been fabricated and erected in accordance with the following documents:
 - a. AISI Standard S200--Cold Formed Steel Framing--General Provisions
 - b. AISI Standard S210--Cold-Formed Steel Framing--Floor and Roof System Design
 - c. AISI Standard S214--Cold-Formed Steel Framing--Truss Design
 - d. AISI Code of Standard Practice
 - e. Steel Deck Institute(SDI) Code of Standard Practice
 - 2. Where required, all shear collectors and continuous termination/transition plates, to be furnished by others, have been installed per the approved design of the engineer of record.
 - 3. All support framing for roof deck assembly shall have top chord/flange surfaces structurally designed and oriented to provide proper deck bearing surfaces in accordance with Steel Deck Institute recommendations. Special attention should be given to deck bearing surfaces which support deck sections that cannot be end lapped or common framing that supports a change in deck direction.
 - 4. On steel support framing in excess of 5'0" on center, all hips and valleys shall have continuous structural support provided by the cold-formed framing contractor/supplier.
 - 5. All top chord/flange deck bearing members shall be a minimum of 18 gage to comply with structural performance criteria.
- D. Roof Penetrations and Support Curbs
 - 1. Where required, all structural steel curbs, roof penetrations and related support framing have been installed in accordance with contract documents and the above referenced documents.
- E. Report any unsatisfactory conditions to the Architect.

3.02 PREPARATION

- A. Structural Adequacy: The General Contractor shall prepare the structure to insure proper and adequate structural support for the materials specified.

3.03 INSTALLATION

- A. Prior to attaching steel deck sheets at all termination points, install Terminator Base Piece on areas as shown on plan per manufacturer's specification. Exercise care to align assembly in a straight line in accordance with the desired line of the roof edge.
 - 1. Attach steel deck sheet to the assembly in a pattern sufficient to develop the shear and uplift values required by the assembly.
 - 2. Screw attach or weld steel deck section to the assembly between structural supports with attachments at the same spacing as the deck side lap fasteners.

- B. Prior to placing steel sections in valleys or on hips, install Terminator Integra valley or hip assemblies as shown on the plans. On joist beam construction, valley or hip support blocks are to be positioned & welded in the valley or hip line between structural supports at a frequency that limits the unsupported span of the continuous plate to 48" maximum. Lap plates over support blocks or structural members 2" minimum. All laps shall be supported. Screw or weld plates to all support block members with a minimum of 5 connectors at block and 4 connectors at intermediate structural members.
 - 1. Properly align plates to coincide with the intended building line for the valley or hip.
 - 2. Provide expansion joints at 40' maximum intervals per standard details.
 - 3. On light gage steel framing, valley or hip assemblies are to be continuously supported by a framing member.
 - 4. Laps of plates are to occur at truss or purlin intersections and be of sufficient length to accept 4 screw fasteners per standard details.
 - 5. Screw attach plates to continuous support member at 18" o.c. and attach plates at intermediate purlin intersections with a minimum of three fasteners.
 - 6. Installations to conform to manufacturer's standard details.
 - 7. Anchorage shall adequately support all design loads.

- C. Install treated lumber as necessary to meet assembly design requirements. Treated lumber shall be completely isolated from any direct contact with steel products by using 40 mil asphaltic waterproof membrane or an equal product. Steel anchors in contact with such lumber must be stainless steel.

3.04 CLEANING

- A. Cleaning: Upon completion of the installation, broom clean the surface of all construction debris.

3.05 FINAL INSPECTION

- A. Final Inspection: Prior to the application of the roof covering, inspect completed portions of the termination and transition assemblies and the structural roof deck assembly and correct any deficiencies and/or damage to the surface.

END OF SECTION 05330

SECTION 05450

PRE-ENGINEERED LIGHT GAUGE STEEL TRUSS FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes all work and supplementary items required to complete the proper installation of the pre-engineered light gauge roof trusses as shown on the Contract Documents and specified herein including headers, outriggers, supplemental rafters and incidental framing for a complete assembly within the extent shown on the drawings.
- B. Pre-engineered light gauge steel trusses include planar structural units consisting of welded, screwed or bolted connected members which are fabricated, cut and assembled prior to delivery or at the job site.
- C. Types of prefabricated trusses include:
 - 1. Gable-shaped trusses
 - 2. Monopitch trusses
 - 3. Irregular shaped trusses

1.03 RELATED SECTIONS

- A. Structural Steel: Section 05120.

1.04 REFERENCE STANDARDS

- A. The following documents of the issue in effect on the date of material procurement, referred to thereafter by basic designation only form a part of this specification to the extent indicated by reference thereto.
 - 1. American Iron and Steel Institute:
 - a. Specification for the Design of Cold-Formed Steel Structural Members.
 - 2. American Society of Testing Materials:
 - a. ASTM A 446: "Specification for Sheet Steel, Zinc Coated (Galvanized) by the Hot-Dip Process, Physical (Structural) Quality."
 - Grade A, Fy = 33 ksi: 18 gauge and lighter
 - Grade D, Fy = 50 ksi: 16 gauge and heavier
 - Galvanizing: G-60 Coating Class
 - 3. American Welding Society:
 - a. AWS D1.0 "Code for Welding in Building Construction"
 - b. ANSI Z49.1 "Safety in Welding and Cutting"

1.05 QUALIFICATIONS

- A. Trusses shall be designed, fabricated and erected by a firm which has a record including a minimum of five years of successfully fabricating trussed assemblies similar to scope required and which practices a quality control which includes inspection by an independent inspection and testing agency acceptable to Architect and authorities having jurisdiction.

1.06 SUBMITTALS

- A. Product data: Submit fabricator's technical data covering materials, shapes, hardware, fabrication process, handling and erection. Submit certificate, signed by an officer of subcontractor or fabricating firm, indicating that trusses to be supplied for project comply with indicated requirements.
- B. Shop drawings: Submit shop drawings showing shapes and dimensions of members to be used including pitch, span, camber configuration and spacing for each type or configuration of truss required. Show all bearing and anchorage details. Specify and detail all supplemental strapping, truss to truss connections, including all bracing and bridging, structurally supported hip and valley plates, perimeter eave and ridge plates, bracing clips and other accessories required for proper installation and support of composite roof decking. Shop drawings shall include all placement sequences and instructions.

To the extent engineering design considerations are indicated as fabricator's responsibility, submit design analysis and test reports indicating loading, section properties, allowable stress, stress diagrams and calculations, and similar information needed for analysis and to insure trusses comply with requirements. All designs shall bear the name and seal of a Structural Engineer licensed to practice in the state where the trusses are to be erected.

- C. Basis of Design: Basis of Design is indicated on drawings.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products in exact accordance with the manufacturer's latest published requirements and specifications to avoid damage from bending, overturning, or other cause for which truss is not designed to resist or endure. Storage shall be off-ground in a dry ventilated space or protect with waterproof coverings.
- B. Time fabrication and erection of trusses to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.01 FRAMING COMPONENTS

- A. Available Manufacturer: Subject to compliance with requirements, framing shapes and components for pre-engineered light gauge prefabricated steel trusses shall be as manufactured or recommended by United States Gypsum Company or approved equal.

- B. Design, analysis and computation of section properties shall be in conformance with the Specification for the Design of Cold-Formed Steel Structural Members of the American Iron and Steel Institute.
- C. All galvanized structural members shall be formed from steel that corresponds to the requirements of ASTM A 446-89, Grade A (minimum yield of 33 ksi) for 18 gauge steel or lighter and ASTM A 446-89, Grade D (minimum yield of 50 psi) for 16 gauge or heavier.
- D. All steel members shall be galvanized with a G60 coating minimum.

2.02 FASTENERS

- A. Framing components shall be field or shop fabricated and joined to one another by means of welding or through the use of screws as recommended by the component provider.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Visually examine and verify that receiving surfaces of the substructure have no apparent defects or errors which would result in substandard workmanship. Additionally, the following items shall be installed and inspected prior to roof truss installation.
 - 1. Conditions of Surfaces.
 - a. Exterior bearing plates:
 - (1) Properly positioned within Bond Beam.
 - (2) Installed so as to allow complete and adequate contact with truss connection member.
 - b. Interior bearing plates:
 - (1) Properly positioned within Bond Beam.
 - (2) Installed so as to allow complete and adequate contact with truss connection member.
 - c. Exterior and Interior Bearing Plates installed in proper elevations so as to permit the installation of the truss system without the use of shims or adjustability.
- B. Report any unsatisfactory conditions to the Architect.

3.02 PREPARATION

- A. Structural Adequacy: Contractor shall prepare the structure to insure proper and adequate structural support for the materials specified.

3.03 FABRICATION

- A. Light gauge steel trusses may be fabricated either on the jobsite or at the fabricator's shop.
- B. All trusses shall be fabricated and erected in strict accordance with the current printed instructions of the approved subcontractor or fabricator.

- C. All truss components shall be straight and true prior to fabrication. Flattening or straightening of components, when necessary, shall be accomplished in a manner so as to not damage the component.
- D. All truss components shall be cut neatly to fit snugly against adjacent members.
- E. No splices will be allowed in trusses except as authorized in writing by the Architect or as shown on the approved shop drawings.
- F. Provide all clips, angles, and other miscellaneous pieces necessary to attach light gauge steel trusses to the substructure or to attach other components within this section to one another.
- G. All trusses shall be erected true and plumb and properly bridged and braced in accordance with the approved shop drawings.
- H. All truss components shall be connected to one another by means of screw attachment or by welding.
- I. Completed trusses shall be free from twists, bends, or open joints with all members straight and true to line.
- J. If the truss components have been welded to one another then all welds must be thoroughly cleaned and wire brushed and primed and painted with a high zinc content paint capable of providing an equal or greater degree of protection than the original G-60 galvanized coating.

3.04 ERECTION

- A. Prefabricated trusses shall be braced against racking. Lifting of trusses shall be done so as to not cause local distortion in any member.
- B. All light gauge steel framing shall be erected by approved methods using equipment of adequate capacity to safely perform the work.
- C. The contractor is responsible for checking the dimensions and assuring the fit of all members and trusses before erection begins.
- D. All work shall be erected plumb and level and to dimensions, spacings indicated on the drawings.
- E. Components shall be of the size and spacing shown on the approved shop drawings.
- F. Provide web stiffeners and reinforcement at reaction points where required by analysis or to suit details.
- G. Hoist units in place by means of lifting equipment suited to sizes and types of trusses required, applied at designated lift points as recommended by fabricator, exercising care not to damage truss members.

- H. Provide temporary bracing as required to maintain trusses plumb, parallel and in location indicated, until permanent bracing is installed.
- I. Anchor trusses securely at all bearing points to comply with methods and details indicated.
- J. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads, and comply with other indicated requirements.
- K. Do not cut or remove truss members.

END OF SECTION 05450

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**SECTION 05500
METAL FABRICATIONS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.02 SUMMARY

- A. This section includes following metal fabrications:
 - 1. Rough hardware.
 - 2. Pipe bollards.
 - 3. Trench Drains
 - 4. Down spout boots.
 - 5. Loose bearing and leveling plates.
 - 6. Loose steel lintels.
 - 7. Glass unit masonry frames
 - 8. Miscellaneous framing and supports for the following:
 - a. Overhead doors.
 - b. Suspended folding partitions.
 - c. Suspended operable partitions.
 - d. Applications where framing and supports are not specified in other sections.
 - 9. Shelf and relieving angles.
 - 10. Ladders.
 - 11. Ladder safety cages.
 - 12. Steel framed stairs.
 - 13. Steel pipe railings and handrails.
 - 14. Stair Nosing.
 - 15. Louver protection screens.
 - 16. Expansion joint covers.
- B. Related Sections: Following sections contain requirements that relate to this Section:
 - 1. Division 5 Section "Structural Steel" for structural steel framing system components.

1.03 DEFINITIONS

- A. Definitions in ASTM E 985 for railing-related terms apply to this Section.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

- A. Structural Performance of Handrails and Railing System: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E 985 for structural performance based on testing performed in accordance with ASTM E894 and E 935.
- B. Structural Performance:
 - 1. Design, engineer, fabricate, and install following metal fabrications to withstand following structural loads without exceeding allowable design working stress of materials involved, including anchors and connections.
 - 2. Apply each load to produce maximum stress in each respective component of each metal fabrication.
 - 3. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 300 lbf applied at any point nonconcurrently, vertically downward, or horizontally.
 - b. Uniform load of 100 lbf per linear ft. applied nonconcurrently, vertically downward or horizontally.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.

4. Handrails Not Serving as Top Rails: Capable of withstanding following loads applied as indicated:
 - a. Concentrated load of 200 lbf applied at any point nonconcurrently, vertically downward or horizontally.
 - b. Uniform load of 50 lbf per linear foot applied nonconcurrently, vertically downward or horizontally.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
5. Infill Area of Guardrail Systems: Capable of withstanding horizontal concentrated load of 200 lbf applied to one sq. ft. at any point in the system including panels, intermediate rails balusters, or other elements composing the infill area.
 - a. Above load need not be assumed to act concurrently with uniform horizontal loads on top rails of railing systems in determining stress on guard.
6. Treads of Steel Stairs: Capable of withstanding uniform load of 100 lbf per sq. ft. or concentrated load of 300 lbf on area of 4 sq. inches located in center of tread, whichever produces greater stress.
7. Platforms of Steel Stairs: Capable of withstanding uniform load of 100 lbf per sq. ft.

1.05 SUBMITTALS

- A. General: Submit following in accordance with General Conditions of Contract and Division 1 Specification Sections.
 1. Product data for products used in miscellaneous metal fabrications, including paint products and grout.
 2. Shop drawings detailing fabrication and erection of each metal fabrication indicated.
 - a. Include plans, elevations, sections, and details of metal fabrications and their connections.
 - b. Show anchorage and accessory items.
 - c. Provide templates for anchors and bolts specified for installation under other Sections.
- B. Where installed metal fabrications indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis signed and sealed by qualified professional engineer responsible for their preparation.
- C. Submit samples representative of materials and finished products specified herein.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.
- E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience.
 1. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firms experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in Work.
- B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.
- C. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel," D1.3 "Structural Welding Code - Sheet Steel", and D1.2 "Structural Welding Code - Aluminum."
 1. Certify that each welder satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, undergone re-certification.
- D. Engineer Qualifications: Professional engineer licensed to practice in jurisdiction where project located and experienced in providing engineering services of kind indicated that have resulted in successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project.

1.07 PROJECT CONDITIONS

- A. Field Measurements:
1. Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings.
 2. Coordinate fabrication schedule with construction progress to avoid delay of Work.
 - a. Where field measurements cannot be made without delaying Work, guarantee dimensions and proceed with fabrication of products without field measurements.
 - b. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions.
 - c. Allow for trimming and fitting.

1.08 SEQUENCING AND SCHEDULING

- A. Sequence and coordinate installation of wall handrails as follows:
1. Mount handrails only on completed walls.
 2. Do not support handrails temporarily by any means not satisfying structural performance requirements.
 3. Mount handrails only on gypsum board assemblies reinforced to receive anchors, and where location of concealed anchor plates clearly marked for benefit of Installer.

PART 2 - PRODUCTS

2.01 FERROUS METALS

- A. Metal Surfaces, General:
1. For metal fabrications exposed to view upon completion of Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes.
 2. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A 36.
- C. Rolled Steel Floor Plates: ASTM A 786.
- D. Steel Bars for Gratings: ASTM A 569 or ASTM A 36.
- E. Wire Rod for Grating Cross Bars: ASTM A 510.
- F. Steel Tubing: Product type (manufacturing method) and as follows:
1. Cold-Formed Steel Tubing: ASTM A 500, grade indicated below:
 - a. Grade A, unless otherwise shown or required for design loading.
 2. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.
- G. Uncoated Structural Steel Sheet: Product type (manufacturing method), quality, and grade, as follows:
1. Cold-Rolled Structural Steel Sheet: ASTM A 611, grade as follows:
 - a. Grade A, unless otherwise indicated or required by design loading.
 2. Hot-Rolled Structural Steel Sheet: ASTM A 570, grade as follows:
 - a. Grade 30, unless otherwise indicated or required by design loading.
- H. Un-coated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:
1. Cold-Rolled Steel Sheet: ASTM A 366.
 2. Hot-Rolled Steel Sheet: ASTM A 569.
- I. Galvanized Steel Sheet: Quality as follows:
1. Commercial Quality: ASTM A 526, G90 coating designation unless otherwise indicated.

- J. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:
 - 1. Black finish, unless otherwise indicated.
 - 2. Galvanized finish for exterior installations and where indicated.
 - 3. Type F, standard weight (schedule 40), unless otherwise indicated, or another weight, type, and grade required by structural loads.
- K. Gray Iron Castings: ASTM A 48, Class 30.
- L. Malleable Iron Castings: ASTM A 47, grade 32510.
- M. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- N. Concrete Inserts:
 - 1. Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27.
 - 2. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
- O. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy to be welded.

2.02 GROUT AND ANCHORING CEMENT

- A. Nonshrink Nonmetallic Grout:
 - 1. Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C 621 specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
- B. Products: Subject to compliance with requirements, provide one of following:
 - 1. Nonshrink Nonmetallic Grouts:
 - a. "Bonsal Construction Grout"; W.R. Bonsal Co.
 - b. "Diamond-Crete Grout"; Concrete Service Materials Co.
 - c. "Euco N-S Grout"; Euclid Chemical Co.
 - d. "Kemset"; Chem-Masters Corp.
 - e. "Crystex"; L & M Construction Chemicals, Inc.
 - f. "Masterflow 713"; Master Builders.
 - g. "Sealtight 588 Grout"; W.R. Meadows, Inc.
 - h. "Sonogrout"; Sonneborn Building Products Div., Rexnord Chemical Products, Inc.
 - i. "Stoncrete NM1"; Stonhard, Inc.

2.03 FASTENERS

- A. General:
 - 1. Provide zinc-coated fasteners for exterior use or where built into exterior walls.
 - 2. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
- C. Lag Bolts: Square head type, FS FF-B-561.
- D. Machine Screws: Cadmium plated steel, FS FF-S-92.
- E. Wood Screws: Flat head carbon steel, FS FF-S-111.
- F. Plain Washers: Round, carbon steel, FS FF-W-92.
- G. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, [nondrilling]), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.

H. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.

I. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

2.04 PAINT

A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing min. 94% zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

D. Zinc Chromate Primer: FS TT-P-645.

E. Field Painting; Refer to Section 09900.

2.05 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but min. needed to comply with performance requirements indicated.

1. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.
2. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from following max. change (range) in ambient temperature in design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners; base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 100°F (55.5°C).

D. Shear and punch metals cleanly and accurately; remove burrs.

E. Ease exposed edges to radius of approximately 1/32", unless otherwise indicated.

1. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with AWS recommendations and following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible.

1. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts.
2. Locate joints where least conspicuous.

- I. Provide for anchorage of type indicated; coordinate with supporting structure.
 - 1. Fabricate and space anchoring devices to provide adequate support for intended use.
- J. Shop Assembly:
 - 1. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
 - 2. Disassemble units only as necessary for shipping and handling limitations.
 - 3. Use connections that maintain structural value of joined pieces.
 - 4. Clearly mark units for reassembly and coordinated installation.
- K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints exposed to weather in manner to exclude water, or provide weep holes where water may accumulate.

2.06 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.
 - 1. Straight bolts and other stock rough hardware items specified in Division 6 sections.
- B. Fabricate items to sizes, shapes, and dimensions required.
 - 1. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.10 PIPE BOLLARDS

- A. Fabricate pipe bollards from Schedule 80 steel.
 - 1. Bollards to be 6" diameter unless noted.
 - 2. Bollards to be of size indicated:
 - a. All applications except where indicated: 6'-0" long, 3'-0" embedded in ground.
 - b. Kitchen Dumpster Pad: 8'-0" long, 3'-0" embedded in ground.
 - 3. Cap bollards with 1/4" min. thickness steel plate.
- B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4" thick steel plate welded to bottom of sleeve.
- C. Finish:
 - 1. Galvanized after fabrication.
 - 2. Factory primed, Field painted.

2.11 SLOT CHANNEL TRENCH DRAIN:

- A. Modular trench drain system pre-cast from corrosion resistant polyester concrete with interlocking modular components for on-site installation.
 - 1. Unit to comply with the following physical and mechanical characteristics.
 - a. Top Unit Width: 5.7"
 - b. Internal Unit Width: 4.3"
 - c. Unit Depth 5.7".
 - 2. Polymer Concrete to comply with the following:
 - a. Compressive strength: 14,000 psi
 - b. Flexural strength: 3,000 psi
 - c. Water absorption rate: not to exceed 0.1% by weight
 - 3. Channel Profile:
 - a. Unit to provide positive interlocking tongue and groove connections sealed to provide water tight connections.
 - b. Each section to be approximately 3 feet long with a longitudinal 0.5" slot.
 - 4. Catch Basin:
 - a. Pre-cast polymer concrete, 21.75" in length with trash bucket and removable cover.

- B. Approved manufacturers subject to conformance with Contract Documents:
 - 1. Aco Polymer Products, Inc, Chardon, Ohio, Sport, System 3000
 - 2. Poly Drain - ABT, Inc.
 - 3. Sports Edge

2.12 DOWNSPOUT BOOTS

- A. Fabricate downspout boots out of 3/16" structural steel tube and plates.
 - 1. Weld 3/16" by 1-1/2" by 1-1/2" 4 each attachment plates to side of tube at 12" above bottom lip and 8" below top lip of boot; predrill with 1/2" diameter holes.
 - 2. Weld 3/16" by 4" high band at top of boot to serve as a receiver for downspout. Face of band to project 3/16" beyond face of tube.
- B. Size:
 - 1. Width and depth required to match size of down spouts.
 - 2. Height indicated on drawings, but min. 2'-0" above finish floor.
- C. Application: provide a down spout boot at each down spout except where down spout spills out on adjacent roof.
 - 1. Where connection to underground downspout drainage system is indicated:
 - a. Extend boot underground and tie into underground storm drainage piping.
 - b. Shape of end of boot required to match storm drain line.
 - 2. Where connection to underground downspout drainage system is **not** indicated:
 - a. Spill to grade on precast concrete splash block.
 - b. Miter and extend bottom of downspout boot 4" out from face of wall at a 45 degree angle. Bottom of lip on downspout boot to be Maximum 2" above splash block.
- D. Location of Use: Provide a downspout boot at each downspout except where downspout spills out on adjacent roof.
- E. Finish: Factory primed, Field painted.

2.13 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area.
 - 1. Drill plates to receive anchor bolts and for grouting as required.
 - 2. Galvanize after fabrication.
- B. Finish: Factory primed, Field painted.

2.14 LOOSE STEEL LINTELS

- A. Provide loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form single unit where indicated.
- C. Size loose lintels for equal bearing of one inch per foot of clear span but min. 8" bearing at each side of openings, unless otherwise indicated.
- D. Galvanize loose steel lintels located in exterior walls.
- E. Finish: Factory primed, Field painted.

2.15 GLASS UNIT MASONRY FRAMES

- A. Fabricate frames from steel members, ASTM A36.
 - 1. Head and jambs: 1/4" bent steel plate channels of depth and with length to meet requirements of glass unit masonry manufacturer and applicable fire codes.
 - 2. Sill: 1/4" bent steel plate angle of same depth as jamb channels with 2" vertical legs.
 - 3. Intermediate mullions: 1/4" X 2-1/2" steel plate.
- B. Provide adjustable anchors at 2'-8" O.C. welded to jamb members. Anchors to be 12 gage X 1-1/2" X 8" steel straps.
- C. Weld all connections.
 - 1. Field weld mullions into place coordinating with masonry work.
- D. Finish:
 - 1. Factory primed, Factory applied powdered coat finish.

2.16 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated or are not part of structural steel framework, as required to complete work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports.
 - 1. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection.
 - 2. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- C. Equip units with integrally welded anchors for casting into concrete or building into masonry.
 - 1. Furnish inserts if units installed after concrete placed.
 - 2. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in form of steel straps 1-1/4" wide x 1/4" x 8" long.
- D. Fabricate support for suspended and folding partitions as follows:
 - 1. Structural Steel Members: To be continuous steel shapes of size required to limit deflection to L/360 between hangers, but no less than listed below.
 - 2. Support Angles: Minimum 2 each continuous 5" X 3-1/2" X 5/16"; steel angles; unless noted otherwise. Length as necessary to span between a minimum of Four (4) structural supporting members. Weld or bolt to supporting structure.
 - 3. Suspension Angles: Minimum 1-1/2" X 1-1/2" X 1/4"; steel angles; unless noted otherwise. Construct a rectangular boxes of specified angles with mitered and welded corners. Height as necessary to extend from underside of structure to top of partition. Weld to 5" angles at underside of structure. Space framed "boxes" maximum of 36" O.C.
 - 4. Angle Braces: Minimum 1-1/2" X 1-1/2" X 1/4"; steel angles; unless noted otherwise. Weld angles to each vertical suspension angle to form staggered "X" bracing. Angle of bracing to be between 45 degrees and 60 degrees.

2.17 SHELF AND RELIEVING ANGLES

- A. Fabricate shelf and relieving angles from steel angles of sizes indicated and for attachment to concrete framing.
 - 1. Provide slotted holes to receive 3/4" bolts, spaced max. 6" from ends and max. 24" o.c., unless otherwise indicated.

- B. For cavity walls, provide vertical channel brackets to support shelf/relieving angles from back-up masonry and concrete.
 - 1. Align expansion joints in angles with indicated expansion joints in cavity wall exterior wythe.
- C. Finish: Factory primed, Field painted..

2.18 STEEL LADDERS

- A. General: Fabricate ladders for locations shown, with dimensions, spacings, details and anchorages indicated.
 - 1. Comply with requirements of ANSI A14.3.
- B. Siderails: Continuous steel channels C4x5.4 with smoothed legs, spaced 18" apart.
- C. Pipe Rungs:
 - 1. 1" galvanized steel pipe, spaced 12" o.c.
 - 2. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
- D. Support each ladder at top and bottom and at intermediate points spaced max. 4'-0" o.c. by means of welded steel brackets.
 - 1. Brackets: 4" x 9" x 3/8" steel strap returned 4" on wall and projected to hold centerline of ladder rungs clear of wall surface by min. 8".
 - 2. Extend side rails 42" above top rung, and return rails to wall or structure unless other secure handholds provided.
 - 3. If the adjacent structure does not extend above top rung, goose-neck extended rails back to structure to provide secure ladder access.
- E. Provide non-slip surface on top of each rung, either by coating rung with aluminum oxide granules set in epoxy resin adhesive, or by using type of manufactured rung filled with aluminum oxide grout.
- F. Finish: Factory primed, Field painted.

2.19 LADDER SAFETY CAGES

- A. General: Fabricate ladder safety cages to comply with ANSI A14.3; assemble by welding or riveting.
- B. Application: Provide ladder safety cages at ladders where ladder height exceeds 12'-0".
- C. Primary Hoops: Steel bars, 5/16" x 4", for top, bottom, and for cages longer than 20 feet, intermediate hoops spaced max. 20'-0" o.c.
- D. Secondary Intermediate Hoops: Steel bars, 5/16" x 2" hoops spaced max. 4'-0" o.c. between primary hoops.
- E. Vertical Bars: Steel bars, 5/16" x 2", secured to each hoop, spaced approximately 9" o.c.
- F. Fasten assembled safety cage to ladder rails and adjacent construction as indicated.
- G. Finish: Factory primed, Field painted.

2.20 STEEL FRAMED STAIRS

- A. General: Construct stairs to conform to sizes and arrangements indicated.
 - 1. Join pieces together by welding, unless otherwise indicated.
 - 2. Provide complete stair assemblies, including metal framing, hangers, columns, railings, newels, balusters, struts, clips, brackets, bearing plates, and other components necessary for support of stairs and platforms, and as required to anchor and contain stairs on supporting structure.
 - 3. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual" for class of stair designated, except where more stringent requirements indicated:
 - a. Architectural class unless indicated.

- B. Stair Framing:
 - 1. Fabricate stringers of structural steel channels, or plates, or combination thereof, as indicated.
 - 2. Provide closures for exposed ends of stringers.
 - 3. Construct platforms of structural steel channel headers and miscellaneous framing members indicated.
 - 4. Bolt or weld headers to strings, newels, and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.
 - 5. Where masonry walls support steel stairs, provide temporary supporting struts designed for erection of steel stair components before installation of masonry.
- C. Metal Pan Risers, Subtreads, and Subplatforms:
 - 1. Shape metal pans for risers and subtreads to conform to configuration shown.
 - 2. Provide thicknesses of structural steel sheet for metal pans indicated, but not less than that required to support total design loading.
 - 3. Form metal pans of uncoated cold-rolled steel sheet, unless otherwise indicated.
 - 4. Form metal pans of galvanized steel sheet, where indicated.
 - 5. Directly weld risers and subtreads to stringers; locate welds on side of metal pans to be concealed by concrete fill.
 - 6. Provide subplatforms of configuration and construction indicated; if not indicated, of same metal as risers and subtreads, in thicknesses required to support design loading.
 - a. Attach subplatform to platform framing members with welds.
- D. Stair Railings and Handrails: Comply with applicable requirements specified elsewhere in this Section for steel pipe railings and handrails, and as follows:
 - 1. Fabricate newels of steel tubing and provide newel caps of gray-iron castings, as shown.
 - 2. Railings may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
 - 3. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

2.21 STEEL PIPE RAILINGS, HANDRAILS AND GUARDRAILS

- A. General: Fabricate pipe railings, handrails and guardrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.
 - 1. For fabrication of handrails and railing systems, use only materials smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled trade names, and roughness; remove blemishes by grinding prior to cleaning, treating and application of surface treatment.
 - 2. Rails to be complete with wall brackets, floor sleeves, one piece escutcheons, turns, and end caps.
- B. Pipe Rail Size; Fabricate pipe rails of standard weight pipes of dimensions indicated, unless other sizes or weights indicated on drawings:
 - 1. Pipe Guardrails:
 - a. All Applications: 1-1/2" O.D.
 - 2. Pipe Handrails:
 - a. Application #1; Adults (Ages 13-Up): 1-1/2" O.D.
 - b. Application #2; Children (Ages 1-12): 1-1/4" O.D.
 - 3. Pickets (Where indicated):
 - a. All Applications: 3/4" O.D.
- C. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
 - 1. At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.
- D. Form changes in direction of railing members by following methods:
 - 1. Insertion of prefabricated elbow fittings.
 - 2. Radius bends of radius indicated.
 - 3. Mitering at elbow bends.
 - 4. Bending.
 - 5. Any method indicated above, applicable to change of direction involved.

- E. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.
- F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.
 - 1. Wall returns to be perpendicular to rail and wall and shall extend back to within 1/4" of face of wall.
- G. Close ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4" or less..
- H. Brackets, Flanges, Fittings, and Anchors:
 - 1. Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of railings and handrails to other work. Wall brackets to be equivalent to Julius Blum & Comp. No. 498 wall bracket, unless noted or detailed otherwise.
 - 2. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.
 - 3. For railing posts set in concrete fabricate sleeves from steel pipe min. 6" long and with inside diameter not less than 1/2" greater than outside diameter of post, with steel plate closure welded to bottom of sleeve.
 - a. Hold top edge of sleeve 1/2" below finished surface of concrete.
 - b. Provide friction fit, one piece removable covers (escutcheons) designed to keep sleeves clean.
 - 4. For removable railing posts, fabricate slip-fit sockets from steel pipe whose inside diameter sized for close fit with posts and limit deflection of post without lateral load, measured at top, to max. 1/12 of post height.
 - a. Provide socket covers designed and fabricated to resist accidental dislodgement.
- I. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports.
 - 1. Size fillers to suit wall finish thicknesses.
 - 2. Size fillers to produce adequate bearing to prevent bracket rotation and over-stressing of substrate.
- J. For exterior steel railings and handrails formed from steel pipe with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.
- K. For interior steel railings formed from steel pipe with black finish, provide nongalvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
- L. Finish: Provide finish of type indicated:
 - 1. Exterior Applications:
 - a. Galvanize after fabrication.
 - b. Factory primed, factory applied powdered coated finish.
 - c. Submit a minimum of 15 standard colors from which the architect may select.
 - 2. Interior Application:
 - a. Factory primed, factory applied powdered coated finish.
 - b. Submit a minimum of 15 standard colors from which the architect may select..

2.22 STAIR NOSINGS

- A. Description:
 - 1. 1/4" thick x 4" wide x width of steps less 16".
 - 2. Extruded aluminum with seven (7) abrasive filled ribs.
 - 3. Abrasive Color: Selected by Architect from Manufacturer's standard line.
- B. Approved Products for Cast-In-Place Concrete Stairs:
 - 1. American Safety Tread Co., Inc.; Type 3711.
 - 2. Amstep Products Div., American Safety Technologies; Type 241A.
 - 3. Armstrong Products, Inc.; Type S27.
 - 4. Metalines Div., Balco, Inc.; Type T-407.
 - 5. Wooster Products, Inc. Type 241.

- C. Approved Products for Concrete Filled Steel Pan Stairs:
 - 1. American Safety Tread Co., Inc.; Type 9711.
 - 2. Amstep Products Div., American Safety Technologies; Type 241AP.
 - 3. Armstrong Products, Inc.; Type BF27
 - 4. Metalines Div., Balco, Inc.; Type M-473
 - 5. Wooster Products, Inc. Type 241BF.

2.23 LOUVER PROTECTION SCREEN

- A. Furnish and install as detailed where shown on Drawings and described herein.
 - 1. Gymnasium, Lunchroom; Cafeteria, Cafetorium: Furnish and install louver protection screen at each grille or louver located in cafeteria where such louver or grille is below 10'-0" above finished floor.
 - 2. Furnish elsewhere where indicated on drawings.
- B. Perforated steel plate min. 1/8" thick (minimum) x length x width required to fit opening with single screen size.
 - 1. Perforations:
 - a. Egyptian style with minimum of 55% open area.
 - b. No rough edges permitted.
- C. Steel Angle Frame: Provide a 2 1/2" X 2 1/2" X 1/4" steel angle frame continuously around perimeter of perforated plate and a 2 1/2" x 4" x 1/4" steel angle frame around the perimeter of the opening. Miter and weld corners.
 - 1. Where necessary to accommodate louver specified under mechanical section; provide off set frame.
- D. Screen Stiffeners: Weld 1" x 1/4" steel plates at 12" on center each way at back side of the protection screen, length of plate stiffener to extend the full width and height of the louver.
 - 1. Align stiffeners with solid bars at screen. Do not extend stiffeners across 'voids' or openings.
- E. Finish: Factory primed, Field painted.
 - 1. Paint screen and frame to match wall in which it occurs.
- F. Approved manufacturers subject to conformance with Contract Documents:
 - 1. Ametco Manufacturing Co.
 - 2. Architectural Grille
 - 3. Kees Incorporated
 - 4. McNichols Co.
 - 5. Register and Grille Manufacturing Company., Inc..

2.24 EXPANSION JOINT COVERS

- A. Furnish and install as detailed complete with anchoring devices.
 - 1. Furnish expansion joint cover at each interior expansion joint, whether specifically shown on drawings or not.
 - 2. Furnish and install joint cover at each exterior 2" wide expansion joint.
- B. Size: Expansion joint cover to be of size required for width of expansion joint indicated.
- C. Expansion joint covers in fire rated partitions, walls, and floors shall bear U.L. fire rating label equivalent to wall or floor rating.
- D. Finish:
 - 1. Interior Locations: Clear Anodized aluminum.
 - 2. Exterior locations: Bronze Anodized aluminum.

- E. Model and manufacturer shall be as shown on drawings. If not shown on drawings provide the following:
 - 1. Exterior Applications:
 - 2. Exterior Applications:
 - a. Wall to wall; straight: Balco XH4FS
 - b. Wall to wall; perpendicular: Balco XH4FVS
 - 3. Interior Applications
 - a. Concrete floor slab to slab; Balco 95FP
 - b. Concrete floor slab to wall; Balco 95GFVP
 - c. Wall to wall; straight: Balco 6TW.
 - d. Wall to wall; perpendicular: Balco 6TWC.
 - e. Ceilings; Gypsum Board; Straight: Balco: 75FWG
 - f. Ceilings; Gypsum Board; Perpendicular: Balco 75FWGC
- F. Approved manufactures subject to conformance with indicated model.
 - 1. Balco, Inc.
 - 2. Construction Specialties, Inc
 - 3. Inpro Corporation, Joint Master
 - 4. Metalines, Inc.
 - 5. MM Systems Corp.
 - 6. Watson Bowman Acme Corp.

2.25 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish metal fabrications after assembly.

2.26 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by hot-dip process comply with following requirements:
 - 1. ASTM A 153 for galvanizing iron and steel hardware.
 - 2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299" thick and heavier.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated.
 - 1. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.
 - 2. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.
- D. Powder Coated Finishes: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
 - 1. Powder Coat: Where powder coating indicate, all surfaces shall receive powder coat.
 - 2. Finish after manufacturer and prior to installation
 - a. Electrostatic applied polyester coating. 2 coat system. Total finished thickness 4 to 5 mill cured.
 - b. First coat 2 to 2.5 mills. Cure 5 minutes at 395°F and 10 minutes at 356°F.
 - c. Second coat: Cure at 392°F for 22 minutes and 356°F for 35 minutes.

3. Manufacturers: provide products from one of the listed manufacturers:
 - a. Alvarado.
 - b. Tiger.
 - c. DSM Powder Coating Resins
 - d. KMI Systems Inc
 - e. Porter Corporation

2.27 ALUMINUM FINISHES

- A. Finish designations prefixed by "AA" conform to system established by Aluminum Association for designating aluminum finishes.
 1. Clear Anodized Finish: AA-M12C22A41 (Mechanical Finish: Class I Architectural: clear film thicker than 0.7 mil) complying with AAMA 607.1.
 - a. Nonspecular; Chemical Finish: etched, medium matte; Clear Anodic Coating
 2. Colored Anodized Finish: NAAMM AA-C22A42/44, Class I (min. thickness 0.7 mils), integral or electrolytically deposited color anodized finish as follows:
 - a. Provide standard aluminum industry dark bronze color.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors to be embedded in concrete or masonry construction; coordinate delivery of such items to project site.
- B. Center nosings on tread widths with noses flush with riser faces and tread surfaces.
- C. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.02 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, wood screws, and other connectors as required.
 1. Where components fastened to masonry walls attach using epoxy set type screws/bolts of type and size indicated or required.
 2. Use of toggle bolts or Tapcon type fasteners not acceptable
- B. Cutting, Fitting, and Placement:
 1. Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications.
 2. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints.
 1. Weld connections not left as exposed joints, but not shop welded because of shipping size limitations.
 2. Do not weld, cut, or abrade surfaces of exterior units hot-dip galvanized after fabrication, and intended for bolted or screwed field connections.
- E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- F. Corrosion Protection: Coat concealed surfaces of aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals with heavy coat of bituminous paint or zinc chromate primer.

3.03 INSTALLATION OF BOLLARDS

- A. Anchor bollards in concrete by means of pipe sleeves preset and anchored into concrete.
1. After bollards inserted into sleeves, fill annular space between bollard and sleeve solid with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's directions.
 2. Fill pipe bollard with nonshrink, non metallic grout.
 3. Set bollard a minimum of 3'-0" in ground in 3'-6" deep by 1'-6" diameter concrete footing.
 4. Bollard to be plumb and straight.
 5. Field paint bollards.

3.04 INSTALLATION OF SLOT CHANNEL TRENCH DRAIN SYSTEM

- A. Install trench drain in strict compliance with the manufacturer's written instruction.
- B. Preparation:
1. Set top of excavate area for channel placement wide enough and deep enough to accommodate the slot channel drain system channel and a minimum of 4 inches (100mm) concrete encasement.
 2. Align top of channel with the surface of the surrounding slab.
- C. Installation:
1. Install starting from the outlet or catch basins.
 2. Insert channels from above to allow ends to interlock.
 3. Channel sections shall be placed on brick, rebar basket, low slump concrete grout slurry, or suspended to obtain correct finished elevation.
 4. Cutting will be made, if required, by masonry or concrete saw.
 5. Cover top of channel with tape, plastic, or plywood strips to protect channel surface during concrete pour.
 6. Place concrete in a manner that will not dislodge the channels.
- D. Finishing and Clean-up Following final set of concrete, remove protection covering the top channels.

3.05 INSTALLATION OF DOWNSPOUT BOOTS

- A. Anchor downspout boots to wall using 5/16" diameter lag bolts in pre-drilled holes.
1. Use all four holes.
- B. Downspout Boots to be installed plumb and true, in proper alignment with downspout and proper height above grade where terminated above a splash block, and proper height below grade where connected to storm drainage system.
1. At splash block bottom of boot to be maximum of 2" above splash block.
 2. At storm drain line extend 4" below grade and connect to storm drainage.
 3. Encase roof drain leader/downspout boot at grade in a min. of 1'-0" x 1'-0" x 8" deep concrete pad flush with grade
- C. Where boot connected to underground storm drainage system, connect boot to underground system in a manner capable of resisting a 20'-0" head of water without evidence of leakage.
1. Seal joint water tight.

3.06 SETTING LOOSE PLATES

- A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces.
 - 1. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges, or other adjustable devices.
 - 1. After bearing members positioned and plumbed, tighten anchor bolts.
 - 2. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 3. Use metallic nonshrink grout in concealed locations where not exposed to moisture; use nonmetallic nonshrink grout in exposed locations, unless otherwise indicated.
 - 4. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.07 INSTALLATION of GLASS UNIT MASONRY FRAMES

- A. Install steel channel surround in accordance with manufacturers recommendations and as follows:
 - 1. Steel channel frame shall be set in place, anchored to opening and fully welded.
 - 2. Exposed seams to be ground smooth, filled with mineral filler and sanded to eliminated visible seams.
 - 3. Provide and install backer rod and sealant continuous along each edge of frame where frame abuts glass.
 - a. Color of sealant to be selected by the Architect.
- B. Concealed Mullions:
 - 1. Install concealed mullions within vertical joints of glass block at spacings indicated so mullions do not touch glass block surface.
 - 2. Connect mullions to head and sill frames as indicated.
 - 3. Weld connections of mullions to sill frames to comply with AWS D1.1 "Structural Welding Code".

3.08 INSTALLATION OF SUPPORTS FOR OPERABLE AND/OR FOLDING PARTITIONS

- A. Anchor supports securely to, and rigidly brace from, overhead building structure.
- B. Frame to be set true and square; with attachment surface level to within 1/8" in 10'-0".

3.09 INSTALLATION OF LADDERS

- A. Provide and install ladders at each roof scuttle (hatch) and elsewhere where indicated on drawings.
- B. Ladder to be installed plumb and true and centered on roof hatch.

3.10 INSTALLATION OF LADDER SAFETY CAGE

- A. Provide and install safety cage on each ladder over 10'-0" in height.
- B. Unless noted otherwise, provide security gate at entrance to cage.

3.11 INSTALLATION OF FRAMED STAIRS

- A. Install framed stairs in locations indicated.
- B. Finished riser heights at each set of stairs to be equal in height; finished treads to be equal in depth.

3.12 INSTALLATION OF STEEL PIPE RAILINGS, HANDRAILS AND GUARDRAILS

- A. **General:** Install pipe railings, handrails and guardrails in accordance with the provisions of the contract documents and applicable codes. Applicable codes to include, but not strictly limited to:
 - 1. International Building Code; Current Edition
 - 2. Life Safety Code, NFPA 101; Current Edition
 - 3. Georgia Accessibility Code; Current Edition
 - 4. Americans with Disabilities Act, ADA, Current Edition

- B. **Definitions:** For the purpose of this section the following definitions shall apply:
1. Sloping Walk: Any walk or surface where the slope of the surface is equal to or less (flatter) than 1:20 (5%).
 2. Handicapped Ramp (or Ramp): Any sloping walk or surface where slope of surface of greater than 1:20 (5%). The maximum slope of a ramp shall not exceed 1:12 (8.333%).
- C. **Handrails:** Provide and install hand rails on each side of ramps and stairs, regardless of whether handrails shown on drawings Where ramp or stairs width exceeds 5'-0", in addition to side handrails, provide a center handrail.
1. Handrails not required at sloping walks, unless otherwise indicated.
 2. Where handrails are indicated to be provided in facilities where children are the primary users (School - Grades PK-7), provide one hand rail at children's height and one at adult height.
 3. Mounting Heights of Handrails:
 - a. Children: 1'-10" above surface of walk, ramp, platform and stair nosing.
 - b. Adult :2'-10" above surface of walk, ramp, platform and stair nosing.
 4. Rail Extensions:
 - a. Ramps: Extend handrail(s) a minimum of 1'-0" beyond top and bottom of ramp.
 - b. Stairs: Extend handrail(s) a minimum of 1'-0" beyond the top riser and 1'-0" plus depth of one tread beyond the bottom riser.
- D. **Guardrails:** Provide guardrails on each "open" side of ramps, stairs or platforms where any part of ramp, stairs or platform are located more than 30" above adjacent floor or grade.
1. Top of guardrails to be 3'-6" above surface of landing or platform and stair nosing.
 2. Guardrails shall be continuous along entire length of ramp and/or stairs and platforms.
- E. **Pickets:** Where any portion of ramp, stairs or platform is located more than 30" above adjacent floor or surface provide vertical pickets complying with requirements contained herein, unless otherwise detailed:
1. Space pickets as required to prevent a 4" diameter sphere from passing through any opening in railing system.
- F. Adjust railings prior to anchoring to ensure matching alignment at abutting joints.
1. Space posts at spacing indicated, or if not indicated, space posts at a maximum of 4'-0" on center and 1'-0" from each end.
 2. Plumb posts in each direction.
 3. Secure posts and railing ends to building construction as follows:
 - a. Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete.
 - b. After posts inserted into sleeves, fill annular space between post and sleeve solid with following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.
 - c. Fill with nonshrink, nonmetallic grout.
 - d. Cover anchorage joint with round steel flange attached to post as follows:
 - e. Welded to post after placement of anchoring material.
 - f. Anchor posts to steel with steel oval flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.
 4. Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
 - a. Anchor rail ends to steel with steel oval or round flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.
- G. Install removable railing sections where indicated in slip-fit metal sockets cast into concrete.
1. Accurately locate sockets to match post spacing.
- H. Secure handrails to wall with wall brackets and end fittings.
1. Provide bracket min. of 1-1/2 inch clearance from inside face of handrail and finished wall surface.
 2. Locate brackets as indicated, or if not indicated, 6" from each end and maximum of 4'-0" on center.
 3. Secure wall brackets and wall return fittings to building construction as follows:
 - a. Use type of bracket with pre-drilled hole for exposed bolt anchorage.
 - b. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.

- c. For hollow masonry anchorage, use toggle bolts having square heads.
- d. For wood stud partitions, use lag bolts set into wood backing between studs; coordinate with stud installations for accurate location of backing members.
- e. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

I. Expansion Joints:

- 1. Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet.
- 2. Provide slip joint with internal sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6" of post.

3.13 INSTALLATION OF STAIR NOSINGS

- A. Install safety treads in accordance with Architectural details and manufacturers written instructions.
- B. Install safety treads on each stair and step not covered by finished flooring.
- C. Set stair nosing prior to pouring concrete; extend integral stud anchor into concrete a minimum of 4". Embed anchor in concrete.
 - 1. Nosing shall be securely anchored in place and shall be free from play or movement.
- D. Set nosing straight and in correct alignment.
- E. Clean stair nosings of soil, stains and concrete.

3.14 INSTALLATION OF LOUVER PROTECTION SCREENS

- A. Installations: Unless otherwise detailed or noted the face of the louver protection screen to be flush with the face of the wall.
- B. Bolt screen to angle with 3/8" bolts and flat washers at 16" on center, unless noted otherwise.
- C. Attach angle to block with lag screws and expansion shield where secured to solid block and toggle bolts where secured to block cavity.
 - 1. Fasteners to be at 16" on center unless noted otherwise.
- D. Prepare and finish.
 - 1. Grind and sand all edges to eliminate all roughness.
 - 2. Field Paint screen and frame, color to be selected by the Architect.

3.15 INSTALLATION OF EXPANSION JOINT COVERS

- A. Set covers in accordance with manufacturer's printed instructions or drawings in locations indicated.
- B. Provide concealed secure anchorage with anchors recommended for substrate encountered; min. 2'-0" o.c.
- C. Keep joint free of all debris and materials which would prevent movement.
- D. Expansion joint cover shall be installed in a manner to allow movement of wall and cover.
- E. Install straight, plumb and true.
- F. Install fire rated expansion joint covers in a manner to ensure continuity of fire rated assembly and in accordance with U.L. requirements.

3.16 ADJUSTING AND CLEANING

- A. Touch-Up Painting:
1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.
 2. Apply by brush or spray to provide min. dry film thickness of 2.0 mils.

END OF SECTION 05500

SECTION 06100
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Types of work in this Section include rough carpentry for:
 - 1. Construction Panels.
 - 2. Wood grounds, nailers and blocking; Wood furring.
 - 3. Sheathing; Platform Sub-flooring; Platform Flooring
- B. Finish carpentry is specified in another section within Division 6.
- C. Polyethylene vapor barrier specified in Section 07150, Moisture Barriers.
- D. Building paper specified in Section 07150, Moisture Barriers.

1.03 DEFINITIONS

- A. Rough carpentry includes carpentry work not specified as part of other sections and is generally not exposed, except as otherwise indicated.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for materials listed below:
 - 1. Sheathing; Construction Panels
 - 2. Sheathing; PlatformFlooring
- B. Material Certificates:
 - 1. Where dimensional lumber provided to comply with min. allowable unit stresses, submit listing of species and grade selected for each use, and submit evidence of compliance with specified requirements.
 - 2. Compliance may be in form of signed copy of applicable portion of lumber producer's grading rules showing design values for selected species and grade.
 - 3. Design values: Approved by Board of Review of American Lumber Standards Committee.
- C. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storing, installation and finishing of treated material.
 - 1. Preservative Treatment: For each type specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and conformance with applicable standards.
 - 2. For water-borne treatment, include statement that moisture content of treated materials reduced to levels indicated prior to shipment to Project site.
 - 3. Fire-Retardant Treatment: Include certification by treating plant that treated material complies with specified standard and other requirements.

1.05 PRODUCT HANDLING

- A. Delivery and Storage:
 - 1. Keep materials under cover and dry.
 - 2. Protect against exposure to weather and contact with damp or wet surfaces.
 - 3. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

4. For lumber and plywood pressure treated with waterborne chemicals, sticker between each course to provide air circulation.

1.06 PROJECT CONDITIONS

- A. Coordination:
 1. Fit carpentry work to other work; scribe and cope as required for accurate fit.
 2. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

PART 2 - PRODUCTS

2.01 LUMBER, GENERAL

- A. Lumber Standards: Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- B. Inspection Agencies: Inspection agencies and abbreviations used to reference with lumber grades and species include following:
 1. SPIB - Southern Pine Inspection Bureau.
 2. WCLIB - West Coast Lumber Inspection Bureau.
 3. WWPA - Western Wood Products Association.
- C. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 1. For exposed lumber apply grade stamps to ends or back of each piece, or omit grade stamps entirely and issue certificate of grade compliance from inspection agency in lieu of grade stamp.
 2. Nominal sizes are indicated, except as shown by detail dimensions.
 3. Provide actual sizes as required by PS 20, for moisture content specified for each use.
 4. Provide dressed lumber, S4S, unless otherwise indicated.
 5. Provide seasoned lumber with 19% max. moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

2.02 MISCELLANEOUS LUMBER

- A. Provide wood for support or attachment of other work including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members.
- B. Provide lumber of sizes indicated, worked into shapes shown, and as follows:
 1. Moisture content: 19% max. for lumber items not specified to receive wood preservative treatment.
 2. Grade: Standard Grade light framing size lumber of any species or board size lumber as required.

2.03 CONSTRUCTION PANELS

- A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood panels and, for products not manufactured under PS 1 provisions, with American Plywood Associates (APA) "Performance Standard and Policies for Structural-Use Panels", Form No. E445.
- B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.
- C. Concealed APA Performance-Rated Panels: Where construction panels used for following concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.

1. Platform Sub-flooring: APA RATED SHEATHING.
 - a. Material: Plywood.
 - b. Exposure Durability Classification: Exterior
 - c. Span Rating: As required to suit joist spacing indicated.
 - d. Grade: B/C
 - e. Treatment: Fire retardant treated.
 - f. Thickness: 3/4" unless noted otherwise.
 2. Wall Sheathing: APA RATED SHEATHING.
 - a. Material: Plywood.
 - b. Exposure Durability Classification: Exterior.
 - c. Span Rating: As required to suit stud spacing indicated.
 - d. Grade: A/C Plugged
 - e. Treatment: Fire retardant treated
 - f. Thickness: 3/4" unless noted otherwise.
 3. Plywood Backing Panels: APA RATED:
 - a. Use: Backboard for mounting telephone and electrical equipment.
 - b. Material: Plywood.
 - c. Treatment: Fire retardant treated.
 - d. Grade: C-D Plugged; Interior glue
 - e. Thickness: 3/4" unless noted otherwise.
- D. Exposed Construction Panels: Where construction panels used for following types of applications, provide panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.
1. Platform Floor: APA RATED SHEATHING.
 - a. Material: Plywood.
 - b. Exposure Durability Classification: Exterior
 - c. Span Rating: As required to suit joist spacing indicated.
 - d. Treatment: Fire retardant treated
 - e. Grade: A/B
 - f. Thickness: 3/4" unless noted otherwise.
 - g. Surface: Fully sanded face.

2.04 MISCELLANEOUS MATERIALS

- A. Fasteners and Anchorages: Provide size, type, material and finish indicated and recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices.
 1. Wood plate and nailers to concrete: Min. 3/8" dia. Tapcon, Molly "Parabolts", or equal, 16" o.c.; predrill wood member 1/16" dia. larger than bolt size.
 2. Wood members to metal framing: Min. #8 "Tek's" self-drilling screws, 8" o.c. or 3/8" min. dia. machine bolts 16" o.c.
 3. Wood furring or grounds to concrete or masonry: Min. 3/8" dia. flathead Tapcon screws, 8" o.c.
 4. Wood members to metal decking: Min. 11-16 x 2-1/4" oval head, type 5 "Tek's" screws, 12" o.c.
 5. Wood blocking and nailers to structural steel: Min. 5/8" carriage bolts at max. 24" on center.
 6. Where rough carpentry work exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with hot-dip zinc coating (ASTM A 153).
- B. Building Paper: ASTM D 226, Type I; asphalt saturated felt, non-perforated, 15-lb. type.
- C. Building Paper: ASTM D 226, Type II; asphalt saturated felt, non-perforated, 30-lb. type.

2.05 WOOD TREATMENT BY PRESSURE PROCESS

- A. Preservative Treatment:
 - 1. Where lumber or plywood is indicated as "PT" or "Treated," or is specified herein as treated, comply with applicable requirements of AWPB Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below.
 - 2. Mark each treated item with the AWPB Quality Mark Requirements.
- B. Pressure-treat above-ground items with water-borne preservatives to comply with AWPB LP-2.
 - 1. After treatment, kiln-dry lumber and plywood to max. moisture content, respectively, of 19% and 15%.
 - 2. Treat indicated items and following:
 - a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
 - b. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.
 - c. Wood framing members less than 18" above grade.
 - d. Wood floor plates installed over concrete slabs directly in contact with earth.
- C. Pressure-treat following with water-borne preservatives for ground contact use complying with AWPB LP-22:
 - 1. Wood members in contact with ground.
- D. Complete fabrication of treated items prior to treatment, where possible.
 - 1. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment and to comply with AWPB M4.
 - 2. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- E. Fire-Retardant Treatment: Where fire-retardant treated wood indicated, pressure impregnate lumber and plywood with fire-retardant chemicals to comply with AWPB C20 and C27, respectively, for treatment type indicated below; identify fire-retardant treated lumber with appropriate classification marking of Underwriters Laboratories, Inc., U.S. Testing, Timber Products Inspection or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire Retardant Type:
 - a. Interior Type A: Use where fire retardant wood indicated for interior applications.
 - b. Exterior Type: Use where fire retardant wood indicated for exterior.
 - 2. Application: All rough carpentry to be fire retardant treated, unless specifically noted as not being fire retardant treated.
- F. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.
- G. Peel and Stick Membrane: Membrane shall be a 40 mil thick, peel and stick, SBS (styrene butadiene styrene) modified, rubberized asphalt sheet waterproofing underlayment. With an internally reinforced non-woven polyester fabric, Roofing Underlayment shall have a white reflective topping for added foot safety as well as heat reduction on the deck and protection against short term Ultra Violet damage. A removable release film shall be on the membrane under side for ease of application.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Discard units of material with defects which might impair quality of work, and units too small to use in fabricating work with min. joints or optimum joint arrangement.
- B. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.

- C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.
 - 1. Countersink nail heads on exposed carpentry work and fill holes.
 - 2. Use common wire nails, except as otherwise indicated.
 - 3. Use finishing nails for finish work.
 - 4. Select fasteners of size that do not penetrate members where opposite side exposed to view or will receive finish materials.
 - 5. Make tight connections between members.
 - 6. Install fasteners without splitting of wood; predrill as required.

3.02 WOOD GROUNDS, NAILERS, BLOCKING AND SLEEPERS

- A. Provide wherever shown and where required for screeding or attachment of other work.
 - 1. Form to shapes shown and cut as required for true line and level of work attached.
 - 2. Coordinate location with other work involved.
- B. Attach to substrates as required to support applied loading.
 - 1. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.
 - 2. Build into masonry during installation of masonry work.
 - 3. Where possible, anchor to formwork before concrete placement.

3.03 WOOD FURRING

- A. Install plumb and level with closure strips at edges and openings.
 - 1. Shim with wood as required for tolerance of finished work.
 - 2. Firestop furred spaces on walls at each floor level and at ceiling line of top story, with wood blocking or noncombustible materials, accurately fitted to close furred spaces.
- B. Furring to Receive Plywood Paneling:
 - 1. Unless otherwise indicated, provide 1" x 3" furring at 2' o.c., horizontally and vertically.
 - 2. Select furring for freedom from knots capable of producing bent-over nails and resulting damage to paneling.
- C. Furring to Receive Gypsum Drywall: Unless otherwise indicated, provide 1" x 2" furring at 16" o.c., vertically.
- D. Suspended Furring:
 - 1. Provide size and spacing shown, including hangers and attachment devices.
 - 2. Level to tolerance of 1/8" in 10', except 1/4" in 10' for thick-coat plaster work.

3.04 INSTALLATION OF CONSTRUCTION PANELS

- A. General: Comply with applicable recommendations contained in Form No. E 30F, "APA Design/Construction Guide - Residential & Commercial," for types of plywood products and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Sheathing: Nail to framing.
 - 2. Plywood Backing Panels: Nail to supports.
- C. Platform Sub-flooring:
 - 1. Lay min 6 mil clear polyethylene vapor barrier over concrete slab. Seal joints in vapor barrier with clear tape of type recommended by vapor barrier manufacturer.
 - 2. Install P.T. 2 X 4 sleepers on vapor barrier in accordance with following:
 - a. Nailers to be placed perpendicular to stage front and continuously along perimeter of stage.
 - b. Attach to concrete slab with power actuated fasteners at max. 8" on center.
 - c. Notch 2 X 4 sleepers (3/4" X 3/4") at 16" on center for ventilation.
 - d. Space sleepers at 16" on center.
 - 3. Fasten sub-flooring to sleepers with construction adhesive and cement coated common nails spaced 8" on center.

- D. Wall Sheathing: Where indicated install wall sheathing in accordance with following:
 - 1. On Metal Studs: Screw attach at 8" on center at each support.
 - 2. On Structural Steel: Bolt to support at 8" on center with 1/4" bolts.
 - E. Platform Flooring:
 - 1. Lay 15# building paper over stage sub-flooring.
 - 2. Attach stage finished flooring to sub-flooring with finish nails spaced 6" on center along length of each support.
 - 3. Sand surface of floor; fill indentations and depressions with wood filler.
 - 4. Paint surface of stage floor flat black, unless noted otherwise.
 - F. Telephone Back Board:
 - 1. Provide a minimum of two separate telephone back boards in locations shown on Electrical Drawings; If not shown as directed by Architect.
 - 2. Unless noted otherwise backboards to be 3/4" thick plywood; 8'-0" x 8'-0", mounted on face of wall at 8" above finished floor.
 - a. Attach to wall with 1/4" toggle bolts at 1'-0" on center along perimeter of plywood.
 - b. Field paint back board with primer and two coats of black paint.
 - G. Computer Back Board:
 - 1. Provide a minimum of two separate computer back boards in locations shown on Electrical Drawings; If not shown as directed by Architect.
 - 2. Unless noted otherwise backboards to be 3/4" thick plywood; 8'-0" x 8'-0", mounted on face of wall at 8" above finished floor.
 - a. Attach to wall with 1/4" toggle bolts at 1'-0" on center along perimeter of plywood.
 - b. Field paint back board with primer and two coats of black paint.
- 3.05 TREATED LUMBER
- A. Treated lumber shall be completely isolated from any direct contact with steel products by using 40 mil asphaltic waterproof membrane or an equal product. Steel anchors in contact with such lumber must be stainless steel.

END OF SECTION 06100

SECTION 06400
ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of each type of architectural woodwork is indicated and scheduled.
- B. Types of architectural woodwork include the following:
 - 1. Interior standing and running trim, and rails, including:
 - a. Trim at acoustical wall panels
 - b. Trim at display cases
 - c. Trim at low wall
 - 2. Architectural cabinets including:
 - a. Wood cabinets.
 - b. Tops.
 - 3. Solid core flush wood doors for use on:
 - a. Teachers Cabinets
 - b. Storage Cabinets
 - 4. Solid Surfacing for use on:
 - a. Window Stools
 - 5. Closet Shelving
 - 6. Miscellaneous Shelving
 - 7. Finish hardware installation.
- C. Solid core wood doors for teachers and storage cabinets and similar items to be furnished and installed as part of this section. Doors to comply with requirements of this Section and Division-8 Section 08211, "Flush Wood Doors".

1.03 QUALITY ASSURANCE

- A. Quality Standards:
 - 1. AWI Quality Standard: Comply with applicable requirements of Architectural Woodwork Institute (AWI), "Architectural Woodwork Quality Standards".
 - 2. Woodwork Institute Manual of Millwork: Comply with applicable requirements of the Woodwork Institute Manual of Millwork, 11th edition, May 1, 2003.
 - 3. Where conflicts exist between above referenced standards, the more rigid of the standards shall apply.
- B. Coordination: Distribute copies of approved scheduled for cabinet hardware specified in Division-8 section "Finish Hardware" to manufacturer of architectural woodwork; coordinate cabinet shop drawings and fabrication with hardware requirements.
- C. Installer Qualifications: Arrange for installation of architectural woodwork items by same firm which fabricated them.
- D. NWWDA Quality Standard: I.S.1 "Industry Standard for Wood Flush Doors", of National Wood Window and Door Association (NWWDA).
- E. AWI Quality Standards: "Architectural Woodwork Quality Standards", including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDS quality standard.
 - 1. Provide Type I glue for all applications.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each product and process specified as work of this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.
 - 1. Submit door manufacturer's technical data for each type door, including details of core and edge construction.
- B. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storing, installation, and finish of treated material.
 - 1. Pressure Preservative Treatment: For each type of treatment and wood species indicated, include certification of treating plant stating type of preservative solution, net amount of preservatives retained, depth of penetration and compliance with indicated standards.
- C. Quality Certification: Submit woodwork Manufacturer's (Fabricator's) certification, stating that fabricated woodwork complies with quality grades and other requirements indicated.
- D. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components.
- E. Samples: Submit the following samples:
 - 1. Lumber with for transparent finish; 6" x 3/4" x 18", for each species and cut, finished on one side and one edge.
 - 2. Wood veneer faced panel products, with transparent finish, finished, 8" x 10", for each species and cut.
 - 3. Lumber or panel products with factory-applied opaque finish, 8" x 10", for each finish system and color.
 - 4. Plastic laminate, 8" x 10" for each type, color, pattern and surface finish.
 - 5. Flexible wood paneling, 8" x 10" for each type, pattern and surface finish.
 - 6. Sample of completed base and overhead cabinet, teachers cabinet and storage shelving with specified finish.
 - 7. Exposed cabinet hardware, one unit of each type and finish.
 - 8. Corner sample of door with partially removed face veneer to expose construction type.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver woodwork, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas.
 - 1. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.06 PROJECT CONDITIONS

- A. Conditioning: Woodwork Manufacturer and Installer advise Contractor of temperature and humidity requirements for woodwork installation and storage areas.
 - 1. Do not install woodwork until required temperature and relative humidity stabilized and maintained in installation areas.
- B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period.
 - 1. Require Woodwork Manufacturer to establish optimum moisture content and required temperature and humidity condition.

1.07 WARRANTY

- A. Submit written agreement on door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty also include refinishing and reinstallation required due to repair or replacement of defective doors where defect not apparent to hanging.
 2. Warranty in effect during following period of time after date of Final Acceptance.
 - a. Solid Core Interior Doors: Life of installation.
- B. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
1. High Pressure Decorative Laminates:
 - a. Consoweld Corp.
 - b. Formica Corp.
 - c. Lamin-Art.
 - d. Micarta Div., Westinghouse Electric Corp.
 - e. Nevamar Corp.
 2. Solid Surfacing:
 - a. DuPont "Corian"
 - b. Avonite.
 - c. Wilson Art "Gibraltar"
 3. Solid Core Doors:
 - a. Algoma Hardwoods, Inc.
 - b. Eggers Industries, Architectural Door Division.
 - c. Graham Manufacturing
 - d. Oshkosh Architectural Door Company
 - e. Marshfield Door Systems (Weyerhaeuser Company)

2.02 FABRICATION, GENERAL

- A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber at time of fabrication and for relative humidity conditions in the installation areas.
- B. Fabricate woodwork to dimensions, profiles, and details indicated with openings and mortises precut, where possible, to receive hardware and other items and work.
1. Ease edges to 1/16" radius, for corners of cabinets and edges of solid wood (lumber) members less than 1" in nominal thickness, 1/8" radius for edges of rails and similar members over 1" in nominal thickness.
 2. Molding Patterns: Stock patterns indicated on drawings or herein reference **AWI** design numbers.
- C. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site to maximum extent possible.
1. Disassemble components only as necessary for shipment and installation.
 2. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Pre-Cut Openings:
1. Fabricate architectural woodwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items.
 2. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape.
 3. Smooth edges of cutoffs and, where located in counter tops and similar exposures seal edges of cutouts with a water-resistant coating.
- E. Measurements:
1. Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain field measurements and verify dimensions and shop drawing details as required for accurate fit.
 2. Where sequence of measuring substrates before fabrication would delay the project, proceed with fabrication (without field measurements) and provide ample borders and edges to allow for subsequent scribing and trimming of woodwork for accurate fit.

- F. Fabricate flush wood doors to produce doors complying with following requirements:
 - 1. In sizes indicated for job-site fitting.
 - 2. Face veneer gluing: Secure face veneer to core using hot press with type I glue.
 - 3. Stiles and Rails: Secure stiles and rails to core with type I glue; dry set slabs not acceptable.

2.03 PRESERVATIVE TREATMENT BY PRESSURE PROCESS

- A. General:
 - 1. Use only preservative solutions and treating processes demonstrated through successful experience and recommended by manufacturer of preservative chemicals and wood treatment plant as being suitable for architectural woodwork of type, species, and finish indicated.
 - a. Comply with AWWPA standards indicated and with instructions of preservative chemical manufacturer.
 - 1) AWWPA Standard for Lumber: AWWPA C2.
 - 2) AWWPA Standard for Plywood: AWWPA C9.
 - 2. Provide retentions and penetrations of preservatives to comply with referenced treatment standards to suit exposure conditions indicated, or, if retention/penetration requirements not included for species indicated, as recommended by manufacturer of preservative chemical solutions.
 - 3. Do not introduce colorants into preservative solutions to distinguish treated wood from untreated wood unless otherwise indicated.
 - 4. Moisture content requirements indicated elsewhere in this Section apply to treated woodwork as well.
 - a. Maintain moisture content required both before and after treatment.
 - 5. Treat individual woodwork components prior to assembly but after machining and sanding has been completed to maximum extent possible.
 - a. Coat surfaces cut after treatment with a heavy brush coating of preservative of type recommended by preservative manufacturer.
 - 6. Discard treated wood products which do not comply with material and other requirements of referenced woodworking standard.
 - a. Do not use twisted, warped, bowed or otherwise damaged or defective wood.
- B. Preservative Type:
 - 1. Volatile Hydrocarbon Solvent-Penta Solution: Pentachlorophenol complying with AWWPA P8 and volatile petroleum solvent (liquefied petroleum gas) complying with AWWPA P9, Type B.
 - a. AWWPA Standard for Above Ground Use: APWB L-4.
 - b. AWWPA Standard for Ground Contact Use: AWPB LP-44.
 - 2. Product: "Cellon" by Koppers Co. Inc.
- C. Extent of Woodwork for Treatment by Pressure Process:
 - 1. Pressure treat the following items of woodwork:
 - a. Exterior woodwork indicated to be preservative treated.
 - b. Interior woodwork indicated to be preservative treated.

2.04 STANDING AND RUNNING TRIM, AND RAILS

- A. Quality Standard: Comply with AWI Section 300.
- B. Rout or groove backs of flat trim members, kerf backs of other wide flat members, except for members with ends exposed in finished work.
 - 1. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- C. Interior Trim and Rails for **Transparent** Finish: Comply with the following requirements:
 - 1. Grade: Custom.
 - 2. Lumber Species: White Birch, plain sawn/sliced.
 - 3. Molding Patterns: Stock molding patterns shown or indicated, reference **AWI** design numbers.

2.05 ARCHITECTURAL CABINETS, WOOD

- A. Quality Standard: Comply with requirements of each of the following:
 - 1. AWI Section 400 and its Division 400A "Wood Cabinets".
 - 2. Manual of Millwork , Applicable Sections
- B. Wood Cabinets for **Transparent** Finish: Comply with the following requirements:
 - 1. Grade: Custom, no particle board permitted.
 - 2. Type of Construction: As indicated.
 - 3. Wood Species for Exposed Surfaces:
 - a. White Birch, plain sawn/sliced.
 - b. Grain Matching: Run and match grain vertically for drawer fronts, doors and fixed panels.
 - c. Grain Appearance: Grain appearance and direction of solid lumber to match veneer lumber (plywood).
 - d. Coloration: Color of adjacent members and coloration of veneer lumber and solid lumber to match.
 - e. Veneer Lumber Grade: Plywood to be A/A grade, lumber core, unless otherwise noted herein.
 - 4. Wood Species for Semi-Exposed Surfaces, including behind drawers and doors:
 - a. Match exposed surfaces.
 - 5. Concealed Members:
 - a. Solid Lumber or Plywood: Any species, with no defects affecting strength or utility.
 - b. Particle board: Not permitted.
 - c. Hardboard: ANSI A135.4, Class 1, tempered.
 - 6. Provide dust panels of 1/4" plywood or tempered hardboard above compartments and drawers except where located directly under tops.
- C. Solid Core Doors for Transparent Finish: Comply with following requirements:
 - 1. Faces: White Birch; plain sawn/sliced; 'A' Grade; 1/50" Minimum thick before sanding.
 - 2. AWI Grade: Custom.
 - 3. Construction: PC-5 (Particle board core, LD-2, 5-ply) or or SCLC-5 (Structural Composite Lumber Core, 5 ply), hot press
 - 4. Exposed Edges: Same species as face veneers.
 - 5. Thickness: 1-3/8" thick unless noted otherwise.

2.06 CABINET HARDWARE AND ACCESSORY MATERIALS

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items which are specified in Division-8 section "Finish Hardware".
- B. Cabinet Hardware Schedule: Refer to schedule at end of this section for cabinet hardware required for architectural cabinets.
- C. Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.
- D. Hardware Finishes: Comply with BHMA 1301 for finishes indicated by BHMA Code Numbers or if not otherwise indicated, provide finishes complying with requirements indicated below:
 - 1. For exposed hardware comply with requirements indicated for finish and base indicated by BHMA Code Number below:
 - a. 626 (Satin chromium plated, brass or bronze base).
 - 2. For concealed hardware provide manufacturer's standard finish which complies with product class requirements of ANSI/BHMA A156.9.

2.10 ARCHITECTURAL CABINET TOPS

- A. Quality Standard: Comply with AWI Section 400 and its Division 400C.
- B. Type of Counter Top: High Pressure Decorative Laminate:
 - 1. Applications: Areas other than those indicated or detailed as being solid surfacing.
 - 2. Grade: Custom.

3. Laminate Cladding for Horizontal Surface: High pressure decorative laminate complying with NEMA LD 3 and as follows:
 - a. Colors, Patterns, and Finishes: As selected by Architect from manufacturers standard colors and finishes.
 - b. Thickness: 0.0628" nominal thickness (1/16")
 - c. Grain Direction: Parallel to longest dimension.
 - d. Edge Treatment:
 - 1) Same as laminate cladding on horizontal surface.
 - 2) Where indicated provide lumber edge for transparent finish matching wood species and cut on cabinet surfaces.

- C. Counter Top Sheathing: Plywood with grade designation of APA C-D Plugged, Exterior, Pine with exterior glue of 3/4" thickness unless noted or detailed otherwise. Use of particle board prohibited.
- D. Counter Backsplash: Backsplash to consist of plastic laminate on 1 X 4 softwood, unless detailed or noted otherwise.

2.11 WINDOW STOOLS

- A. Mineral-filled acrylic resin composition, solid surface/solid plastic:
 1. Thickness: 3/4" size of shapes indicated
 2. Colors: Architect shall select colors from one of the following:
 - a. Glacier White, Cameo White, Bone, Dusk, Sand Stone
 3. Edge Treatment:
 - a. Square where abutting other surfaces, with edge rounded to 1/4" radius where exposed.
 - b. At bull nose block form shape to follow block profile.
 4. Length to be as required to extend full rough opening of window. Use maximum length section; no section to be less than 4'-0" long.

2.12 THRESHOLDS

- A. Mineral-filled acrylic resin composition, solid surface/solid plastic:
 1. Thickness: 3/4" size of shapes indicated
 2. Colors: Architect shall select colors from one of the following:
 - a. Glacier White, Cameo White, Bone, Dusk, Sand Stone
 3. Edge Treatment:
 - a. Square where abutting other surfaces, with edge rounded to 1/4" radius where exposed.
 - b. At bull nose block form shape to follow block profile.
 4. Thickness to be as required to extend 1/4" above surface of floor tile.
 5. Where adjacent floor elevations differs, slope top surface at 1:12 to comply with handicapped provisions.
 6. Width of threshold to be minimum 4"; width as required to provide sloped surface at 1:12.
 7. Length to be as required to extend full rough opening of door or opening. Use maximum length sections; no section to be less than 3'-0" long.

2.13 CLOSET SHELVING

- A. Quality Standard: Comply with AWI Section 600.
- B. Shelving for **Transparent** Finish: Comply with the following requirements:
 1. Grade: Custom.
 2. Shelving Material: Birch faced veneer core plywood.
- C. Application:
 1. Provide closet shelving where indicated on drawings.

2.14 MISCELLANEOUS SHELVING:

- A. Quality Standard: Comply with AWI Section 600.

- B. Shelving for Transparent Finish: Comply with the following requirements:
 - 1. Grade: Custom.
 - 2. Shelving Material: Birch faced veneer core plywood.
 - 3. Edging: Solid Hardwood banding of species to match shelving.
- C. Application: Provide miscellaneous shelving as follows:
 - 1. Where shelving shown on drawings and is referred to as 'Shelving', 'Misc. Shelving' or 'Miscellaneous shelving' or where details of Miscellaneous Shelving referenced.
 - 2. Where shelving shown on drawings but not noted or referenced as to type.

2.15 CLOSET AND SHELVING HARDWARE

- A. Adjustable Shelf Standards and Related Supports: Provide standards and supports of type indicated which comply with ANSI/BHMA A156.9.
 - 1. Horizontal Slotted Type: Mortise mounted, 5/8" wide x 3/16" high x length indicated, BHMA No B84071, zinc-plated steel.
 - 2. Support Type: Closed shelf rest, BHMA No. B84081, zinc-plated steel.
- B. Clothes Poles and Supports: Provide stainless steel pipe or tubing cut to lengths required, with stainless steel flanges.
 - 1. Size: 1.314" O.D., 0.1333" wall thickness (1").
 - 2. Center Brackets: Combination shelf and closet pole support; stainless steel.

2.16 FASTENERS AND ANCHORS

- A. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S-111 for applicable requirements.
 - 1. For metal framing supports, provide screws as recommended by metal framing manufacturer.
- B. Nails: Select material, type, size and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
 - 1. Provide stainless steel or aluminum nails for exposed exterior woodwork which is to receive transparent finish (if any).
 - 2. Provide any type of non-corrosive nail for other exterior woodwork.
- C. Anchors: Select material, type, size and finish required by each substrate for secure anchorage.
 - 1. Provide non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance.
 - 2. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.
 - 3. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.17 FACTORY FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

- A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.
- B. General: The entire finish of interior architectural woodwork is work of this section, regardless of whether factory-applied or applied after installation.
- C. Factory Finishing: To the greatest extent possible, finish architectural woodwork at factory; defer only final touch-up, cleaning and polishing for time after delivery and installation.
- D. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing of concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.
 - 1. Apply painter's finish to all exposed and semi-exposed portions of cabinets, including cabinet interior.
 - 2. Backprime all cabinets prior to installation.

- E. **Transparent** Finish for Open Grain Woods: Comply with requirements indicated below for grade, finish system, staining, effect and sheen.
1. Custom: Custom.
 2. Finish: AWI Finish System #5 catalyzed polyurethane.
 3. Staining: To match color selected by Architect.
 4. Effect: Closed grain (filled finish).
 5. Sheen: Semi-gloss.
- F. **Transparent** Finish for Closed-Grain Woods: Comply with requirements indicated below for grade, finish system, staining, effect and sheen.
1. Grade: Premium.
 2. Finish: AWI Finish System #5 catalyzed polyurethane.
 3. Staining: To match color selected by Architect.
 4. Effect: Closed grain.
 5. Sheen: Semi-gloss.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.
- B. Pre-Installation Meeting:
1. Meet at project site prior to delivery of architectural woodwork and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work.
 2. Include Contractor; Architect and other Owner Representatives (if any); Installers of architectural woodwork, wet work such as plastering, other finishes, painting, mechanical work and electrical work; and firms or persons responsible for continued operation (whether temporary or permanent) of HVAC system required to maintain temperature and humidity conditions.
 3. Proceed with woodwork installation only when all concerned agree that required ambient conditions can be maintained.
- C. Deliver concrete inserts and similar anchoring devices to be built into substrates, well in advance of time substrates are to be built.
- D. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

3.02 INSTALLATION

- A. Install woodwork plumb, level, true and straight with no distortions.
1. Shim as required using concealed shims.
 2. Install to tolerance of 1/8" in 8'-0" for plumb and level (including tops); and with no variations in flushness of adjoining surfaces.
- B. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- C. Pressure Treated Wood: Handle, store, and install pressure treated wood in compliance with recommendations of chemical treatment manufacturer including those for adhesives, where required for installation.
1. For preservative treated lumber cut or drilled in field, treat cut ends with preservative solution used for original treatment by brushing, spraying, dipping or soaking; as required by AWWPA M4.
- D. Anchor woodwork to anchors or blocking built-in or directly attached.
1. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation.
 2. Except where prefinished matching fasteners heads required, countersink fine finishing nails for exposed nailing and fill flush with woodwork, matching final finish where transparent finish indicated.

- E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
 - 1. Use scarf joints for end-to-end joints.
 - 2. Stagger joints in adjacent and related members.
 - 3. Cope at returns, miter at corners and comply with referenced Quality Standards for joinery.
 - F. Wood Storage (Miscellaneous) Shelving: Complete the assembly of units and install in the areas indicated, including hardware and accessories as indicated.
 - 1. At corners and intersections provide 'filler' cap to enclose opening at top of cabinets.
 - 2. Except where noted otherwise securely fasten shelving unit thru cleat at back of units to substrate with fasteners suitable for back up materials, using minimum 3/8" diameter epoxy set type fasteners, at maximum of 12" on center (minimum three (3) anchors per shelving unit).
 - G. Rods: Clothes poles shall be installed in a manner to limit deflection of pole to no more than 1/2".
 - 1. Where length of pole exceeds 42", provide intermediate (center) support brackets at a maximum of 42" on center.
 - H. Finish Hardware Installation:
 - 1. Supplier to mark each item of hardware for location.
 - a. Protect markings until each item installed.
 - b. If any item of hardware delivered to job not marked, return to supplier for marking before attempting to install.
 - 2. Install and make adjustments for correct working order.
 - 3. Replace hardware damaged by improper adjustment or abuse, at no additional cost to Owner.
 - 4. Fit all surface applied hardware.
 - 5. Provide clean, sized and placed mortises and drilled holes for all mortise hardware such as lock sets, flush bolts and pivots.
 - 6. After hardware installation, protect exposed surfaces from wear and abuse with heavy paper and masking tape; maintain until job completion.
 - 7. Center kickplates at bottom of doors and provide same margin at bottom as at sides.
 - 8. Remove all hardware, except that which is primed for painting, before painter's finish applied and replace and readjust for function after painter's finish completed and dried hard.
 - I. Thresholds: Install thresholds set in same type of setting bed as abutting field flooring unless otherwise indicated.
 - 1. Install at locations indicated and where exposed edge of tile flooring meets other finished flooring material where top of adjacent finished flooring approximately equal in elevation.
 - 2. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent non-tile floor finish.
 - 3. Install in a manner necessary so that top surface of threshold is maximum 1/4" above adjacent finished flooring surface.
 - 4. Where possible use single piece threshold for each unbroken length.
 - 5. Miter outside and inside corners.
- 3.03 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION
- A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair replace woodwork. Adjust joinery for uniform appearance.
 - B. Clean, lubricate and adjust hardware.
 - C. Clean woodwork on exposed and semi-exposed surfaces; touch-up shop-applied finishes to restore damaged or soiled areas.
 - D. Complete finishing work specified as work of this Section, to whatever extent not completed at shop or prior to installation of woodwork.
 - E. Provide final protection and maintain conditions, in manner acceptable to Fabricator and Installer, which ensures architectural woodwork being without damage or deterioration at time of Final Acceptance.

3.04 CABINET HARDWARE SCHEDULE

A. For each 1-3/8" thick solid core hinged door leaf:

1-1/2 pr.	Hinges	Hager	1191 4½X4½ US26D
		McKinney	2714 4½X4½ US26D
		Stanley	741 4½X4½ US26D
3	silencer	Quality	1337-B
		Hager	308D
		Glynn-Johnson	Z3
1	Stops	Quality	307 X US26D
		Hager	
		Ives	

Deadlock, lock sets and cylinders furnished and installed as part of Section 08710.

B. For each 1/4" sliding glass set:

1	Track assembly:	EpcO Co. 723-1 with 753 rollers and 730 jamb channels. Keelan Hardware Co. 2407 upper track and jamb channel, 2410 shoes, 2411 track and 2408 rollers.	
1	lock:	KnapE & Vogt P1092 with 1098 rollers and 1093 jamb channels. Best 3S773SS1 627 EpcO co. G-04 KnapE & Vogt 965 NP	

C. For adjustable shelves in cabinetwork:

2	Standards	Grant	120
		Lamp	SP-1820
		KnapE & Vogt	255
	Brackets	Grant	21
		Lamp	SPB-20
		KnapE & Vogt	256

D. For wall mounted shelves:

2	Standards	KnapE & Vogt	80 x length required x anochrome.
		Lamp	SP-1820
		Grant	
	Brackets	KnapE & Vogt	180 x length required x anochrome.
		Lamp	SPB-20
		Grant	

E. For closet accessories in or not in cabinets:

Rod	EpcO	870 x 850 flanges
	KnapE & Vogt	770 x 735 flanges
	Stanley	V7052
Shelf and Rod Supports	Hager	1797
	KnapE & Vogt	1195
	Stanley	7046
Rod Supports	Hager	1798
	KnapE & Vogt	KV9201
	Stanley	7037
Shelf Supports:	Hager	1796
	Lamp	BT-380
	Stanley	796

END OF SECTION 06400

**SECTION 07115
SHEET WATERPROOFING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of each type of sheet waterproofing work indicated on drawings.
- B. Types of sheet waterproofing specified in this Section include following:
 - 1. Composite sheet waterproofing.
 - 2. Premoulded membrane.
- C. Sheet waterproofing location of use: Sheet waterproofing to be used in the following applications and elsewhere where noted or indicated on drawings or in specifications:
 - 1. Composite sheet waterproofing for use in locations as follows:
 - a. Earth face of foundation wall where adjacent floor slabs at different levels.
 - b. Elevated slab waterproofing used in conjunction with split slab construction.
 - 2. Premoulded membrane for use in locations as follows: Floor slab membrane under concrete slab where specialty floor systems specified (Special Coatings, Synthetic, Rubber or Wood). Areas include, but not limited to:
 - a. Gymnasium floor where wood flooring specified to be installed.

1.03 SYSTEM PERFORMANCE

- A. Provide sheet waterproofing products produced and installed to establish and maintain watertight continuous seals.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Submit product data and general recommendations from waterproofing materials manufacturer, for types of waterproofing required.
 - 2. Include data substantiating that materials comply with requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Obtain primary waterproofing materials of each type required from single manufacturer, to greatest extent possible.
 - 2. Provide secondary materials only as recommended by manufacturer of primary materials.
- B. Installer: Firm with min. 3 years of successful experience in installation of waterproofing similar to requirements for this Project and acceptable to manufacturer of primary waterproofing materials.
- C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

1.06 PROJECT CONDITIONS

- A. Substrate: Proceed with work after substrate construction, openings, and penetrating work completed.
- B. Weather: Proceed with waterproofing and associated work only when existing and forecasted weather conditions permit work performed in accordance with manufacturers' recommendations and warranty requirements.

1.07 SPECIAL PROJECT WARRANTY

- A. Provide written warranty, agreeing to replace/repair defective materials and workmanship.
 - 1. Warranty to include responsibility for removal and replacement of other work which conceals sheet waterproofing.
 - 2. Warranty Period: 5 years after date of Final Acceptance.

PART 2 - PRODUCTS

2.01 General:

- A. Provide sheet waterproofing materials complying with required performance.
- B. Other similar materials certified in writing to be equal-to-or-better-than specified may be used if acceptable to Architect.

2.02 COMPOSITE SHEET WATERPROOFING

- A. Self-adhering membrane of polymeric, modified or rubberized asphalt integrally bonded to polyethylene sheeting, formed into uniform flexible sheets of thickness shown, or min. 56 mils if no thickness shown, complying with following:
 - 1. Tensile Strength: 250 psi; ASTM D 412.
 - 2. Ultimate Elongation: 300%; ASTM D 412.
 - 3. Brittleness Temperature: -25°F (-32°C); ASTM D 746.
 - 4. Hydrostatic Head Resistance: 150 feet min.
 - 5. Water Absorption: Min. 0.5% weight gain for 48 hours of immersion at 70°F (21°C); ASTM D 570.
- B. Products: Subject to compliance with requirements, provide one of following:
 - 1. Bituthene; W. R. Grace Co.
 - 2. Mel-Rol (vertical surfaces), Mel-Gard (horizontal surfaces); W. R. Meadows.
 - 3. Plastiwrap; Progress Unlimited, Inc.

2.03 PREMOULDED MEMBRANE

- A. Permanently bonded seven-ply pre moulded membrane consisting of a reinforced core and carrier sheet with fortified bitumen layers, protective weathercoating, and a plastic antistick sheet. Membrane to comply with following:
 - 1. Water vapor transmission rating: 0.000 grains/ft sq/hour.
- B. Products: Subject to compliance with requirements, provide one of following:
 - 1. Sealtight Premoulded Membrane; W. R. Meadows.
 - 2. W. R. Grace Co.
 - 3. Progress Unlimited, Inc.

2.04 DRAINAGE LAYER

- A. High flow stip and sheet drainage composite system designed for collection and transport of water to discharge pipes and drains at base of retaining walls and at edge of elevated split slab construction.

- B. Materials: Two-part prefabricated drainage composite consisting of a 12" (300 mm) high by 1" (25 mm) thick, 3-dimensional polystyrene core which is wrapped with a heavy 6-oz. non-woven polypropylene filter fabric.
 - 1. The 3-dimensional, dimple core shall provide compressive strength which allows water to flow to drainage discharge pipes.
 - 2. The filter fabric shall allow water, or other liquids to pass into the drainage core while restricting the passage of soil particles.
 - 3. The fabric shall be bonded to the core to minimize fabric intrusion into the core resulting from backfill pressure.
- C. Products: Subject to compliance with requirements, provide one of following:
 - 1. Aquadrain
 - 2. Applied Technology LLC
 - 3. Silka Sarnafil
 - 4. Carlisle Coating

2.05 AUXILIARY MATERIALS

- A. Adhesives: Provide types of adhesive compound and tapes recommended by waterproofing sheet manufacturer, for bonding to substrate (if required), for waterproof sealing of seams in membrane, and for waterproof sealing of joints between membrane and flashings, adjoining surfaces and projections through membrane.
- B. Primers: Provide type of concrete primer recommended by manufacturer of sheet waterproofing material for applications required.
- C. Coatings: Provide type of coating recommended by waterproofing sheet manufacturer, for improvement of weathering resistance on exposed areas of membrane, including areas extended as flashing (if any).
 - 1. Provide black coating except as otherwise indicated.
- D. Flashing Materials: Except as otherwise indicated, provide types of flexible sheet material for flashing as recommended by waterproofing sheet manufacturer.
- E. Protection Course: Where shown or recommended by manufacturer, provide type recommended by waterproofing sheet manufacturer, unless another type is indicated; include adhesives recommended by manufacturer.
 - 1. If waterproofing membrane complete with integral protection, no separate protection course required.
- F. Drainage Course: Provide nominal 1" diameter river washed, smooth edged stone as a pressure relief and drainage course.
 - 1. Drainage course shall extend from 8" below finished floor (or grade) to bottom of footing. Extend out a minimum of 1'-0" from face of retaining wall.
- G. Paper Slip Sheet: 5-lb. rosin-sized building paper.

PART 3 - EXECUTION

3.01 PREPARATION

- A. General: Comply with manufacturers instructions for surface preparation.
- B. Pre-installation Meeting: Prior to installation of waterproofing and associated work, meet at project site with Installer of each component of associated work, inspection and testing agency representatives (if any), and installers of work requiring coordination with waterproofing work.
 - 1. Review material selections and procedures to be followed in performing work.
- C. Inspection: Prior to application of waterproofing the contractor, waterproofing installer and waterproofing manufacturer shall jointly inspect the substrate onto which the waterproofing is to be installed.
 - 1. Make necessary corrections.
 - 2. Application of waterproofing shall be considered as acceptance of substrate as acceptable for each party to guarantee their portion of the work.

- D. Concrete Sub-slabs or Earth:
 - 1. Immediately before placement of waterproofing sheet, ensure removal of projections which might penetrate sheet or curing compounds which would interfere with fully bonded systems.
 - 2. Clean slab of loose material by brooming and vacuuming.
 - E. Concrete Decks: Install waterproofing membrane on top of concrete sub floor, extend across entire sub-floor area, down into floor drains, and turn up face of wall a minimum of 2".
 - 1. Immediately before placement of waterproofing sheet, grind or abrasive blast surface lightly to ensure removal of projections which might penetrate sheet or curing compounds which would interfere with fully bonded systems.
 - 2. Clean deck of loose material by brooming and vacuuming.
 - 3. Install drainage composite over water proofing.
 - F. Vertical Foundation Walls: Where adjacent floor elevations differ, whether specifically shown on drawings or not, provide continuous waterproofing membrane on earthen face of foundation wall from bottom of lower footing, across top of footing, up face of wall to level of underside of upper floor, unless detailed otherwise.
 - 1. Chip off projections where necessary for proper placement and adhesion of waterproofing sheet.
 - 2. Apply primer to concrete and masonry surfaces at rate recommended by manufacturer of primary waterproofing materials.
 - 3. Prime only area which will be covered by WP membrane in same working day; reprime areas not covered by WP membrane within 24 hours.
 - 4. Install drainage composite over water proofing.
- 3.02 INSTALLATION; GENERAL
- A. Comply with manufacturer's instructions for handling and installation of sheet waterproofing materials.
 - B. Coordinate installation of waterproofing materials and associated work to provide complete system complying with combined recommendations of manufacturers and installers involved in work.
 - 1. Schedule installation to minimize period of exposure of sheet waterproofing materials.
 - C. Extend waterproofing sheet and flashings as shown to provide complete membrane over area indicated waterproofed.
 - 1. Seal to projections through membrane and seal seams.
 - 2. Bond to vertical surfaces and also, where shown or recommended by manufacturer, bond to horizontal surfaces.
 - D. Membrane Lap: Apply horizontal membrane using dutch-lap method in accordance with manufactures written recommendations.
 - E. Top Edge Seal: For vertical and sloped wall membrane, finish in reglet (where provided), otherwise finish under flashing or under masonry in joint.
 - 1. Caulk exposed edges with mastic or sealant.
 - F. Expansion Joints:
 - 1. Install joint filler as recommended by manufacturer, with protruding rounded surface.
 - 2. Apply continuous 8" wide strip of membrane on joint followed by membrane application.
 - G. Coat exposed areas of sheet and flashing materials.
 - 1. Comply with sheet manufacturer's recommendations for application and cure of coating.
 - H. Install protection course of type indicated over completed membrane, complying with manufacturer's recommendations for both waterproofing sheet and protection course materials.
- 3.03 INSTALLATION; BELOW SLAB
- A. Install waterproofing membrane on top of concrete sub floor, extend across entire sub-floor area, down into floor drains, and turn up face of wall a minimum of 2".

- B. Extend waterproofing sheet and flashing as shown to provide complete membrane over area indicated waterproofed.
 - 1. Seal to projections through membrane and seal seams.
 - 2. Bond to vertical surfaces and also, where shown or recommended by manufacturer, bond to horizontal surfaces.
- C. Install drainage composite over water proofing.
 - 1. Install in strict conformance with manufacturers written instructions.

3.04 INSTALLATION; VERTICAL WALL/FOUNDATION

- A. At foundation walls extend waterproofing full height of foundation wall from top of floor slab to top of footings, across top of footing and down the face of the footing.
 - 1. Install waterproofing on sloping concrete wash at toe (top) of footing.
 - 2. Install stone drainage course along entire length of foundation wall receiving waterproofing. Drainage course shall extend from bottom of lower footing to within 8" of finished grade and shall extend out from face of wall a minimum of 2'-0"; unless otherwise detailed.
- B. Install drainage composite over water proofing.
 - 1. Install in strict conformance with manufacturers written instructions.
 - 2. At the base of a foundation wall, install drainage composite with the open core side up and the 2" (50mm) flap of filter fabric side against the wall.
 - 3. Secure the base drain to the foundation wall over bentonite waterproofing with washer-head fasteners placed through the 2" flap of filter fabric.
 - 4. Use a general construction adhesive, such as Liquid Nails, to secure drainage composite into position over the waterproofing membrane.
 - 5. Install a continuous strip of drainage composite along the base of the wall.
 - 6. Use couplers and corner fittings as required to form a continuous installation.
 - 7. Install discharge outlet fittings to discharge pipes as required for the project.
 - a. All the outlet fittings are designed to fit standard 4"(100mm) PVC sewer pipe.

3.05 PERFORMANCE REQUIREMENTS

- A. Waterproof membranes required to be watertight and not deteriorate in excess of limitations published by manufacturer.
- B. In-place Testing:
 - 1. Before completed membranes on horizontal surfaces covered by protection course or other work, test for leaks with 2" depth of water maintained for 24 hours.
 - 2. Repair any leaks revealed by examination of substructure and repeat test until no leakage observed.

3.06 CLEANING

- A. After completion, remove any masking materials and stains from exposed surfaces caused by waterproofing installation.

3.07 PROTECTION

- A. Institute all required procedures for protection of completed membrane during installation of work over membrane and throughout remainder of construction period.
- B. Do not allow traffic of any type on unprotected membrane.

END OF SECTION 07115

SECTION 07155
UNDER SLAB VAPOR BARRIERS/RETARDERS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Work includes provision of all labor, materials and equipment necessary to supply and install products herein specified.
- B. The following materials are specified in this Section:
 - 1. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Related Work Specified in other Sections Include:
 - 1. Cast in place concrete, Section 03300.
 - 2. Concealed Vinyl Sheet and Composite Flashing; Section 04200
 - 3. Waterproofing membrane below gymnasium and multi-purpose floor slabs; Section 07115, Sheet Waterproofing.
 - 4. Bituminous Dampproofing; Section 07160.
 - 5. Elastomeric Flashing (Ice and Water Shield); Section 07600

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 1745-97 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
 - 2. ASTM E 154-88 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
 - 3. ASTM E 96-95 Standard Test Methods for Water Vapor Transmission of Materials
 - 4. ASTM E 1643-98 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
- B. American Concrete Institute (ACI)
 - 1. ACI 302.1R-96 Vapor Barrier Component (plastic membrane) is not less than 10 mils thick

1.04 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit drawings fully detailing work to be provided under this section.
 - 2. Submit manufacturer's installation instructions for placement, seaming and pipe boot installation
- B. Catalog Data: Submit min. of four (4) copies of manufacturer's current standard catalog data that completely describes and generally details products herein specified.
- C. Samples: Provide min. of one (1) sample, size required to be representative of actual product herein specified to be installed, for approval by Architect.
- D. Test Data: Submit independent laboratory test results showing compliance with ASTM & ACI Standards.

1.05 DELIVERY AND STORAGE

- A. Adequately package and protect materials during shipment.
 - 1. Upon arrival to jobsite, Contractor inspect materials for damage and stains.
 - 2. Remove damaged or permanently stained materials from site and replace at no cost to Owner.
- B. Store materials in dry ventilated areas until installation.

1.06 QUALITY ASSURANCE

- A. Manufacturer's name and identification number listed as means of establishing standard type and quality and not construed as restrictive or proprietary.
- B. Similar products by other reputable manufacturers acceptable provided it is determined, to satisfaction of Architect, as equal and comparable in all respects to system specified.
 - 1. Should manufacturers other than listed manufacturers be proposed for use, submit for Architect's approval, complete descriptive data and manufacturer's certificate of conformance of system proposed for use in order that proper comparison be made.
- C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- D. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.
- E. Asbestos Certification: Manufacturers of products specified herein shall certify in writing, as part of close-out documents, that products furnished are 100% asbestos free.

PART 2 - PRODUCTS

2.01 FLOOR SLAB MEMBRANE

- A. Vapor *Retarder* membrane shall comply with the following:
 - 1. Water Vapor Transmission Rate: ASTM E 96; 0.04 Perms or lower
 - 2. Water Vapor Retarder: ASTM E 1745; Meets or exceeds Class A
 - 3. Thickness of Retarder (plastic): ACI 302.1R-96; Not less than 10 mils
- B. Approved Manufacturers: The following manufactures are approved subject to compliance with the provisions of this section:
 - 1. Stego Wrap 10-mil Vapor Retarder by Stego Industries llc, San Juan Capistrano, CA (877) 464-7834 www.stegoindustries.com.
 - 2. Griffolyn T-65 by Reef Industries
 - 3. InsulationSolutions Viper Vapor Check II 10 mil.
 - 4. Moistop Ultra-A by Fortifiber Industries
 - 5. Raven Industries Vapor Block 10.

2.01 ACCESSORIES

- A. Seam Tape: Tape shall comply with the following: Water Vapor Transmission Rate: ASTM E 96; 0.3 perms or lower of type recommended by vapor retarder/barrier manufacturer.
- B. Vapor Proofing Mastic: Mastic shall comply with the following: Water Vapor Transmission Rate; ASTM E 96; 0.3 perms or lower of type recommended by vapor retarder/barrier manufacturer
- C. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic in accordance with manufacturer's written instructions.

PART 3 - EXECUTION

3.01 APPLICATION:

- A. Vapor Retarder: Install floor slab membrane (underslab vapor barrier) under all interior concrete floor slabs unless other type of vapor retarder, vapor barrier, or waterproofing specified to be installed.
 - 1. Floor slab membrane not required under slabs at exterior of building.
- B. Waterproofing: At areas where special flooring indicated to be installed, provide sheet water proofing under floor slab in lieu of vapor retarders or vapor barriers.
 - 1. Below floor slab water proofing shall be installed in accordance with requirements of Section 07115, Sheet Waterproofing.

3.02 PREPARATION

- A. Level and tamp and roll capillary fill (sand or stone) as required by contract documents.
- B. Upon completion of installation of materials specified herein, the contractor shall request that the Architect view installation:
 - 1. Provide minimum of 72 hours advanced notice of intent to request field observation.
- C. The Architect **shall** be permitted to view floor slab membranes prior to these materials being concealed.
 - 1. No materials specified herein shall be concealed without the Architect having viewed said material.
 - 2. Should the Contractor conceal materials specified herein, prior to the Architect viewing said materials, the contractor shall remove finish materials as necessary for Architect to ascertain that materials were installed properly.
 - 3. The cost of demolition and replacement of finished materials necessary for viewing of materials shall be at no additional cost to the contract.

3.03 INSTALLATION

- A. Install Vapor Barrier/Retarder: Installation shall be in accordance with manufacturer's instructions and ASTM E 1643-98.
 - 1. Unroll Vapor Barrier/Retarder with the longest dimension parallel with the direction of the pour.
 - 2. Lap Vapor Barrier/Retarder over footings and seal to foundation walls
 - 3. Overlap joints 6 inches and seal with manufacturer's tape.
 - 4. Lay top lap in direction concrete is spread.
 - 5. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 6. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities.
 - 7. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.
 - 8. Seal **all** penetrations or holes in membrane to ensure continuity of membrane.

END OF SECTION 07155

**SECTION 07160
BITUMINOUS DAMPPROOFING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of each type of dampproofing work indicated on drawings.
- B. Following types and applications of work specified in this Section:
 - 1. Cold-applied asphalt emulsion dampproofing in the following locations:
 - a. Cavity Walls; On cavity face of block.
 - b. Elsewhere where dampproofing is specified to be installed.
- C. Similar work used as exposed finish excluded by definition and, if required, specified as waterproofing, vapor retarder, roofing, flooring, special coating or other appropriate category.

1.03 QUALITY ASSURANCE

- A. General:
 - 1. For each type of work, obtain primary materials from single manufacturer, to greatest extent possible.
 - 2. Provide secondary materials only as recommended by manufacturer of primary materials.
- B. Installer Qualifications: Firm specialized for min. three years in installation of types of dampproofing required for Project and acceptable to manufacturer of primary materials.
- C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's technical product data, installation instructions, and general recommendations for each dampproofing material required.
 - 2. Include data substantiating that materials comply with specified requirements.

1.05 JOB CONDITIONS

- A. Substrate: Proceed with dampproofing work only after substrate construction and penetrating work completed.
- B. Weather: Proceed with dampproofing work only when existing and forecasted weather conditions permit work performed in accordance with manufacturer's recommendations.
 - 1. Do not dampproofing work when temperature 40°F and falling.
- C. Ventilation: Provide adequate ventilation to prevent accumulation of hazardous fumes during application of solvent-based components in enclosed spaces, and maintain ventilation until coatings thoroughly cured.

1.06 CERTIFICATIONS

- A. Provide certification that the material is 100% asbestos free.

PART 2 - PRODUCTS

2.01 BITUMINOUS DAMPPROOFING MATERIALS

- A. General:
 - 1. Provide bituminous dampproofing materials which comply with following requirements, or provide other similar products certified in writing by manufacturer of primary dampproofing materials as superior in performance for application indicated.
- B. Cold-Applied Asphalt Emulsion Dampproofing:
 - 1. Asphalt Emulsion: Manufacturer's standard asphalt and water emulsion coating, recommended for above or below-grade exterior and for above-grade interior applications to either damp (green) or dry substrates, compounded to penetrate substrate and build to moisture resistant coating.
 - a. Provide semi-fibrated type semi-mastic; brush or trowel grade; asbestos-free emulsion; ASTM D 1227, Type IV, except containing non-asbestos fibrous reinforcement and filler materials.
 - b. Dampproofing Type:
 - 1) Spray Application: Type II
 - 2) Troweled or Brushed Type: Type III
 - 2. Manufacturer: Subject to compliance with requirements, provide asphalt emulsion products of one of following:
 - a. Celotex Corporation.
 - b. Certaineed Corporation.
 - c. Genstar Roofing Products Company.
 - d. J. & P. Petroleum Products, Inc.
 - e. Karnak Chemical Corporation.
 - f. Koppers Company, Inc.
 - g. Manville Building Products Corp.
 - h. Sonneborne Bldg. Products/Rexnord Chemical Products Inc.
 - i. Tamko Asphalt Products, Inc.
 - j. Tremco Company.
 - k. W.R. Meadows, Inc.
- C. Miscellaneous Materials:
 - 1. Bituminous Grout: ASTM D 147.
 - 2. Plastic Cement: ASTM D 491, asphalt base, except provide coal-tar base where specifically recommended by manufacturer of bituminous dampproofing materials.

PART 3 - EXECUTION

3.01 GENERAL

- A. Upon completion of installation of materials specified herein, the contractor shall request that the Architect view installation:
 - 1. Provide minimum of 72 hours advanced notice of intent to request field observation.
- B. The Architect shall be permitted to view dampproofing prior to this material being concealed.
 - 1. No materials specified herein shall be concealed without the Architect having viewed said material.
 - 2. Should the Contractor conceal materials specified herein, prior to the Architect viewing said materials, the contractor shall remove finish materials as necessary for Architect to ascertain that dampproofing materials were installed properly.
 - a. The cost of demolition and replacement of finished materials necessary for viewing of dampproofing shall be at no additional cost to the contract.

3.02 SCHEDULING

- A. Schedule application of dampproofing so that the installation of rigid cavity insulation and laying of brick occur within no more than thirty (30) days of the date of application of the dampproofing.

3.03 PREPARATION OF SUBSTRATE

- A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.
- B. Prepare surface: Prepare surface of block by performing the following work:
 - 1. Clean surface of block.
 - 2. Remove all excess mortar and grout from surface of wall to obtain a smooth uniform surface.
 - 3. Remove all mortar droppings.
 - 4. Remove all other debris and material which interfere with proper installation of dampproofing.
 - 5. Fill and seal all penetrations through face of masonry.
 - 6. Fill holes in face of masonry.
 - 7. Point-up all mortar joints to eliminate cracks, gaps or other openings in mortar and to provide a smooth, solid, dense surface.
 - 8. Install flashing over beams, columns, pipes or other materials which penetrate cavity face of block wall.
- C. Install cant strips and similar accessories shown and as recommended by prime materials manufacturer even if not shown.
- D. Fill voids, seal joints, and apply bond breakers (if any) as recommended by prime materials manufacturer, with particular attention at construction joints.
- E. Install separate flashings and corner protection stripping as recommended by prime materials manufacturer, where indicated to precede application of dampproofing.
 - 1. Comply with details shown and manufacturer's recommendations.
 - 2. Give particular attention to requirements at building expansion joints, if any.
- F. Prime substrate as recommended by prime materials manufacturer.

3.04 INSTALLATION

- A. General: Comply with manufacturer's instructions, except where more stringent requirements shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of work.
- B. Apply Dampproofing as follows:
 - 1. Apply coat of semi-fibrated, semi-mastic, asphalt emulsion dampproofing materials using a two coat application procedure.
 - a. The first coat to be sprayed-on.
 - b. The second to be troweled or brushed-on.
 - c. Application rate: Total application rate to be a minimum of 5.0 gal. per 100 sq. ft..
 - d. Min. finished thickness: Dry film thickness of a minimum of 62 mils (1/16").
 - 2. Coat outer face of inner wythe of new masonry exterior walls with dampproofing. Dampproofing shall fully cover entire face of cavity walls and shall be free of holidays, voids or gaps and shall be of sufficient thickness to prevent bleed through of natural color of block.
 - a. Dampproofing shall extend full height and length of wall, including areas below flashings at grade

3.05 DETERIORATION OF COATING

- A. Where dampproofing has faded in color, deteriorated due to moisture or water, or where coverage has in any way been lessened or damaged, the contractor shall re-apply dampproofing to thickness indicated.

3.06 PROTECTION

- A. Protection of Other Work:
 - 1. Do not allow liquid and mastic compounds to enter and clog drains and conductors.
 - 2. Prevent spillage and migration onto other surfaces of work, by masking or otherwise protecting adjoining work.

- B. Do not allow dampproofing to get on portion of masonry wall ties that protrude into brickwork; remove any that does get on this part of wall tie.
- C. Exercise care in application in order to protect exposed work.
 - 1. Where exposed surfaces become coated or smeared, thoroughly clean and remove dampproofing without damage to surface.
 - 2. Replace materials damaged due to attempts at removal, without cost to Owner.

END OF SECTION 07160

**SECTION 07190
WATER REPELLENTS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of surfaces to receive water repellent indicated on drawings and by provisions of this Section.
- B. Following applications of water repellent required:
 - 1. Exterior face brick; where located above a roof,
 - 2. Exterior unit masonry (split face) surfaces; all.
 - 3. Exterior architectural precast concrete surfaces; all.

1.03 QUALITY ASSURANCE

- A. Installer: Firm with min. of 3 years successful experience in application of water repellents of types required on substrates similar to those of Project.
- B. Project Mock-Up:
 - 1. Apply water repellent to mock-up, either partial or full coverage as directed, before proceeding with installation.
 - 2. Comply with installation requirements of this Section.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, installation instructions, and general recommendations for water repellents.
 - 1. Include data substantiating that materials recommended by manufacturer for applications indicated and comply with requirements.
- B. Warranty: Provide water repellents manufacturer's warranty on installed work, agreeing to pay for recoating of defective work as necessary, to eliminate water penetration for five (5) years from date of Final Acceptance.
- C. Samples: Submit 16" square samples of each substrate indicated to receive liquid water repellent, with repellent treatment specified applied to half of each sample.

1.05 JOB CONDITIONS

- A. Weather and Substrate Conditions: Do not proceed with application of water repellent (except with written recommendation of manufacturer), when:
 - 1. Ambient temperature less than 50°F (10°C).
 - 2. Substrate surfaces cured for less than 2 months.
 - 3. Rain or temperatures below 40°F (4°C), predicted for 24 hours, or earlier than 3 days after surfaces became wet.
 - 4. Substrate frozen.
 - 5. Surface temperature of less than 40°F (4°C).

PART 2 - PRODUCTS

2.01 WATER-BASED ACRYLIC SEALER

- A. Provide manufacturer's standard 'water-clear' emulsion-type breathing coating of acrylic resins (based on methyl methacrylate) in water recommended by manufacturer for application to interior and exterior concrete and masonry surfaces as a water-repellent coating, average 25% solids content.
- B. Manufacturer: Subject to compliance with requirements, including warranty period indicated, provide products of one of following:
 - 1. Applied Polymers of America, inc.
 - 2. OKON, Inc
 - 3. Seal-Krete, Inc.
 - 4. VIP Enterprises

PART 3 - EXECUTION

3.01 PREPARATION

- A. Test Application: Prior to performance of water repellent work, including bulk purchase/delivery of products, prepare small application in unobtrusive location and in manner acceptable to Architect, for purpose of demonstrating final effect (visual and physical/chemical) of planned installation.
 - 1. Proceed with work only after Architect's acceptance of test application, or as otherwise directed.
- B. Revision of planned installation, if any and as requested by Architect, by change order where it constitutes departure from requirements of contract documents at time of contracting.
- C. Clean substrate of substances which might interfere with penetration/adhesion of water repellents; test for moisture content, in accordance with repellent manufacturer's instructions, to ensure surface sufficiently dry.
- D. Coordination with Sealants: Where feasible, delay application of water repellents until installation of sealants completed in joints adjoining surfaces coated with repellent.
- E. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent.
 - 1. Cover adjoining and nearby surfaces of aluminum and glass where possibility of water repellent deposited on surfaces.
 - 2. Cover live plant materials with drop cloths.
 - 3. Clean water repellent from adjoining surfaces immediately after spillage.
 - 4. Comply with manufacturer's recommendations for cleaning.

3.02 INSTALLATION

- A. Apply heavy saturation spray coating of water repellent on surfaces indicated for treatment using low pressure spray equipment.
 - 1. Comply with manufacturer's instructions and recommendations, using airless spraying procedure unless otherwise indicated.
- B. Precast Work: At Contractor's option, complete first application of water repellent on precast concrete units prior to installation of units.
 - 1. Mask sealant-bond surfaces to prevent migration of water repellent onto joint surfaces.
- C. Apply second saturation spray coating, repeating first application.
 - 1. Comply with manufacturer's instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats.
 - 2. Consult manufacturer's technical representative if printed recommendations not applicable to project conditions.

END OF SECTION 07190

**SECTION 07200
INSULATION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of insulation work shown on drawings and indicated by provisions of this Section.
- B. Applications of insulation specified in this Section include following:
 - 1. Board-type cavity wall insulation.
 - a. Referred to on drawings as "Rigid cavity Insulation".
 - b. Install on face of block in exterior cavity wall construction and elsewhere where shown on drawings.
 - 2. Blanket-type building insulation.
 - a. Referred to on drawings as "Building Insulation", "Blanket Insulation" or "Batt Insulation".
 - b. Install above suspended ceilings, fire rated assemblies, and elsewhere where indicated.
 - 3. Foamed-In-Place Masonry Insulation:
 - a. Referred to on drawings as "Foamed-In-Place Masonry Insulation"
 - b. Install where indicated on drawings.
- C. Roof deck insulation specified in Division-3, Section 03251 Light Weight Insulating Concrete Roof Deck.
- D. Roof deck insulation specified in Division-5, Section 05300, Composite Roof Deck.
- E. Roof deck insulation for Flexible Sheet Roofing System specified in Division-7, Section 07530, Flexible Sheet Roofing System .
- F. Foam plastic board insulation for exterior insulation and finish systems specified in another Division-7 section.
- G. Sound attenuation blankets installed as part of metal-framed gypsum drywall assemblies are specified in Division-9 section "Gypsum Drywall".
- H. Semi-Rigid, Semi Refractory, Fire Safing Insulation specified in Division 7 section, Fire-Stopping.
- I. Thermal insulation installed with z-furring members specified in Division- 9 section "Gypsum Drywall".

1.03 QUALITY ASSURANCE

- A. Thermal Resistivity:
 - 1. Where thermal resistivity properties of insulation materials designated by r-values they represent rate of heat flow through homogeneous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated.
 - 2. Properties expressed by temperature difference in degrees F between two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.
- B. Fire Performance Characteristics:
 - 1. Provide insulation materials identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is part, determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Surface Burning Characteristics: ASTM E 84.
 - b. Fire Resistance Ratings: ASTM E 119.
 - c. Combustion Characteristics: ASTM E 136.

- C. Max. Allowable Content of Inorganic Insulations: Provide insulations composed of mineral fibers or mineral ores which contain no asbestos of any type or mixture of types occurring naturally as impurities as determined by polarized light microscopy test per Appendix A of 40 CFR 763.
- D. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature and installation instructions for each type of insulation and vapor retarder material required.
- B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including r-values (aged values for plastic insulations), densities, compression strengths, fire performance characteristics, perm ratings, water absorption ratings and similar properties.
 - 1. For fire safeing materials, submit manufacturer data showing applicable U.L. Design numbers.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow.
 - 1. Comply with manufacturer's recommendations for handling, storage and protection during installation.
- B. Protection for Plastic (rigid board) Insulation:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment. Materials subjected to prolonged exposure to be replaced with new.
 - 2. Protect against ignition at all times.
 - 3. Do not deliver plastic insulating materials to project site ahead of installation time.
 - 4. Complete installation and concealment of plastic materials rapidly as possible in each area of work.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of following:
 - 1. Manufacturers of Extruded Polystyrene Board Insulation:
 - a. Amoco Foam Products Co.
 - b. Dow Chemical U.S.A.
 - c. Minnesota Diversified Products, Inc.
 - d. UC Industries.
 - 2. Manufacturers of Glass Fiber Insulation; Building Insulation:
 - a. CertainTeed Corp.
 - b. Knauf Fiber Glass.
 - c. Owens-Corning Fiberglas Corp.
 - d. Johns Manville
 - 3. Manufacturers of Foamed-In-Place Masonry Insulation:
 - a. Dow Chemical
 - b. Tailored Chemical Products
 - c. Tripolymer Foam Insulation
 - 4. Manufacturers of Vapor Barriers:
 - a. Bay Insulation
 - b. Dupont Tyvek
 - c. Insulation Solutions
 - d. Thermal Design, Inc. P.O. Box 468, 600 N. Main Street, Madison, NE 68748. Telephone 800-255-0776.

2.02 INSULATING MATERIALS

- A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.
- B. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths and lengths.

2.03 EXTRUDED POLYSTYRENE BOARD INSULATION

- A. Extruded Polystyrene Board Insulation: Rigid, cellular thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for Type indicated; with 5-year aged r-values of 5.4 and 5 at 40°F and 75°F (4.4°C and 23.9°C), respectively; and as follows:
 - 1. Type IV, 1.6 lb./cu. ft. min. density, unless otherwise indicated.
- B. Surface Burning Characteristics: Max. flame spread and smoke developed values of 5 and 165, respectively.
- C. Thickness: Thicknesses of rigid cavity insulation to be as follows:
 - 1. Rigid Cavity Insulation: 1-1/2" Unless noted.
- D. Size: Size of rigid board insulation to be as follows:
 - 1. Rigid Cavity Insulation: 1'-4" X 8'-0"; Unless noted.

2.04 BLANKET-TYPE BUILDING INSULATING MATERIAL

- A. Un-faced Mineral Fiber Blanket/Batt Insulation: Formaldehyde-free thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:
 - 1. Mineral Fiber Type: Fibers manufactured from glass or slag.
 - a. Combustion Characteristics: Passes ASTM E 136 test.
 - b. Surface Burning Characteristics: Max. flame spread and smoke developed values of 25 and 50, respectively.
 - 2. Location of Use:
 - a. Install where voids or gaps are indicated to be filled with insulation and elsewhere where indicated on drawings.
 - b. Where multiple layers of insulation required, the second (outer) layer to be unfaced.
- B. Poly Encapsulate-Faced Mineral Fiber Blanket/Batt Insulation: **Class-A** rated formaldehyde-free thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 655 for Type II, Class C (blankets without flame spread rating); Four (4) sided poly encapsulated blankets with a 0.5 per vapor-retarder membrane on one face, respectively; and as follows:
 - 1. Mineral Fiber Type: Fibers manufactured from glass or slag.
 - 2. Minimum "R" Value; Insulation to have "R" values as follows:
 - a. Ceilings: R-19
 - b. Exterior Walls 4" Studs: R-11
 - c. Exterior Walls 6" Studs: R-19
 - 3. Location of Use: For use in walls and above ceilings only where facing fully concealed by and in direct contact with wall and/or ceiling finish where such wall and/or ceiling finish has a flame spread of less than 25 and smoke developed of less than 450. Use of kraft face insulation not permitted where face of insulation not in direct contact with ceiling or wall finish.
- C. FSK-Faced Mineral Fiber Blanket/Batt Insulation: Formaldehyde-free thermal thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 655 for Type III, Class A (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less); foil-scrim-kraft vapor-retarder membrane on one face, respectively; and as follows:
 - 1. Mineral Fiber Type: Fibers manufactured from glass or slag.
 - 2. Combustion Characteristics: Unfaced blanket/batt passes ASTM E 136 test.

3. Surface Burning Characteristics: Max. flame spread and smoke developed values of 25 and 50, respectively.
4. Minimum "R" Value: To match kraft face insulation for type of application.
5. Location of Use: For use in walls and above ceilings where insulation exposed, where face of insulation not in direct contact with wall board or ceiling board, and where part of fire rated assembly.

2.05 FOAMED-IN-PLACE MASONRY INSULATION

- A. Foamed-In-Place Masonry Insulation shall be two component thermal insulation produced by combining a plastic resin and a catalyst foaming agent surfactant which, when rationed and mixed, together with compressed air produce a cold-setting foam insulation with the following characteristics:
 1. Fire Resistant Rating: Min. four (4) hour fire resistance wall rating (ASTM E-119) for 8" and 12" concrete masonry units when used in standard two (2) hour rated concrete masonry units.
 2. Surface Burning Characteristic: Maximum flame spread, smoke developed and fuel contributed of 15, 75 and 0 respectively.
 3. Combustion Characteristics: Non-combustible; Class A building material.
 4. Thermal Values: 'R' value of 4.91/inch @ 32 degrees F mean; ASTM C-177. "R" values for block as follows:
 - a. 8" CMU - 14.2.
 - b. 12" CMU - 20.0
 5. Sound Abatement: Min. Sound Transmission Class (STC) rating of 53 and a min. Outdoor Indoor Transmission Class (OITC) of 44 for 8" concrete masonry wall assembly (ASTM E90-90).
 6. Application:
 - a. Install in walls surrounding Choral Classrooms.
 - b. Install at new walls at Existing Drama Classroom (Adjacent to existing lunchroom)
 - c. Install elsewhere where indicated on drawings.

2.06 AIR/MOISTURE BARRIERS

- A. Woven, reinforced, high-density polyethylene yarns coated on the exposed side with a continuous white or colored polyethylene film complying with the following:
 1. Perm rating: 0.02 for fabric and for seams; Procedure A, non-inverted method (ASTM E-96).
 2. Flame spread (ASTM E 84): Not more than 25.
 3. Smoke density (ASTM E 84): Not more than 50.
 4. Weight: 4.1 oz/square yard minimum.
 5. Tensile Strength: 160 lbs. Warp, 135 lbs. Fill; ASTM D1682-64-Grab method.
 6. Tear Strength: 64 lbs. Warp, 63 lbs. Fill; ASTM D-4633-91, tongue method.
 7. Total Thickness: 5.9 mils +/- 10%; ASTM D-2103.
- B. Size and seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
 1. Vapor tight, double extrusion welded process.
 2. Stapled seams not acceptable.
- C. Factory-folded to allow for rapid pull-out on strap support system.
- D. Color: White.

2.07 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with requirements for fire performance characteristics.
- B. Mechanical Anchors: Type and size indicated or, if not indicated, as recommended by insulation manufacturer for type of application and condition of substrate.
- C. Eave Ventilation Troughs: Preformed rigid fiberboard or plastic sheet designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

- D. Crack Sealer for Board Insulation: Provide polymeric insulating foam in aerosol dispenser designed for filling voids in board insulation.
 - 1. Basis of Specification:
 - a. Construction Products Div., W.R. Grace & Co., "Polycel 100".
 - 2. Acceptable manufactures subject to compliance with technical specifications:
 - a. Dow Chemical Company
 - b. Henkel Corporation

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

- A. Installer examine substrates and conditions under which insulation work performed.
 - 1. Satisfactory substrate one that complies with requirements of section in which substrate and related work specified.
 - 2. Installer provide written report listing conditions detrimental to performance of work in this Section.
 - 3. Do not proceed with installation of insulation until unsatisfactory conditions corrected.
- B. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections which might puncture vapor retarders.

3.02 INSTALLATION, GENERAL

- A. Comply with manufacturer's instructions for particular conditions of installation in each case.
 - 1. If printed instructions not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Extend insulation full thickness shown over entire area insulated.
 - 1. Cut and fit tightly around obstructions, and fill voids with insulation.
 - 2. Remove projections which interfere with placement.
- C. Apply single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.
- D. Continuity of Insulation System: Install wall and roof insulation systems in a manner to maintain uninterrupted continuity of insulation envelope system.
 - 1. The intent of the insulation is to create an uninterrupted building envelope capable of resisting the transfer of heat from one side of the envelope to the other. The contractor shall be responsible for furnishing all materials and labor necessary to install the insulation building envelope.
 - 2. Install wall insulation full height and length of exterior walls.
 - 3. Install ceiling/roof insulation full length and width of building.
 - 4. Provide additional insulation at transition from wall to ceiling/roof as necessary, indicated or required to maintain continuity of the insulation system.
 - 5. Where insulation placed at ceiling or sub ceiling and levels of ceiling or sub ceiling vary, provide insulation in vertical wall or partition from lower ceiling or sub ceiling to upper ceiling or sub ceiling as required to maintain the continuity of the insulation system.

3.03 INSTALLATION OF RIGID CAVITY-WALL INSULATION:

- A. Rigid Cavity Insulation: Insulate exterior cavity walls and other areas where shown on drawings by installing specified insulation on cavity side of inner wythe.
 - 1. Bring insulation up completely to elevations indicated for underside of bond beams, lintels, through-wall flashing, and similar interruptions through cavity before installing these items.
- B. Condition of Surfaces:
 - 1. Wall surfaces of cavities against which insulation applied: Clean and dry.
 - 2. Check surfaces for protruding mortar, concrete, or other obstacles that may interfere with installation of insulation.
 - a. Remove such obstacles, if present, before applying insulation.

- C. Apply insulation directly to masonry by use of plastic cement, portland cement, approved wall ties, or approved mechanical fasteners recommended by insulation manufacturer.
 - D. On units of plastic insulation, install small pads of adhesive spaced approximately 1'-0" o.c. both ways on inside face.
 - 1. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways.
 - 2. Press units firmly against inside wythe of masonry or other construction as shown.
 - 3. **DO NOT** rely on friction from wall ties to hold insulation in place.
 - E. Cut insulation to fit neatly against adjoining surfaces and apply in parallel courses with joints breaking midway over course below.
 - 1. Apply insulation in contact with adjoining units without forcing.
 - 2. Fit joints tightly.
 - 3. Use of nails or other methods of attachment which will damage damp proofing are not acceptable.
 - F. Seal joints between closed-cell (non-breathing) insulation units by applying mastic or sealant to edges of each unit to form tight seal as units shoved into place.
 - 1. Fill voids in completed installation with mastic or sealant.
- 3.04 INSTALLATION OF GENERAL BUILDING INSULATION
- A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations.
 - 1. If no specific method indicated use mechanical anchorage to provide permanent placement and support of units.
 - 2. Provide all material necessary for proper installation and support of insulation to prevent sagging, loose joints, and pulling of fiberglass away from vapor barrier.
 - B. Apply insulation in a manner so as not to reduce the overall thickness and the insulating value of the insulation.
 - 1. Avoid compression of insulation.
 - C. Ceiling Insulation: Ceiling insulation to be loosely laid with adjacent sections tightly abutted.
 - 1. Where domestic water or sprinkler piping exist, run insulation over the top of the piping in a manner that insures that the piping is within the Insulated space.
 - D. Wall Insulation: Wall insulation to be of size to match stud spacing.
 - 1. Install insulation in between stud, full height and width of opening, using single pieces only.
 - 2. Extend flange on vapor barrier across face of stud in order to maintain integrity of vapor barrier.
 - 3. Secure insulation flange to stud at 12" on center.
 - E. Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated.
 - 1. Do not obstruct ventilation spaces, except for fire stopping.
 - 2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure air-tight installation.
 - F. Set reflective foil-faced units accurately with air space in front of foil as shown.
 - 1. Provide min. 3/4" air space where possible.
 - G. Coordination with electrical and mechanical equipment: Where electrical equipment and fixtures or mechanical equipment are recessed in ceilings where insulation is specified to be installed, hold insulation back from edge of device a minimum of 3".
 - 1. **DO NOT** place insulation over recessed mechanical or electrical equipment unless specifically noted otherwise.
- 3.05 INSTALLATION OF FIRE RATED INSULATION
- A. Comply with requirements for installation of general building insulation.

- B. Fire rated insulation: Insulation installed over fire rated ceilings or in fire rated walls or spaces (plenums) shall be fire rated and shall have facing suitable for maintaining required rating.

3.06 INSTALLATION OF LOOSE INSULATION FILL

- A. Place loose glass insulation into spaces and onto surfaces as shown, either by pouring or by machine-blowing.
- B. Level horizontal applications to uniform thickness indicated, lightly settled to uniform density, but not excessively compacted.
- C. Stuff loose glass fiber insulation into miscellaneous voids and cavity spaces where shown.
 - 1. Compact to approximately 40% of normal max. volume (to density of approximately 2.5 lbs. per cu. ft.)

3.07 INSTALLATION OF FOAMED-IN-PLACE MASONRY INSULATION:

- A. General: Install insulation in strict accordance with the manufactures written instructions.
 - 1. Where indicated, install foamed-in-place masonry insulation in cores of concrete masonry units.
 - 2. Install foamed-in-place masonry insulation from interior prior to installation of interior finish work.
- B. Installation: Place foamed-in-place masonry insulation in cells of concrete masonry units by pumping insulation through 5/8" diameter holes drilled into each cell of each block in a straight horizontal row in accordance with the following:
 - 1. Drill holes in mortar joints at approximately 8" on center.
 - 2. First row of holes to be at approximately 5'-0" above floor.
 - 3. Subsequent rows of holes to be drilled a maximum of 10'-0" on center vertically.
- C. Repair: Upon completion of placement of foam insulation patch holes with mortar to match existing and re-tool mortar joints to eliminate appearance of 'patch'.

3.08 INSTALLATION OF VAPOR RETARDERS

- A. General:
 - 1. Extend vapor retarders to extremities of protected areas from vapor transmission.
 - 2. Secure in place with adhesives or other anchorage system indicated.
 - 3. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those stuffed with loose fiber-type insulation.
- B. Seal all joints as follows:
 - 1. Seal vertical joints in vapor retarders over framing by lapping over face of stud minimum 2".
 - a. Fasten vapor barrier to framing at top, bottom, sides, at perimeter of wall openings and at lap joints; space fasteners 16" on center.
 - 2. Seal overlapping joints in vapor retarders with adhesives per vapor retarder manufacturer's printed directions.
 - a. Seal butt joints and fastener penetrations with tape of type recommended by vapor retarder manufacturer.
 - b. Locate all joints over framing members or other solid substrates.
 - c. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.
 - 3. Seal joints caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with cloth or aluminized tape of type recommended by vapor retarder manufacturer to create an airtight seal between penetrating objects and vapor retarder.
 - 4. Repair any tears or punctures in vapor retarders immediately before concealment by other work.
 - a. Cover with tape or another layer of vapor retarder.

3.09 EAVE VENTILATION TROUGHS

- A. Install eave ventilation troughs between all structural members (rafters) as necessary to ensure that a minimum of 8" clear ventilation is provided between top of trough and underside of roof deck.

3.10 PROTECTION

- A. General: Protect installed insulation and vapor retarders from harmful weather exposures and from possible physical abuses, where possible by non delayed installation of concealing work or, where not possible, by temporary covering or enclosure.
 - 1. In areas where insulation to remain exposed, where vapor barrier is damaged due to construction activities replace with new. Field patches not acceptable.

END OF SECTION 07200

SECTION 07240
EXTERIOR INSULATION AND FINISH SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. This section includes:
 - 1. Exterior insulation and finish systems (E.I.F.S.) with air/moisture barrier and drainage system.
 - 2. Exterior Insulation and Finish Systems applications over:
 - a. Concrete surfaces.
 - b. Masonry surfaces.
 - c. Glass mesh reinforced sheathing
- B. Related Sections Include::
 - 1. Concrete substrates behind system specified in Division-3 sections.
 - 2. Masonry substrates behind system specified in Division-4 Section "Unit Masonry".
 - 3. Metal stud system for exterior walls supporting sheathing behind system specified in Division-9 Section "Gypsum Drywall".
 - 4. Sealing joints specified in this section.

1.03 DEFINITIONS

- A. Exterior Insulation and Finish System:
 - 1. Exterior assembly composed of outer layer forming protective finish coating applied to substrate of construction indicated.
 - 2. Exterior assembly composed of inner layer of glass mesh reinforced sheathing and/or thermal insulation board and outer layer forming protective finish coating. Assembly applied to supporting substrate of construction indicated.
- B. System Manufacturer: Manufacturer of exterior insulation and finish system.

1.04 SYSTEM DESCRIPTION

- A. Provide system complying with following performance requirements:
 - 1. Bond Integrity: Free from bond failure within system components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
 - 2. Weathertightness: Resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building which results in deterioration of thermal-insulating effectiveness or other degradation of system and assemblies behind system including substrates, supporting wall construction, and interior finish.
 - 3. Fire Performance Characteristics: Provide materials and construction identical to those tested for following fire performance characteristics, per test method indicated below, by UL or other testing and inspecting agencies acceptable to authorities having jurisdiction:
 - 4. Surfacing Burning Characteristics: Flame spread rating of 25 or less per ASTM E 84 for insulation board and protective finish coats, when each tested individually.

1.05 REFERENCED DOCUMENTS :

- A. ASTM Standards: The following ASTM standard apply to work of this section:
1. B117 Test Method for Salt Spray (Fog) Testing
 2. C79 Test Method for Gypsum Sheathing Board
 3. C150 Specification for Portland Cement
 4. C297 Test Method for Tensile Strength of Flat Sandwich Constructions in Flatwise Plane
 5. C578 Specification for Performed, Cellular Polystyrene Thermal Insulation.
 6. C1177 Specification for Glass Mat Gypsum for use as Sheathing
 7. C1382 Test Method for Determining Tensile Adhesion Properties of Sealant When Used in Exterior Insulation and Finish Systems (EIFS) Joints
 8. D522 Test Methods for Mandrel Bend Test of Attached Organic Coatings
 9. D968 Test Method for Abrasion Resistance of Organic Coatings by Falling Abrasive
 10. D1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
 11. E2134 Standard test method for Evaluating the Tensile-Adhesion Performance of and Exterior Insulation and Finish System (EIFS).
 12. D2247 Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
 13. D2370 Test Method for Tensile Properties of Organic Coatings
 14. E2430 Standard specifications for Expanded Polystyrene (EPS) thermal insulation board of use in exterior insulation and finish systems (EIFS).
 15. E2485 Standard test method for freeze/thaw resistance of exterior insulation and finish system (EIFS) and water resistive barriers.
 16. D3273 Test for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
 17. D4541 Test Method for Pull-Off Strength of Coatings using Portable Adhesion-Testers
 18. E84 Test Method for Surface Burning Characteristics of Building Materials
 19. E96 Test Methods for Water Vapor Transmission of Materials
 20. E119 Method for Fire Tests of Building Construction and Materials
 21. E283 Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences
 22. E330 Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
 23. E331 Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
 24. G23 Recommended Practice for Operating Light-and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Non-metallic Materials
 25. G53 Recommended Practice for Operating Light-and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Non-metallic Materials

1.06 BUILDING CODE STANDARDS :

- A. Fire Code: The provisions of the following fire codes apply to work of this section
1. NFPA 259, test Method for Potential Heat of Building Materials.
 2. NFPA 268, "Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source."
 3. NFPA 285, Standard Method of Test for Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components Using the Intermediate-scale, Multi-Test Apparatus.
- B. Proprietary Specifications
1. 101514 Georgia-Pacific Corporation, "Dens Glass Gold Sheathing"
 2. AATCC-127 Water Resistance: Hydrostatic Pressure Test

1.07 DESIGN REQUIREMENTS

- A. Wind Load: Design for maximum allowable system deflection, normal to the plane of the wall of L/360.
 - 1. Design for wind load in conformance with code requirements.
- B. Moisture Control
 - 1. Prevent the accumulation of water behind the EIFS system, either by condensation or leakage through the wall construction, in the design and detailing of the wall assembly.
 - 2. Provide flashing to direct water to the exterior where it is likely to penetrate components in the wall assembly, including, above window and door heads, beneath window and door sills, at roof/wall intersections, decks, abutments of lower walls with higher walls, above projecting features, and at the base of the wall.
 - 3. Air Leakage Prevention – provide continuity of air barrier system at foundation, roof, windows, doors and other penetrations through the system with connecting and compatible air barrier components to minimize condensation and leakage caused by air movement.
 - 4. Vapor Diffusion and Condensation – perform a dew point analysis of the wall assembly to determine the potential for accumulation of moisture in the wall assembly as a result of water vapor diffusion and condensation. Adjust insulation thickness and/or other wall assembly components accordingly to minimize the risk of condensation. Avoid the use of vapor retarders on the interior side of the wall in warm, humid climates.
- C. Impact Resistance: Provide ultra-high impact resistance unless otherwise noted.
- D. Color Selection: Color texture to be a light reflectance value of 20 or greater.

1.08 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's technical data for each component of exterior insulation and finish system.
 - 2. Product data for each type of material to be used.
- B. Shop Drawings:
 - 1. Submit manufacturers specifications, details, and installation instructions.
 - 2. Provide project specific details showing each unique condition.
 - 3. Submit complete shop drawings showing installation of system, location of control joints, location of expansion joints, junctions with other materials and location and type of joint sealant.
- C. Samples for Initial Selection Purposes:
 - 1. Manufacturer's standard color charts and small scale samples indicating textural choices available.
 - 2. Submit sealant manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available.
- D. Samples for Verification Purposes: Samples, 2' square, for each finish, color, and texture indicated; prepare samples using same tools and techniques intended for actual work.
 - 1. Incorporate within each sample a typical control joint filled with sealant of color indicated or selected.
- E. Installer certificates signed by manufacturer certifying that Installers comply with specified requirements.
 - 1. Applicators certificate of instruction.
- F. Test reports for system from qualified independent testing laboratory certifying and interpreting test results relative to system's compliance with requirements for fire performance characteristics, bond integrity, and material properties.
- G. Sealant compatibility and test reports from sealant manufacturer certifying that materials forming joint substrates of system tested for compatibility and adhesion with joint sealants; include sealant manufacturer's interpretation of results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

- H. Research reports or evaluation reports of model code organization acceptable to authorities having jurisdiction which evidence system's compliance with building code in effect for Project.
 - 1. Manufacturers code compliance report
 - I. Copy of product warranty.
- 1.09 QUALITY ASSURANCE
- A. Manufacturer Qualifications:
 - 1. Firm regularly engaged in manufacturing products for system indicated and with min. twenty (20) successful experience in applications similar to that required for this Project.
 - 2. Manufacturer to be a member in good standing of EIFS Industry Members Association (EIMA)
 - 3. Manufacturing facilities to be ISO 9002 certified
 - B. Installer Qualifications: Engage Installer certified in writing by system manufacturer as qualified for installation of systems indicated.
 - 1. Installer to be engaged in application of EIFS for a minimum of three (3) years.
 - 2. Knowledgeable in the proper use and handling of materials and listed by manufacturer as having attended manufacturer's continuing education.
 - 3. Employ skilled mechanics that are experienced and knowledgeable in EIFS application, and familiar with the requirements of the specified work.
 - 4. Successful completion of minimum of three (3) projects of similar size and complexity to the specified project.
 - 5. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with manufacturer's published specifications and details and the project plans and specifications.
 - C. Insulation board manufacturer requirement
 - 1. Recognized by manufacturer as capable of producing insulation board to meet system requirements, and hold a valid licensing agreement with manufacturer.
 - 2. Listed by an approved agency.
 - 3. Label insulation board with information required by manufacturer, the approved listing agency and the applicable building codes.
 - D. Single Source Responsibility: Obtain materials for system from either single manufacturer or from manufacturers approved by system manufacturer as compatible with other system components.
 - E. Design and Detailing: Encapsulate insulation board by substrate at all locations; separate from exterior of building by thermal barrier having a minimum of a fifteen (15) minute finish rating.
 - 1. Manufacturer/installer responsible for design of system to comply with requirements contained in this section and the information contained on drawings.
 - F. Field-Constructed Mock-Up: Prior to installation of system, erect mockups for each form of wall construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects including those related to execution.
 - 1. Build mock-ups to comply with following requirements, using materials indicated for final work:
 - 2. Locate mock-ups on site in location and of size indicated or, if not indicated, directed by Architect.
 - 3. Erect mock-ups in presence of Architect.
 - 4. Demonstrate proposed range of color, texture, and workmanship expected in completed work.
 - 5. Construct full-scale mock-up of typical EIFS/window wall assembly with specified tools and materials and test air and water infiltration and structural performance in accordance with ASTM E283, E331, E330, respectively, through independent laboratory. Mock-up shall comply with requirements of project specifications. Where mock-up is tested at job site maintain approved mock-up at site as reference standard. If tested off-site accurately record construction detailing and sequencing of approved mock-up for replication during construction.
 - G. Manufacturers certificate of compliance with 2009 International Building Code (IBC)

- H. EPS board manufacturers certificate of compliance with ASTM E2430-Standard Specification for Expanded Polystyrene (EPS) Thermal Insulation Boards for Use in Exterior Insulation and Finish Systems (EFIS).
 - I. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
 - J. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in work
 - 2. Statement also state that proposed application of product on project is suitable and proper.
 - K. Inspections:
 - 1. Provide independent third party inspection where required by code or contract documents.
 - 2. Conduct inspections in accordance with code requirements and contract documents.
 - L. Pre-Installation Conference: Conduct conference at Project site for purposes of ensuring coordinated and timely execution of work of this Section; comply with Division-1 requirements.
- 1.10 DELIVERY, STORAGE, AND HANDLING
- A. Deliver products in original, unopened packages with manufacturer's labels identifying products legible and intact.
 - B. Store materials inside and under cover; keep dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, damage from construction traffic and other causes.
 - 1. Protect coatings (pail products) from freezing and temperatures in excess of 90 degrees.
 - C. Protect Portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.
 - 1. Stack insulation board flat and off the ground.
- 1.11 PROJECT CONDITIONS
- A. Environmental Conditions: Do not install system when ambient outdoor temperatures 40°F (4°C) and falling unless temporary protection and heat provided to maintain ambient temperatures above 40°F (4°C) during installation of wet materials and for 24 hours after installation or longer to allow them to become thoroughly dry and weather resistant.
 - B. Provide supplementary heat for installation in temperatures less than 40 degrees F.
 - C. Provide protection of surrounding areas and adjacent surfaces from application of materials
- 1.12 SEQUENCING AND SCHEDULING
- A. Sequence installation of system with related work specified in other sections to ensure that wall assemblies, including flashing, trim, and joint sealers, protected against damage from weather, aging, corrosion, or other causes.
 - B. Coordinate installation of foundation waterproofing, roofing membrane, windows, doors and other wall penetrations to provide a continuous air barrier.
 - C. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall.
 - D. Coordinate installation of windows and doors so air barrier components are connected to them to provide a continuous air barrier.

- E. Install window and door head flashing immediately after windows and doors are installed.
 - F. Install diverter flashing wherever water can enter the wall assembly to direct water to the exterior.
 - G. Install copings and sealant immediately after installation of the EIFS system and when EIFS coatings are dry.
 - H. Attach penetrations through EIFS to structural support and provide watertight seal at penetrations.
- 1.13 SYSTEM PERFORMANCE CRITERIA
- A. Installer provide fifteen (15) year guarantee of materials, installation and workmanship. Warranty to cover entire system components, including sealants, sheathing, reinforcing fabric, finish coats and other components specified in this section.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER'S:

- A. Manufacturers: materials are specified by brand names to establish a standard quality, or by performance requirements and general description of product. The architect will consider substitutions for brand names of products specified, provided the procedures set forth for substitutions are followed. The architect reserves the right to reject any material which, in his opinion, will not produce the quality of work specified herein.
- B. The specification is based on Sto Industries, Inc. systems as follows:
 - 1. Sto Corporation, Air/Moisture Barrier, EIF System; StoTherm Lotusan Next.
- C. The following are acceptable manufactures, provided the materials and products are equal to the above and technical specifications contained herein:
 - 1. Dryvit Systems, Inc.
 - 2. Parex, Incorporated
 - 3. Standard Watermaster
 - 4. Synergy

2.02 MATERIALS

- A. Compatibility: Provide adhesive, board insulation, reinforcing fabrics, base and finish coat materials, sealants, and accessories compatible with one another and approved for use by system manufacturer.
- B. Provide colors and texture of protective coating to comply with following requirements:
 - 1. Provide selection made by Architect from manufacturer's full range of standard colors and textures available for type of finish coat indicated.

2.03 GLASS MESH REINFORCED SHEATHING

- A. Proprietary backing units with glass mesh fiber mesh reinforcing and water resistant coating on both faces, of type recommended by EFIS system manufacturer and complying with one of the following:
 - 1. Coated Gypsum Panels: Water resistant, silicone-treated gypsum core with glass fiber mesh surface mats and manufacturer's proprietary water/vapor retarding, alkali resistant coating on both faces, ½" thick x 48" wide x 96", 108" or 120" long, weighing 2.0 lbs./s.f.
 - 2. Cement-Coated Portland Cement Panels: High density portland cement surface coating on both faces, lightweight concrete core composed of portland cement and expanded ceramic aggregate; 7/16" thick x 36" wide x 36", 48", 60", 64", or 72" long; 3.2 - 3.8 lbs./s.f.
 - 3. Vinyl-Coated Portland Cement Panels: Core formed in continuous process from aggregated portland cement slurry and reinforced with vinyl-coated woven glass fiber mesh embedded in both surfaces, with one face smooth and other textured; ½" thick and x 36" wide x 48", 60", and 72" long; 3 lbs./s.f.
 - 4. Products: Subject to compliance with requirements, provide one of following products:
 - a. "Dens-Glass Gold"; Georgia Pacific Corp.
 - b. "Wonder-Board"; Modulars Inc.
 - c. "Durock Tile Backer Board"; Durabond Div., USG Industries, Inc.

2.04 SURFACE PREPARATION MATERIALS

- A. Surface-Sealer: System manufacturer's standard adhesion intermediary designed to improve bond between substrate of type indicated and adhesive for application of insulation.
- B. Conditioner: Water-based surface conditioner with a minimum solids content of 8% for treatment of dry, porous concrete, plaster or masonry surfaces, load bearing painted surfaces, or for protection of sheathing from moisture damage.
- C. Leveler: Provide one of the following as required to level surfaces:
 - 1. A one component factory proportioned enhanced 100% acrylic polymer based leveler for concrete, masonry, plaster/stucco surfaces and acrylic based textured coatings (for leveling up to 1/16").
 - 2. A one component factory proportioned enhanced 100% acrylic polymer based leveler with water repellent additive for concrete, masonry or plaster surfaces (for leveling up to 1/8").
 - 3. A one component factory proportioned polymer modified fiber reinforced cement based leveler with water repellent additive for concrete, masonry or plaster surfaces (for leveling up to 1/2").
- D. Air/Moisture Barrier:
 - 1. Joint Compound: Ready mixed acrylic based flexible joint compound for rough opening protection and joint treatment of wall sheathing.
 - 2. Waterproof Coating: Ready mixed acrylic-based waterproof coating for wall sheathing.

2.05 ADHESIVE

- A. Adhesive for Application of Insulation: System manufacturer's standard formulation designed for indicated use, compatible with substrate and complying with following requirements:
 - 1. Cementitious Adhesives: Primer/Adhesive: One component polymer modified cement based, factory blend, and adhesive with less than 50 percent Portland cement content by weight (for use over exterior gypsum sheathing).
 - 2. Factory-mixed formulation designed for adhesive attachment of insulation to substrates of type indicated, as approved by system manufacturer.
 - 3. Either job-mixed or ready-mixed formulation indicated above.

2.06 RIGID BOARD INSULATION

- A. General: Insulation to comply with requirements listed:
 - 1. Insulation to be classified by Underwriter's Laboratory (U.L.).
 - 2. Flame Spread: less than 25; Smoke Developed less than 450 in accordance with ASTM E 84.
 - 3. Dimensional Tolerance: edges square within 1/16"; thickness uniform to within 1/16".
 - 4. Minimum thickness of board 1"; maximum thickness shall be no less than 4" as established by system manufacture based upon fire tests and EST reports.
- B. Nominal 1.0 lb/ft³ (16 kg/m³) Expanded Polystyrene (EPS) Insulation Board in compliance with ASTM C 578 Type I requirements.

2.07 REINFORCING MESHES

- A. Reinforcing Fabric: Balanced, alkali-resistant open weave glass fiber fabric treated for compatibility with other system materials; made from continuous multi-end strands with min. tensile strength of 120 lbs. and 140 lbs. in warp and fill directions, respectively, per ASTM D 1682 and complying with ASTM D 578 and following requirements:
- B. Standard Mesh:
 - 1. Nominal 4.5 oz./sq. Yd symmetrical, interlaced open-weave glass fiber fabric made with a min. 20 percent by weight alkaline resistant coating compatible with other system products.
 - 2. Application: For application over Armor Mat

- C. Ultra-High Impact Mesh:
 - 1. Armor Mat; Nominal 15 oz/yd² (509 g/m²), ultra-high impact, double strand, interwoven, open-weave glass fiber fabric with alkaline resistant coating compatible with other system materials.
 - 2. Application; All Areas unless otherwise noted
- D. Specialty Meshes:
 - 1. Corner Mat: Nominal 7.8 oz/yd² (265 g/m²), pre-creased, heavy-duty, open-weave woven glass fiber fabric with alkaline resistant coating for compatible with other system components
 - 2. Application: Typical for all corners (inside and out)

2.08 EXTERIOR FINISH SYSTEM

- A. Base Coat Materials; General: System manufacturer's standard, job-mixed formulation of portland cement complying with ASTM C 150, Type I, white or natural color; and system manufacturer's standard polymer-based adhesive designed for use indicated.
 - B. Cementitious Base Coats: One component polymer modified cement based factory blend, base coat with less than 50 percent Portland cement content by weight.
- 2.09 Waterproof Base Coat: Two component fiber reinforced acrylic-based waterproof base coat mixed with Portland cement (for use as a waterproof base coat to waterproof foundations, parapets, splash areas, trim and other projecting architectural features).
- A. Primer: Acrylic based tinted primer required.
 - B. Finish Coat Materials: System manufacturer's standard mixture complying with following requirements for material composition and method of combining materials:
 - 1. Equal to Stolit-Lotusan premium acrylic based textured wall coating with Lotus-Effect, Pronounced self-cleaning performance.
 - C. Color Selection: The lightness value of the exterior finish color to be applied over the insulation board shall be 20% or greater, and the color fastness shall not be less than 8.

2.10 MECHANICALLY FASTENERS

- A. System manufacturer's standard corrosion-resistant fastener assemblies, complete with system manufacturer's standard washer and shaft attachments, selected for properties of pull-out, tensile, and shear strength required to resist design loads of application indicated, capable of pulling fastener head below surface of insulation board, and of following description:
 - 1. For attachment to steel studs from 0.033" to 0.112" in thickness provide steel drill screws complying with ASTM C 954.
 - 2. For attachment to light gage steel framing members (not less than 0.0179" in thickness) provide steel drill screws complying with ASTM 1002.
 - 3. For attachment to masonry and concrete substrates provide nylon fasteners, sized to fit insulation thickness indicated and penetrate substrate to depth required to secure anchorage, with 1-7/8" diameter collar, for attachment to masonry and concrete substrates.

2.11 ELASTOMERIC SEALANTS

- A. Sealant Products: Provide manufacturer's standard chemically curing, elastomeric sealant compatible with joint fillers, joint substrates, and other related materials and complies with requirements of Division-7 section "Joint Sealers" for products corresponding to description indicated below.
 - 1. Sealant for expansion joints between EIFS sections shall be of an ultra-low modulus designed for a minimum of 100% elongations and a minimum of 50% compressions.
 - 2. Sealant for perimeter seals at windows, doors and other wall penetrations shall be low modulus, deigned for a minimum of 50% elongations and a minimum of 25% compression.
 - 3. Sealant Color: Provide color of exposed sealants to comply with following requirements:
 - a. Provide color selected by Owner/Architect from manufacturer's standard colors.

2.12 MIXING

- A. General: Comply with system manufacturer's requirements for combining and mixing materials.
 - 1. Do not introduce admixtures, water, or other materials except as approved by system manufacturer.
 - 2. Mix materials in clean containers.
 - 3. Use materials within time period specified by system manufacturer or discard.
- B. Mix with a clean, rust-free high-speed mixer to a uniform consistency.
- C. Mix only as much material as can readily be used.
- D. Do not use anti-freeze compounds or other additives

2.13 WATER / CEMENT

- A. Water: Clean and potable.
- B. Cement: ASTM C 150-89 Portland Cement, Type I

2.14 ACCESSORIES

- A. High impact rigid PVC plastic, conforming to ASTM D-1784-81, Cell Classification 13244C, Manufactured with BF Goodrich Geon Vinyls.
 - 1. Accessories include:
 - a. Starter track; Part No. STDE
 - b. Corner Bead, 1-1/4" X 1-1/4" with perforated flanges.
 - c. "J" Bead, 1" back leg, 1/2" return.
 - d. "MJ" Bead, 1-1/8" perforated flange, 1/4" return.
 - e. Stop Beads, 1-1/8" perforated flange.
 - f. Channel Reveal, 3/4" wide unless noted.
 - g. Control Joint with removable tape, 3/16" reveal.
 - h. Expansion joint, with removable tape, 1/2" reveal.
 - i. Soffit Vent, 3" wide (unless noted), with a free area of 15 sq.in. per lineal foot.
 - 2. Approved Manufacturer's subject to conformance with contract requirements:
 - a. Vinyl Corp., Miami, Florida 305-648-4695
 - b. Plastic Components, Miami, Florida, 305-885-0561; 800-327-7077.
 - c. PFB (Plasti-Fab) Corporation; 888-446-5377
- B. Column Collar: Where Gypsum board abut round or partially round concrete columns provide preformed Column Trim of inside dimension to match column diameter.
 - 1. Column Collar to be Single piece extruded aluminum of finish to match ceiling grid.
 - 2. Size: Provide edge moldings fabricated to diameter required to fit penetration exactly.
 - 2. Style: 3/4" Reveal Edge; of type to accommodate ceiling specified.
 - 3. Approved Manufacturers; Subject to conformance with specification:
 - a. Fry Reglet Corporation.
 - b. MM Systems Corporation.
 - a. Pittcon Industries

PART 3 - EXECUTION

3.01 GENERAL

- A. Installation of E.I.F.S. system Components shall be performed by and/or supervised by Manufacturer trained Applicators only.
- B. Under no circumstances shall any of the products be altered by adding any additives, except for small amounts of clean water as directed on label antifreeze, accelerators, rapid binders, etc., are forbidden.

- C. Mix materials in accordance with manufacturers recommendations and instructions.
 - 1. Mix with a clean, rust-free high speed mixer. Add water as directed on labeling.3.01

3.02 INSTALLERS\APPLICATORS

- A. Installer to meet criteria established above under the 'Quality Assurance' Section.

3.03 INSPECTION

- A. Prior to application of finish system, representative of manufacturer of finish system shall examine substrate for compliance with Contract Documents and system manufacturer's specifications.
 - 1. Advise Contractor and Architect of all discrepancies.
- B. Contractor shall correct all noted deficiencies to the satisfaction of the Manufacturer and Architect.
 - 1. Do not proceed with work until all unsatisfactory conditions corrected.

3.04 EXAMINATION

- A. Examine substrates, with Installer present, to determine if in satisfactory condition for installation of system.
 - 1. Do not proceed with installation of system until unsatisfactory conditions corrected.
- B. Inspect sheathing application for compliance with applicable requirement:
 - 1. Exterior gypsum sheathing – GA-253.
 - 2. Glass mat faced gypsum sheathing – Georgia Pacific Publication 101514.
 - 3. Cementitious sheathing – Consult manufacturer's published recommendations.
- C. Report deviations from the requirements of project specifications or other conditions that might adversely affect the Air/Moisture Barrier and EIFS installation to the General Contractor. Do not start work until deviations are corrected.

3.05 PROTECTION

- A. Protect contiguous work from moisture deterioration and soiling resulting from application of systems.
 - 1. Provide temporary covering and other protection needed to prevent spattering of exterior finish coatings on other work.
 - 2. Protect system, substrates, and wall construction behind them from inclement weather during installation.
 - 3. Prevent infiltration of moisture behind system and deterioration of substrates.
- B. Provide protection of installed materials from water infiltration into or behind them.
- C. Provide protection of installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry.

3.06 SURFACE PREPARATION

- A. Substrate Preparation:
 - 1. The surface to receive the E.I.F.S. shall be structurally sound, clean, dry and free of warpage, residual moisture or damage from moisture. Surfaces shall be uniform, with no irregularities greater than 1/8" in 4'-0".
 - 2. Remove surface contaminants and replace damaged sheathing.
 - 3. Spot surface defects in sheathing with joint compound.
 - 4. Prepare and clean substrates to comply with system manufacturer's requirements to obtain optimum bond between substrate and adhesive for insulation.
 - 5. Apply surface-sealer and/or conditioners over substrates where required by system manufacturer for improving adhesion.

3.07 INSTALLATION

- A. Install Air/Moisture Barrier and EIFS in compliance with manufacturer's published instructions.
- B. Air/Moisture Barrier Installation:
 - 1. For installation over glass mesh reinforced sheathing in compliance with ASTM C 1177:
 - 2. Protect rough openings, joints and parapets: apply joint compound by trowel over rough openings sheathing joints, inside and outside corners, and tops of parapets. Immediately embed reinforcing mesh in the wet joint compound and trowel smooth. Embed minimum 4 inch wide mesh at sheathing joints and minimum 9 inch wide mesh at rough openings, inside and outside corners and tops of parapets.
 - 3. Spot fasteners with joint compound.
 - 4. Apply waterproof coating by roller over sheathing surface, including the dry joint compound, to a uniform wet mil thickness of 10 mils in one coat. Use ½ inch nap roller for plywood and gypsum sheathing. Use ¾ inch nap roller for glass mat faced gypsum sheathing. Protect from weather until dry.
 - 5. Coordinate installation of connecting air barrier components with other trades to provide a continuous airtight membrane.
 - 6. Coordinate installation of flashing and other moisture protection components with other trades to achieve complete moisture protection such that water is directed to the exterior, not into the wall assembly, and drained to the exterior at sources of leaks (windows, doors and similar penetrations through the wall assembly).
- C. Starter Track:
 - 1. Strike a level line at the base of the wall to mark where the top of the starter track terminates.
 - 2. Attach the starter track even with the line into the structure a maximum of 16 inches on center with the proper fastener: Type S-12 corrosion resistant screws for steel framing with minimum 3/8 inch penetration, and galvanized or zinc coated nails for wood framing with minimum ¾ inch penetration. Attach between studs into sheathing as needed to secure the track flat against the wall surface. For solid sheathing attach directly into sheathing at 12 inches on center maximum.
 - 3. Butt sections of starter track together. Miter cut outside corners and abut. Snip front flange of one inside corner piece (to allow EPS Board to be seated inside of track) and abut.
 - 4. Install Starter Track at other EIF System terminations as designated on detail drawings: above windows and doors, at floor lines, above roof along dormers or gable end walls, and beneath window sills with concealed flashing.
 - 5. Strike a level line at the base of the wall to mark where the top of the starter track terminates.
 - 6. Attach the starter track even with the line into the structure a maximum of 16 inches on center with the proper fastener: Type S-12 corrosion resistant screws for steel framing with minimum 3/8 inch penetration, and galvanized or zinc coated nails for wood framing with minimum ¾ inch penetration. Attach between studs into sheathing as needed to secure the track flat against the wall surface. For solid sheathing attach directly into sheathing at 12 inches on center maximum.
 - 7. Butt sections of starter track together. Miter cut outside corners and abut. Snip front flange of one inside corner piece (to allow EPS Board to be seated inside of track) and abut.
 - 8. Install Starter Track at other EIF System terminations as designated on detail drawings: above windows and doors, at floor lines, above roof along dormers or gable end walls, and beneath window sills with concealed flashing.
- D. Splice Strips for Starter Track and Flashing:
 - 1. Starter Track, Window/Door Head Flashing and Side Wall Step Flashing: install 2 inch wide diagonal splice strips of detail mesh at ends of head flashings. Install minimum 4-inch wide splice strips of detail mesh between back flange of starter track, head flashings and roof/side wall step flashing. Center the mesh so it spans evenly between the back flange of the Starter Track or flashing and the sheathing. Embed the mesh in the wet joint compound and trowel smooth.
 - 2. Apply waterproof coating over the splice strip when the joint compound is dry
- E. Backwrapping: Apply a strip of detail mesh to the dry air/moisture barrier at all system terminations (windows, doors, expansion joints, etc.) except where the Starter Track is installed. The mesh must be wide enough to adhere approximately 4 inches of mesh onto the wall, be able to wrap around the insulation board edge and cover a minimum of 2 ½ inches on the outside surface of the insulation board. Adhere mesh strips to the air/moisture barrier and allow them to dangle until the backwrap procedure is completed.

- F. Adhesive Application and Installation of Insulation Board:
1. Rasp the lower face of insulation boards to provide a snug friction fit into the Starter Track. (Rasping prevents an outward bow at the Starter Track.
 2. Apply adhesive to the back of the insulation board with the proper size stainless steel notched trowel. Apply uniform ribbons of adhesive parallel with the SHORT dimension of the board so that when boards are placed on the wall the ribbons will be VERTICAL.
 3. Immediately place insulation boards in a running bond pattern on the wall with the long dimension horizontal. Start by inserting the lower edge of the boards inside the starter track at the base of the wall until they contact the bottom of the track. Apply firm pressure over the entire surface of the boards to ensure uniform contact of adhesive. Bridge sheathing joints by a minimum of 8 inches. Interlock inside and outside corners.
 4. Butt all board joints tightly together to eliminate any thermal breaks in the EIFS. Care must be taken to prevent any adhesive from getting between the joints of the boards.
 5. Cut insulation board in an L-Shaped pattern to fit around openings. Do not align board joints with corners of openings.
 6. Remove individual boards periodically while the adhesive is still wet to check for satisfactory contact with the substrate and the back of the insulation board. An equal amount of adhesive must be on the substrate and the board when they are removed, as an indication of adequate adhesion. Do not use nails, screws, or any other type of non-thermal mechanical fastener.
- G. Slivering and Rasping of Insulation Board Surface
- H. EPS insulation board exposed to sunlight will develop a powdery residue on the surface. This residue must be entirely removed by rasping the surface.
- I. After insulation boards are firmly adhered to the substrate, fill any open joints in the insulation board layer with slivers of insulation or approved spray foam.
1. Rasp the insulation board surface to achieve a smooth, even surface and to remove any ultraviolet ray damage.
- J. Trim, Reveals and Projecting Aesthetic Features:
1. Attach features and trim where designated on drawings with adhesive to the insulation board or sheathing surface. Slope the top surface of all trim/features minimum 1:2 (27 degrees).
 2. Cut reveals/aesthetic grooves with a hot-knife, router or groove-tool in locations indicated on drawings.
 3. Offset reveals/aesthetic grooves minimum 3 inches (75 mm) from insulation board joints.
 4. Do not locate reveals/aesthetic grooves at high stress areas such as corners of windows, doors, etc.
 5. A minimum $\frac{3}{4}$ inch (19 mm) thickness of insulation board must remain at the bottom of the reveals/aesthetic grooves.
- K. Completion of Backwrapping: Complete the backwrapping procedure by applying base coat to exposed edges of insulation board and approximately 4 inches (100 mm) onto the face of the insulation board. Pull mesh tight around the board and embed it in the base coat with a stainless steel trowel. Use a corner trowel for clean, straight lines. Smooth any wrinkles or gaps in the mesh.
- L. Base Coat and Reinforcing Mesh Application:
1. Apply minimum 9x12 inch diagonal strips of detail mesh at corners of windows, doors, and all penetrations through the system. Embed the strips in wet base coat and trowel from the center to the edges of the mesh to avoid wrinkles.
 2. Apply detail mesh at trim, reveals and projecting architectural features. Embed the mesh in the wet base coat. Trowel from the base of reveals to the edges of the mesh.
 3. Ultra-High Impact mesh application: Apply base coat over the insulation board with spray equipment or a stainless steel trowel to a uniform thickness of approximately 1/8 inch. Work horizontally or vertically in strips of 40 inches, and immediately embed the mesh into the wet base coat by troweling from the center to the edge of the mesh. Butt the mesh at seams. Allow the base coat to dry.

4. Standard mesh application: Apply base coat over the insulation board and Ultra-High impact mesh, with spray equipment or a stainless steel trowel to a uniform thickness of approximately 1/8 inch. Work horizontally or vertically in strips of 40 inches, and immediately embed the mesh into the wet base coat by troweling from the center to the edge of the mesh. Overlap mesh not less than 2-1/2 inches at mesh seams and at overlaps of detail mesh. Feather seams and edges. Double wrap all inside and outside corners with minimum 2-1/2 inch (64 mm) overlap in each direction. Avoid wrinkles in the mesh. The mesh must be fully embedded so that no mesh color shows through the base coat when it is dry. Re-skin with additional base coat if mesh color is visible.
 5. Sloped Surfaces: for trim, reveals, aesthetic bands, cornice profiles, sills or other architectural features that project beyond the vertical wall plane more than 2 inches apply waterproof base coat with a stainless steel trowel to the weather exposed sloped surface and minimum four inches above and below it. Embed standard mesh or detail mesh in the waterproof base coat and overlap mesh seams a minimum of 2-1/2 inches.
 6. Allow base coat to thoroughly dry before applying primer or finish.
- M. Primer Application: Apply primer evenly with brush, roller or proper spray equipment over the clean, dry base coat and allow to dry thoroughly before applying finish.
- N. Finish Coat Application: Apply finish directly over the base coat (or primed base coat) when dry. Apply finish by spraying or troweling with stainless steel trowel, depending on the finish specified. Follow these general rules for application of finish:
1. Avoid application in direct sunlight.
 2. Apply finish in a continuous application, and work to an architectural break in the wall.
 3. Weather conditions affect application and drying time. Hot or dry conditions limit working time and accelerate drying. Adjustments in the scheduling of work may be required to achieve desired results: cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing. Adjust work schedule and provide protection.
 4. Apply texture type selected by architect.
 5. Do not install separate batches of finish side-by-side.
 6. Do not apply finish into or over sealant joints. Apply finish to outside face of wall only.
 7. Do not apply finish over irregular or unprepared surfaces, or surfaces not in compliance with the requirements of the project specifications.

3.08 JOINTS

- A. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories. Unless noted otherwise control joints in to be spaced in accordance with the following criteria:
1. Maximum area between control joints: 100 Square feet. Maximum Dimension of area: 12 feet.
 2. Joints to be equally spaced.
 3. Locate at each wall offset.
 4. Locate a points of system termination and at intersections with differing materials.
 5. Layout of joints to be approved by Architect prior to installation.
- B. Provide minimum 3/4 inch wide expansion joints in the EIFS where they exist in the substrate or supporting construction, where the EIFS adjoins dissimilar construction or materials, at changes in building height, and at floor lines in multi-level wood frame construction.
- C. Provide minimum 1/2 inch (13 mm) wide sealant joints at all penetrations through the EIFS (windows, doors, etc.).
- D. Provide compatible backer rod and sealant that has been evaluated in accordance with ASTM C1382, "Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish System (EIFS) Joints," and that meets minimum 50% elongation after conditioning.
- E. Provide joints so that air barrier continuity is maintained across the joint and drain joints to the exterior.

3.09 TRIM, PROJECTING ARCHITECTURAL FEATURES AND REVEALS:

- A. All trim and projecting architectural features shall have a minimum 1:2 [27 degrees] slope along their top surface.
- B. All horizontal reveals shall have a minimum 1:2 [27 degrees] slope along their bottom surface.
- C. Where trim/feature or bottom surface of reveal projects more than 2 inches from the face of the EIFS wall plane, protect the top surface with waterproof base coat.

3.10 ACCESSORIES

- A. Install rigid vinyl accessories as shown on Architect's Details or as required to complete installation of finish system.
 - 1. Install 3" soffit vent around perimeter (4 sides) of each exterior soffit or ceiling.
 - 2. Install expansion and control joints as recommended by manufacturer and as described above.
- B. Install accessories in full compliance with manufacturer's written recommendations.
 - 1. Accessories shall be mechanically fastened to substrate using nails or screws spaced at no more than 12" on center.
 - 2. Install accessories straight, square and true.
 - 3. Face of accessory to be flush with surface of finish system.

3.11 INSTALLATION OF JOINT SEALANTS

- A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements of Division-7 section "Joint Sealers".

3.12 ACCEPTANCE

- A. The finished surface shall be of uniform thickness, texture, color appearance and free of irregularities.
 - 1. Surface to be plumb to within 1/16" in 4'-0".
 - 2. Surface to be level to within 1/16" in 4'-0".
- B. The finish shall be uniform in color, free from bleed thru of base course or mesh.
- C. EIFS and insulation system to be free from cracks and other surface imperfections.

3.13 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work.
 - 1. Promptly remove protective coatings from window and door frames, and any other surfaces outside areas indicated to receive protective coating.
- B. Provide final protection and maintain conditions, in manner acceptable to Installer and system manufacturer, which ensures system being without damage or deterioration at time of Final Acceptance.

END OF SECTION 07240

**SECTION 07270
FIRE-STOPPING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of each form and type of fire stopping indicated on drawings and herein.
- B. Types of Fire-Stopping materials specified in this Section include the following:
 - 1. Semi-Rigid, Thermal Ceramic Fire Safing Insulation.
 - 2. One-Part Fire-Stopping Sealant.
 - 3. Foamed-In-Place Fire-Stopping Sealant.
- C. Building and roof insulations specified in other Division-7 sections.
- D. Non-fire-rated joint sealers specified in other Division-7 sections.
- E. Firestopping as part of Mechanical systems specified in a Division 15, Section.
- F. Penetration Seals as part of Electrical systems specified in a Division 16, Section.

1.03 SYSTEM PERFORMANCES

- A. Provide individual or combination of listed fire-stop materials produced and installed to establish and maintain applicable fire/smoke rating of assembly in which material is to be installed.
- B. Fire-Stop system, consisting of a single material or combination of materials listed shall be capable of maintaining fire/smoke rating equal to or greater than that listed for assembly (wall, ceiling, roof, floor, ect.) in which fire-stopping is to be used.
- C. Fire Performance Characteristics: Provide insulation materials identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is part, determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Surface Burning Characteristics: ASTM E 84.
 - 2. Fire Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.04 SUBMITTALS

- A. Product Data from manufacturer's for each fire-stop product required, including instructions for preparation and fire-stop application.
 - 1. Indicated specific application for each material being submitted.
 - 2. Indicated applicable U.L. Design numbers for each proposed application.
 - 3. Submit manufacturer test data showing compliance with applicable fire/smoke ratings.
- B. Sealant Samples for Initial Selection Purposes: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- C. Sealant Samples for verification purposes of each type and color of joint sealer required.
 - 1. Install joint sealer samples in 1/2 inch wide joints formed between two 6" long strips of material matching appearance of exposed surfaces adjacent to joint sealers.

- D. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings tested for compatibility and adhesion with joint sealants.
 - 1. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Installer successfully completed within last 3 years at least 3 fire-stop applications similar in type and size to that of this Project.
- B. Single Source Responsibility for Fire-Stop Materials: Obtain fire-stop materials from single manufacturer for each different product required.
- C. Preconstruction Compatibility and Adhesion Testing: Submit samples of all materials that contact or affect fire-stop to fire-stop manufacturers for compatibility and adhesion testing, as indicated below:
 - 1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques required to obtain rapid, optimum adhesion of fire-stop to joint substrates.
 - 2. Perform tests under normal environmental conditions that exist during actual installation.
 - 3. Submit min. 9 pieces of each type of material, including joint substrates, shims, fire-stop backings, secondary seals, and miscellaneous materials.
 - 4. Schedule sufficient time for testing and analysis of results to prevent delay in progress of Work.
 - 5. Investigate materials failing compatibility or adhesion tests and obtain fire-stop manufacturer's written recommendations for corrective measures, including use of specially formulated primers.
- D. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- E. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.
- F. Max. Allowable Content of Inorganic Insulations: Provide insulations composed of mineral fibers or mineral ores which contain no asbestos of any type or mixture of types occurring naturally as impurities as determined by polarized light microscopy test per Appendix A of 40 CFR 763.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.07 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of fire-stop materials under following conditions:
 - 1. When ambient and substrate temperature conditions outside limits permitted by joint sealer manufacturer or below 40°F (4.4°C).
 - 2. When joint substrates wet due to rain, frost, condensation or other causes.
- B. Joint Width Conditions: Do not proceed with installation of fire-stop materials where joint widths less than allowed by fire-stop manufacturer for application indicated.

- C. Joint Substrate Conditions: Do not proceed with installation of fire-stop materials until contaminants capable of interfering with adhesion removed from joint substrates.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. General: In order to obtain required fire/smoke rating(s) the contractor shall use product types listed either individually or in combination with each other, as necessary to comply with applicable U.L. Design numbers.
 - 1. Contractor shall utilize one of the manufacturers listed in each category.
- B. Manufacturers: Subject to compliance with requirements, provide products of one of following:
 - 1. Manufacturers of Semi-Rigid, Thermal Ceramics Blanket Insulation:
 - a. Manville Corp.
 - b. Thermal Ceramics, Inc.; Fire Master Construction/Safing Joint Fire Protection
 - c. The Carborundum Company
 - d. United States Gypsum Co.
 - e. Hilti Speed Plugs
 - 2. One-Part Fire-Stopping Sealant:
 - a. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
 - b. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
 - c. Hilti Elastomeric Sealant
 - 3. Foamed-In-Place Fire-Stopping Sealant:
 - a. "Dow Corning Fire Stop Foam"; Dow Corning Corp.
 - b. "Pensil 851"; General Electric Co.
 - c. Hilti Fire Foam

2.02 PRODUCTS, GENERAL

- A. Compatibility: Provide fire-stop materials, joint fillers, primers and other related materials compatible with one another and with joint substrates under conditions of service and application, as demonstrated by fire-stop manufacturer based on testing and field experience.
- B. Provide manufacturer's standard fire-stopping sealant, with accessory materials, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Colors: Provide color of exposed fire-stop joint sealer indicated or, if not otherwise indicated, selected by Architect from manufacturer's standard colors.
- D. Formulate fire-stop joint sealant for interior joints to accept paint after curing.

2.03 CHARACTERISTICS:

- A. Product shall be classified by Underwriters Laboratories, Inc., as "fill, void or cavity material" for through-penetration firestop systems in accordance with ASTM E814 and U.L. 1479 and complying with the following:
- B. Fire/Smoke rating of material(s) in proposed application shall have ratings, fire and/or smoke, to match assembly in which material is used.

2.04 SEMI-RIGID, THERMAL CERAMIC FIRE SAFING INSULATION

- A. Semi-Refractory Fiber Board Safing Insulation: Semi-rigid boards designed for use as fire stop at openings in fire rated walls and floors, produced by combining semi-refractory mineral fiber manufactured from slag with thermosetting resin binders to comply with ASTM C 612, Class 1 and 2; nominal density of 4.0 lbs. per cu. ft.; passing ASTM E 136 for combustion characteristics; r-value of 4.0 at 75°F (23.9°C) and as follows:
 - 1. Material shall be free of dangerous or toxic off-gassing.
 - 2. Flame Spread: 0; Smoke Developed: 0; Fuel Contribution: 0.
 - 3. Service Range: 280 degrees to 2300 degrees F.
 - 4. Melting Point - 3200F
- B. Fire Safing to be used to seal opening in fire/smoke rated walls and floors, as necessary, as required and as follows:
 - 1. Fire/Smoke stop at openings between edge of slab and exterior wall panels.
 - 2. Fire/Smoke stop between top of rated walls and floor slabs and floor system assemblies.
 - 3. Fire/Smoke stop between top of rated walls and roof decks and roof system assemblies.
 - 4. To seal expansion and control joints in rated masonry walls.
 - 5. Openings in fire/smoke rated walls and floors.
 - 6. To seal penetrations, including structural, through fire/smoke rated walls, floors and assemblies.
 - 7. Elsewhere where indicated or required to maintain ratings.

2.05 FIRE-STOPPING JOINT SEALANT

- A. One-Part Fire-Stopping Sealant: One part elastomeric sealant formulated for use in through-penetration fire-stop system for sealing openings around cables, conduit, pipes and similar penetrations through walls and floors and in compliance with the following:
 - 1. Material shall be free of dangerous or toxic off-gassing.
 - 2. Flame Spread: 0; Smoke Developed: 0; Fuel Contribution: 0.
- B. Sealant to be used to seal around cables, conduit, pipes and similar penetrations through walls and floors, sealing expansion and control joints in masonry construction, and the following:
 - 1. Penetrations through fire/smoke rated walls and partitions.
 - 2. Pipe, ducts, electrical penetrations through fire/smoke rated walls.
 - 3. Openings between tops of walls and roof deck where occurring in fire/smoke rated walls.
 - 4. Expansion joints in fire/smoke rated walls.
 - 5. Elsewhere where required or designated to maintain fire/smoke rating of partition.

2.06 FOAMED-IN-PLACE FIRE-STOPPING JOINT SEALANT

- A. Two-part, foamed-in-place, silicone sealant formulated for use in through-penetration fire-stop system for filling openings around cables, conduit, pipes and similar penetrations through walls and floors. Comply with ASTM E814/U.L. 1479 "Standard Method of Fire Tests of Through-Penetration Firestops for Fire Exposure" and in compliance with the following:
 - 1. Material shall be free of dangerous or toxic off-gassing.
 - 2. Flame Spread: 0; Smoke Developed: 0; Fuel Contribution: 0.
- B. Sealant to be used to seal around cables, conduit, pipes and similar penetrations through walls and floors and the following:
 - 1. Penetrations through fire/smoke rated walls and partitions.
 - 2. Pipe, duct, electrical penetrations through fire/smoke rated walls.
 - 3. Elsewhere where required or designated to maintain fire/smoke rating of partition.

2.07 MISCELLANEOUS MATERIALS

- A. General: Provide sealant backings of material and type which are nonstaining; compatible with joint substrates, sealants, primers and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - 1. Provide forming, joint-fillers, packing and other accessory materials required for installation of fire-stopping sealants as applicable to installation conditions indicated.

- B. Primer: Provide type recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate tests and field tests.
- C. Firestop Damming: Provide type and where required or recommended by firestop manufacturer as necessary for proper installation and function of materials herein specified.
- D. Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaners of type acceptable to manufacturer of sealants and sealant backing materials, not harmful to substrates and adjacent nonporous materials, and not leave oily residues or otherwise have detrimental effect on sealant adhesion or in-service performance.
- E. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.
- F. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with requirements for fire performance characteristics.
- G. Mechanical Anchors: Type and size indicated or, if not indicated, as recommended by insulation manufacturer for type of application and condition of substrate.
- H. Mastix Sealer: Type recommended by insulation manufacturer for bonding edge joints between units and filling voids in work.

PART 3 - EXECUTION

3.01 GENERAL

- A. Comply with manufacturer's pre-printed instructions for installation of each type of firestop material, for each condition of use.
 - 1. If printed instructions not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Installation and materials shall be in accordance with requirements of this Section, manufacturers recommendations, and in accordance with requirements of Local and State Fire Marshal.
- C. Where ever fire and/or smoke walls abut fire and/or smoke rated assemblies, the joint between the wall and the assembly shall be sealed with materials described herein, in accordance with manufacturers recommendations to maintain specified ratings.
 - 1. All fire and smoke rated partitions shall be sealed at fire and/or smoke rated assembly or deck in a manner to maintain specified rating and to prevent the passage of smoke.
- D. Where ever fire or smoke walls are extended to the floor and/or roof deck, the joint between the top of the wall and the floor and/or roof deck shall be sealed with materials specified herein, in accordance with manufacturers recommendations to maintain specified ratings.
- E. All penetrations through fire/smoke-rated partitions shall be sealed utilizing fire/smoke-rated components herein described either individually or jointly as dictated by field conditions.
 - 1. Generally fire safing shall be used at structural penetrations through fire/smoke-rated walls, at top of fire rated partitions and at expansion joints.
 - 2. Generally firestop sealant shall be utilized where gap is relatively small (3/4" and smaller).
 - 3. Generally firestop foam insulations will be utilized where gaps are larger than 3/4".

3.02 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance.
 - 1. Do not proceed with installation of joint sealants until unsatisfactory conditions corrected.

3.03 INSPECTION

- A. Installer examine substrates and conditions under which fire-stopping work performed.
 - 1. Satisfactory substrate one that complies with requirements of section in which substrate and related work specified.
 - 2. Installer provide written report listing conditions detrimental to performance of work in this Section.
 - 3. Do not proceed with installation of insulation until unsatisfactory conditions corrected.

3.04 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturers and following requirements:
- B. Remove all foreign material from joint substrates interfering with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellents; water; surface dirt and frost.
 - 1. Clean concrete, masonry and other porous surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or combination of these methods to produce clean, sound substrate capable of developing optimum bond with joint sealers.
 - 2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form release agents from concrete.
 - 4. Clean metal and other non-porous surfaces by chemical cleaners or other means not harmful to substrates or leaving residues capable of interfering with adhesion of joint sealers.
- C. Joint Priming:
 - 1. Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant substrate tests or prior experience.
 - 2. Apply primer to comply with joint sealant manufacturer's recommendations.
 - 3. Confine primers to areas of joint sealant bond, do not allow spillage or migration onto adjoining surfaces.
 - 4. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces otherwise permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears.
 - a. Remove tape immediately after tooling without disturbing joint seal.

3.04 INSTALLATION

- A. Prepare surfaces and install products in strict conformance with manufacturer's written instructions.
- D. Installation shall be in strict conformance with manufacturer's written instructions.
- B. Provide appropriate fire-rated damming materials as dictated by field conditions and recommended by firestop product manufacturer.
- C. Install materials to proper thickness and utilizing appropriate procedures to obtain fire rating herein specified.

3.05 SEMI-RIGID, THERMAL CERAMIC FIRE SAFING INSULATION

- A. Installation and materials shall be in accordance with requirements of this Section, manufacturers recommendations, and in accordance with requirements of Local and State Fire Marshal.
- B. Provide appropriate fire-rated damming materials as dictated by field conditions and recommended by firestop product manufacturer.
- C. Install materials to proper thickness and utilizing appropriate procedures to obtain fire rating herein specified.
- D. Install fire safing where shown, where indicated herein, and where required to maintain continuity of fire rating.

3.06 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealANT manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Installation of Sealant Backings: Install sealant backings to comply with following requirements:
 - 1. Install joint-fillers of type indicated to provide support of sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
 - 2. Do not leave gaps between ends of joint-fillers.
 - 3. Do not stretch, twist, puncture or tear joint fillers.
 - 4. Remove absorbent joint fillers if wet prior to sealant application and replace with dry material.
 - 5. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where adhesion of sealant to surfaces at back of joints result in sealant failure.
- C. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
- D. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing and other accessory materials to fill openings around structural, plumbing, mechanical and electrical services penetrating floors and walls to provide fire-stops with fire resistance ratings indicated for floor or wall assembly in which penetration occurs.
 - 1. Comply with installation requirements established by testing and inspecting agency.

3.05 FIELD QUALITY CONTROL

- A. After forty-eight (48) hours inspect completed work for complete adhesion and seal. Provide additional materials and labor necessary to obtain complete adhesion and seal.

3.07 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.08 PROTECTION

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so they are without deterioration or damage at time of Final Acceptance.
 - 1. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

3.09 PRODUCT VERIFICATION

- A. Empty containers/wrapping materials for each product type shall be retained until time of Fire Marshall 100% Inspection. At time of inspection contractor shall make available containers/wrapping materials to Fire Marshall for his use in verifying suitability of products in place.

END OF SECTION 07270

**SECTION 07311
ASPHALT SHINGLES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of shingles indicated on drawings, defined to include units employed as weather protection for roofs.
- B. Section includes, but not limited to:
 - 1. Asphalt roofing shingles.
 - 2. Leak barrier and moisture shedding roof deck protection.
 - 3. Metal flashing associated with shingle roofing.

1.03 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: Framing, wood decking and roof sheathing.
- B. Section 07600 - Flashing and Sheet Metal: Sheet metal flashing not associated with shingle roofing; gutters and downspouts.

1.04 QUALITY ASSURANCE

- A. UL Listing: Materials labeled, tested and listed by UL for Class and Rating indicated for each shingle type required.
- B. Manufacturer Qualifications: Company specializing in manufacturing the roofing system products specified in this section, with minimum of 25 years experience.
- C. Installer: Licensed roofing firm with min. 5 years successful experience in applications similar this Project.
- D. Shop Drawings: Submit to the Architect the required Product Data, Shop Drawings, Product Samples, and Color Samples immediately upon the receipt of the signed contract.
 - 1. Materials shall not be ordered and/or delivered to the project site until shop drawings have been submitted, received, reviewed by Architect and found to be "Acceptable as Noted".
- E. Pre-Installation Meeting: Conduct a pre-installation meeting not more than 2 weeks after the start of the roofing project and before start of roofing installation.
 - 1. Contractor shall schedule and arrange meeting and meeting place and notify attendees.
 - 2. Mandatory Attendees: Architect, Roofing installer and manufacturer's steep slope technical representative (not sales agent).
 - 3. Review all pertinent requirements for achieving the warranty specified below and set schedule for final warranty inspection.
- F. Final Warranty Inspection: Provide manufacturer's roofing inspector to review completed project for compliance with the conditions of the warranty specified below as well as manufacturers standard inspection checklist.

1.05 REFERENCED STANDARDS

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.
- D. ASTM C 1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
- E. ASTM D 3018 - Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.
- F. ASTM D 3161 - Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).
- G. ASTM D 3462 - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
- H. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- I. ASTM E 903 - Standard Test Method for Solar Absorption, Reflectance and Transmission of Materials Using Integrating Spheres.
- J. UL 790 - Tests for Fire Resistance of Roof Covering Materials.
- K. UL 997 - Wind Resistance of Prepared Roof Covering Materials.

1.06 SUBMITTALS

- A. Product Data: Submit technical product data, installation instructions and recommendations from shingle manufacturer, including data that materials comply with requirements.
- B. Samples:
 - 1. Submit full range of samples for color and texture selection.
 - 2. After selection, submit 2 full-size shingles for verification of each color/style/texture selected.
- C. Manufacturer's installation instructions, showing required preparation and installation procedures.
- D. Maintenance Stock: 2% of each type/color/texture shingle used in Work.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's unopened, labeled bundles rolls or containers.
- B. Store materials to avoid water damage, and store rolled goods on end.
- C. Store products in manufacturer's unopened labeled packaging until ready for installation.
- D. Store products in a covered, ventilated area, at temperature not more than 110 degrees F (43 degrees C); do not store near steam pipes, radiators, or in sunlight.
- E. Store bundles on flat surface to maximum height recommended by manufacturer; store rolls on end.
- F. Store and dispose of solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- G. Comply with manufacturer's recommendations for job-site storage and protection.

1.08 JOB CONDITIONS

- A. Substrate: Proceed with shingle work only after substrate construction and penetrating work completed.
- B. Weather Conditions: Proceed with shingle work only when weather conditions in compliance with manufacturer's recommendations, when substrate completely dry.

1.09 SPECIFIED PRODUCT WARRANTY

- A. Material Warranty: Provide shingle manufacturer's warranty on installed work, agreeing to pay for repair or replacement of defective shingles as necessary to eliminate leaks.
 - 1. Period of warranty is **Thirty (30)** years from date of Final Approval.
- B. Water-tightness Warranty: Contractor shall furnish guarantee covering maintenance of roofing and flashing systems for period of **Ten (10)** years from date of Final Certificate of Payment. Within this period, Repair, replace or correct any defective materials or workmanship without expense to Owner.
 - 1. Warranty shall include coverage of incidental damages caused by failure to maintain roof in water tight conditions for specified period of time.

PART 2 - PRODUCTS

2.01 ASPHALT SHINGLE MATERIALS

- A. Basis for Specifications: The specification is based on the Timberline Architectural Asphalt Shingles by GAF Materials Corporation, Residential Roofing Products, which is located at: 1361 Alps Rd.; Wayne, NJ 07470; Toll Free Tel: 888-LEAK-SOS; Tel: 888-532-5767; Fax: 973-628-3866; Email: cfontenot@gaf.com; Web: www.gaf.com
 - 1. 30 year warranted Timberline Prestique 30 Shingles by GAF-Elk.
- B. Approved Manufacturers: Approved manufacturers, subject to compliance with technical specifications and compliance with compliance with basis for specifications:
 - 1. Bird & Son/Genstar Building Materials Co.
 - 2. The Celotex Corp.
 - 3. Certainteed Corp.
 - 4. Self-Sealing; GAF Corp.
 - 5. Manville Building Materials Corp.
 - 6. Owens-Corning Fiberglas Corp.
- C. Square Tab Strip Shingles, UL Class "A", Architectural Type: Self sealing, granule surfaced, asphalt shingle with a strong fiberglass reinforced Micro Weave core and a mineral granule surfacing. Architectural laminate styling provides a wood shake appearance with a 5 inch (127 mm) or 5-5/8 inches (143 mm) exposure. Meets ASTM D 3018, ASTM D 3161, and ASTM D 3462; UL 790 Class A rated with UL 997 Wind Resistance Label.
 - 1. Color, texture, shape and appearance to match existing shingle.

2.02 HIP AND RIDGE SHINGLES

- A. Distinctive self sealing hip and ridge cap shingle complementing the color of selected roof shingle.
 - 1. Each bundle covers approx. 25 lineal feet (7620 mm) with a 5 inch (127 mm) exposure.
 - 2. Seal-A-Ridge ArmorShield Ridge Cap Shingles by GAF-ELK.
- B. Approved Manufacturers: Approved manufacturers, subject to compliance with technical specifications and compliance with compliance with basis for specifications:
 - 1. Bird & Son/Genstar Building Materials Co.
 - 2. The Celotex Corp.
 - 3. Certainteed Corp.
 - 4. Self-Sealing; GAF Corp.
 - 5. Manville Building Materials Corp.
 - 6. Owens-Corning Fiberglas Corp.

2.03 UNDERLAYMENT

- A. Leak Barrier: Smoothed surfaced, self-adhering, self sealing, peel and stick type bituminous leak barrier for use as a secondary waterproofing membrane.
 - 1. Smooth surfaced peel and stick membrane for use as a secondary waterproofing membrane.
 - a. Application: For use under shingle roofing, metal flashings, including, but not limited to, rake trim, fascias, ridge caps, valleys, vertical wall flashings, cap flashings, copings and expansion joints covers.
 - b. Thickness: 40 Mil min.
 - 2. Approved manufacturers subject to compliance with technical provisions of the contract:
 - a. W.R. Grace Ice and Water Shield
 - b. MiraDri, WIP 200 Non Skid Film Surface
 - c. Ownes Corning; Weatherlock
 - d. WeatherWatch by GAF-Elk.
- B. Roof Deck Protection: Water repellent, breather type cellulose/glass fiber composite roofing underlayment of type recommended by asphalt shingle manufacturer.

2.04 METAL FLASHINGS AND TRIM

- A. Metal Flashing: Kynar finished sheet aluminum, of shape indicated or required.
 - 1. Comply with ASTM B 209.
 - 2. Job-cut to sizes and configurations required.
- B. Metal Valley Flashing: Min. .040" Kynar finished aluminum sheet, brake-formed to provide a "V" shaped valley flashing extending up each roof surface a minimum of 12" and shall be of shape as follows:
 - 1. Edge of flashing to be crimped 1/2" to form a dam and to allow for attachment with concealed cleats.
 - 2. Furnish in 10' lengths.
 - 3. Color selected by Architect from manufacturers standard colors.
- C. Metal Drip Edge: Min. .032" Kynar finished aluminum sheet, brake-formed to provide profile as shown on drawings.
 - 1. If not shown as fabricate as follows: 4" roof deck flange (horizontal), and 1-1/2" fascia flange (vertical) with a 45 degree, 3/8" long drip at lower edge.
 - 2. Furnish in 10' lengths.
 - 3. Color selected by Architect from manufacturers standard colors.
- D. Metal Rain Diverter: Min. .032" Kynar finished aluminum sheet, brake-formed to provide 3" roof deck flange, and 1-1/2" Vertical water dam with 3/8" X 3/8" boxed hem at upper edge.
 - 1. Rain Diverter to be of length to match door width plus 3'-0".
 - 2. Furnish in 10' lengths.
 - 3. Color selected by Architect from manufacturers standard colors.

2.05 ASSOCIATED PRODUCTS

- A. Fasteners: Standard round wire shingle type, zinc-coated steel or aluminum; 10 to 12 gauge (3.416 mm to 2.657 mm for steel) (2.588 mm to 2.052 mm for aluminum), barbed or deformed shank roofing nails, with heads 3/8 inch (9.5 mm) to 7/16 inch (11 mm) in diameter; length sufficient to penetrate at least 3/4 inch (19 mm) into nailable substrate.
 - 1. Staples: The use of Staples is prohibited.
 - 2. Minimum nail length to be 1-1/2".
 - 3. Submit nails for approval prior to starting work.
- B. Roofing Cement:
 - 1. General purpose asphalt roofing cement meeting the requirements of ASTM D 4586 Type I or II. Matrix Standard Plastic Roof Cement #203 by BMCA.
 - 2. Asphalt Plastic Cement: Fibrated asphalt cement; ASTM D 2822; designed for trowel application.

2.06 VENTILATION

- A. Shingle Covered Continuous Ridge Vent: Continuous Ridge vent to be designed for application of shingles (nail attached) to surface of molded high density polyethylene ridge vent.
 - 1. High Density Polyethylene: Shall be 0.080" thick high density polyethylene capable of remaining flexible at temperatures below zero, with heat stabilizers, ultraviolet inhibitors, and color fast pigments (to prevent fading).
 - 2. Ridge vent shall have a rounded top and be designed with an external wind baffle. The total overall height shall be less than 1". The vent shall provide 17 square inches of net free vent area per foot of vent.
 - 3. Furnish complete with end plugs, connector plugs, hold down straps, and dry glass weather filter.
 - 4. Products: Subject to compliance with requirements, provide one of following:
 - a. Air Vent Inc., Shinglevent II; Phone 1-800-AIR-VENT
 - b. Ampcor; Shingle Over Ridge Vent; Phone 1-800-647-7063
 - c. Ridge Master Plus; Phone 1-800-521-8486

PART 3 - EXECUTION

3.01 REMOVAL OF EXISTING ROOFING

- A. Remove all existing roofing down to the roof deck.
- B. Verify that deck is dry, sound, clean and smooth, free of depressions, waves and projections.

3.02 INSPECTION

- A. Installer examine substrate and conditions under which shingling work performed. Conditions found to be detrimental to re-roofing activities or affect specified warranties shall be corrected by contractor at no cost to the contract.
- B. Roof installer to verify that roof deck is:
 - 1. Smooth and free from ridges and other irregularities which will affect the appearance of the final roof.
 - 2. Sound and in good condition.
 - 3. Securely attached to substrate.
- C. Do not proceed with shingling work until unsatisfactory conditions corrected.
- D. The installation of the new roofing system by the contractor shall be construed as an indication that the contractor has inspected the decking, found the decking to be an acceptable substrate for the new roofing system, and that the contractor and the manufacturer will be capable and willing to provide the required warranties on the completed product.

3.03 PREPARATION OF SUBSTRATE

- A. Clean substrate of any projections and substances detrimental to shingling work.
- B. Cover with sheet metal all holes over 1 inch (25 mm) diameter, cracks over 1/2 inch (12 mm) in width, loose knots and excessively resinous areas. Attach sheet metal to decking with roofing nails.
- C. At areas to receive leak barrier, fill knot holes and cracks with latex filler.
- D. Provide additional fasteners necessary to assure existing roof sheathing is adequately attached to structure.
- E. Remove and replace deteriorated roof deck sheathing.
- F. Coordinate installation of shingles with flashing and other adjoining work to ensure proper sequencing.
 - 1. Do not install shingle roofing until all vent stacks and other penetrations through roofing installed and securely fastened against movement.

- G. Remove portions of plywood at ridge of buildings in accordance with ridge vent manufacturers recommendations in order to allow for proper functioning of ridge vent.

3.04 UNDERLAYMENT AND FLASHINGS INSTALLATION

- A. General: Comply with instructions and recommendations of shingle manufacturer, except to extent more stringent requirements are indicated.
 - 1. Install materials of this section in accordance with applicable codes and ordinances unless more stringent requirements specified herein.
- B. Leak Barrier Underlayment: Leak barrier underlayment to be installed over the entire area of the roof indicated to receive shingle roofing and as follows:
 - 1. Install above **and** below all metal flashings at roof perimeter, roof penetrations, valleys, hips and roof expansion joints.
 - 2. Extend up face of roof curbs and expansion joints full height.
- C. Eave Flashing and Edge Protection: Install metal flashing, vent flashing and edge protection indicated and in compliance with details and recommendations of NRCA Steep Roofing Manual.
 - 1. Metal Drip edge to be installed continuously along the roof perimeter.
 - 2. Install with a minimum 6" laps in direction of water flow; seal laps with continuous 3" wide sealant tape.
 - 3. Place eave edge metal flashing tight with fascia boards; lap joints 2 inches (50 mm) and seal with plastic cement; nail at top of flange.
- D. Rain Diverters:
 - 1. Except where gutters are indicated to be installed, provide rain diverters over each exterior door.
 - 2. Extend horizontal leg of diverter up under shingles a minimum of 3". Attach to deck using roofing nails.
 - 3. Slope rain diverter from center of door to side to allow for drainage,
- E. Valley Flashing (Closed Cut Valley):
 - 1. Install one piece leak barrier, at least 48 inches wide centered on valley running full length of valley without joints; lap ends 6 inches (150 mm) and seal laps in flashing with continuous bed of mastic .
 - 2. Install sheet metal flashing, 36" wide from ridge to eave, centered on valley. Weatherlap end joint a minimum of 12". Seal end joints with two rows of continuous 3" wide sealant tape.
 - 3. Lay one slope of shingles continuously across valley bending up on adjoining surface approximately 12". Press shingles tightly into the valley.
 - 4. Apply succeeding courses in same manner.
 - 5. Use normal shingle fastening methods except that no fasteners shall be within 6" of the valley centerline and two fasteners shall be placed at end of each shingle crossing the valley.
 - 6. Where roof slopes on opposite sides of valley differ, it is important to layer the lower sloped roof first; with the lower slope roofing extending across valley.
 - 7. Apply shingles on adjoining roof plane, starting at eaves and crossing the valley onto the previously applied shingles.
 - 8. Clip shingles being installed no less than 2" back from centerline of valley, following a chalk line snapped over shingles to ensure a neat installation.
 - 9. Trim 1" at a 45 degree angle from the upper corner of each end shingle to direct water into valley.
 - 10. Set cut edge of shingles in continuous bed of asphalt plastic cement approximately 3" wide running full length of valley.
- F. Roof Deck: Install one layer of roof deck underlayment over entire area not protected by eave or valley membrane; run sheets horizontally lapped so water sheds; nail in place.
 - 1. Lap ends at least 6 inches (150 mm); stagger end laps of each layer at least 36 inches (915 mm).
 - 2. Weather-lap side joints a minimum of 12 inches.
 - 3. Lap underlayment over valley protection at least 6 inches (150 mm).

- G. Penetrations:
1. At vent pipes, install a 24 inch (610 mm) square piece of leak barrier lapping over roof deck protection; seal tightly to pipe.
 2. At vertical walls, install leak barrier extending at least 6 inches (150 mm) up the wall and 12 inches (305 mm) on to the roof surface lapping over roof deck protection.
 3. At skylights and roof hatches, install leak barrier up the sides of the frame and 12 inches (305 mm) on to the roof surface on all sides, lapping over roof deck underlayment.
 4. At chimneys, install leak barrier around entire chimney extending at least 6 inches (150 mm) up the wall and 12 inches (305 mm) on to the roof surface lapping over roof deck protection.
 5. At rake edges, install metal edge flashing over leak barrier and roof deck protection; set tight to rake boards; lap joints at least 2 inches (50 mm) and seal with plastic cement; secure with nails.
 6. At hips and ridges, install leak barrier along entire lengths. If ridge vents are to be installed, position the leak barrier so that the ridge slots are not covered.

3.05 SHINGLE INSTALLATION

- A. Comply with installation details and recommendations of shingle manufacturer and NRCA.
- B. Install in accordance with recommendations of NRCA manufacturer's instructions and requirements of local building code.
1. Avoid breakage of shingles by avoiding dropping bundles on edge, by separating shingles carefully (not by "breaking" over ridge or bundles), and by taking extra precautions in temperatures below 40 degrees F (4 degrees C).
 2. Handle carefully in hot weather to avoid damaging shingle edges.
 3. Secure with no less than 6 nails per shingle; use number of nails required by manufacturer or by code, whichever is greater. Nails must be long enough to penetrate through plywood or OSB, or 3/4 inch (19 mm) into dimensional lumber.
- C. Comply with installation details and recommendations of Shingle manufacturer and NRCA Steep Roofing Manual where slopes are over 4 in 12 and Low slopes where slopes are equal to and less than 4 in 12.
1. On low slope applications place a "dab" of plastic cement under leading edge of each shingle to prevent uplift by wind.
- D. Install starter strip of roll roofing or inverted shingles with tabs removed; fasten shingles in pattern, weather exposure and number of fasteners per shingle recommended by manufacturer.
1. Attach Shingle using a minimum of **six** nails per shingle.
 2. Project first course of shingles 1/2 inch beyond face of metal drip edge.
 3. Extend shingles 1/2 inch beyond face of gable edge metal drip edge.
- E. Shingles shall be laid straight and in true alignment from eaves to roof ridge (horizontally) and vertically.
1. Use horizontal and vertical chalk lines to ensure straight coursing.
- F. Place shingles in straight coursing pattern with 5-5/8" weather exposure to produce double thickness over entire roof area.
- G. Provide double course of shingles at eaves.
- H. Nail shingles in accordance with manufacturer's instructions.
- I. Install hip and ridge shingles as required by the manufacturer.
1. At ridges, install hip and ridge shingles over ridge or ridge vent material.
 2. Cap hips and ridges with individual shingles maintaining 5 inch weather exposure; place to avoid exposed nails. Where exposed nails are unavoidable apply sealant to fully cover nail head.

3.06 CONTINUOUS RIDGE VENT INSTALLATION:

- A. Provide continuous ridge vent where indicated on drawings.
 - 1. Provide and install all specified and required accessories, including, end caps.
- B. Install ridge vent in accordance with manufacturers instructions.
- C. Secure ridge vent to structure using screws fitted with neoprene washers in lie of nails.
 - 1. Screws to be of length sufficient to penetrate full depth of plywood sheathing, but no less than 1-1/4".
 - 2. Screws to be spaced at 12" on center.
- D. Ridge Vent:
 - 1. Cut continuous vent slot through sheathing, stopping 6 inches (150 mm) from each end of ridge.
 - 2. On roofs without ridge board, make slot 2 inches (50 mm) wide, centered on ridge.
 - 3. On roofs with ridge board, make two slots 1-3/4 inches (89 mm) wide, one on each side.
 - 4. Install ridge vent material full length of ridge, including uncut areas.
 - 5. Provide continuous sealant tape between roof deck and underside of ridge vent flange.
 - 6. Butt ends of lengths of ridge vent material and join using plastic cement.
 - 7. Install eave vents in sufficient quantity to equal or exceed the ridge vent area, calculated as specified by manufacturer.
 - 8. Install ridge shingles over ridge vent material; use nails of specified length; do not drive nails home, leaving 3/4 inch (19 mm) slot open between ridge and roof shingles.

3.07 SCHEDULING

- A. Schedule work so as to have minimum impact on use of buildings.
- B. Do not remove existing roofing until **ALL** replacement materials are present on the project site.
- C. Immediately upon removal of roofing install underlayment and subsequently shingles. Do not allow underlayment to remain exposed to the elements for any period of time in excess of 24 hours.

3.08 EXTRA STOCK

- A. Provide min. 2% of installed quantity of each type/color/texture shingle used in Work.
- B. Provide in unopened clearly labeled bundles or containers.

3.09 CLEAN UP ACTIVITIES

- A. The contractor shall perform regular cleanup activities to prevent accumulation of construction materials and debris.
 - 1. Frequency of clean-up activities shall be dependent upon the activities taking place and shall render the job site clean and free from debris.
 - 2. A minimum of **twice** (2 times) a day the contractor shall "sweep" the entire site using a magnet to remove nails, screws and other metallic debris.

3.10 DAMAGED OR DETERIORATED MATERIAL:

- A. Underlayment: Torn, ripped or otherwise damaged underlayment shall be removed and replaced with new undamaged material.
 - 1. Where underlayment has been left exposed to the elements for an extended period of time (in excess of one week) the contractor shall remove and replace with new before roofing.
 - 2. Where underlayment is folded, wrinkled, distorted or other installation and or surface imperfections the underlayment shall be considered to be damaged material and shall be removed and replaced with new.
 - 3. Underlayment which become damaged due to exposure to wind, rain, sleet, hail, snow or other causes shall be removed and replaced with new underlayment with at no additional cost to the project.

- B. Shingles: Discolored, marred, defaced, or otherwise damaged shingles shall be removed and replaced with new.
 - 1. Where damage consists of dislodged granules, the contractor shall apply additional granules of color to match shingles.

END OF SECTION 07311

ROOFING GUARANTEE

_____, 20____

CONTRACTOR'S GUARANTEE

WHEREAS, _____;
Roofing Contractor, has furnished the labor and materials required to apply asphalt fiberglass mat roofing system and related items on _____
and in consideration of the purpose of asphalt fiberglass mat shingle roofing system, flashings and related items, in accordance with contract terms, has agreed to issue a guarantee to _____

THEREFORE, _____ agrees for a period of **Ten (10)** years from the date herein, will at (his) (Its) own expense make all repairs, excepting repair or injury from cause other than ordinary wear and tear by elements, that may be necessary to maintain the asphalt fiberglass mat shingle roofing, flashings and related items, on the structure located at _____
in a weathertight and watertight condition.

IN WITNESS THEREOF, _____, Roofing Contractor, has executed this Guarantee.

WITNESS

MANUFACTURER'S 30 YEAR WARRANTY

In addition to above specified Contractor's Roofing Guarantee, Contractor furnish Manufacturer's Standard 30 Year weathertightness warranty covering asphalt fiberglass mat shingles.

SECTION 07410
PREFORMED METAL SIDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of each type of preformed roofing and siding indicated on drawings and by provisions of this Section.
- B. Preformed roofing/siding hereby defined to include panels structurally capable of spanning between supports spaced as indicated.
- C. Types of panels required include following:
 - 1. Steel Un-insulated Siding Panels.
- D. Related Materials specified in this Section:
 - 1. Pre-formed, Prefinished metal trim, flashing, and miscellaneous other components.
 - 2. Perimeter flashing, closures, preformed vent stack boots, and other accessories for complete installation.
 - 3. Sealant Tape, Sealants and Mastic.
 - 4. Elastomeric Flashing
- E. Related Materials specified in other Sections:
 - 1. Metal studs and Furring Channels; Section 09250, Gypsum Drywall
 - 2. Building Insulation: Refer to Section 07200, Insulation.

1.03 PERFORMANCE REQUIREMENTS:

- A. General: Provide manufactured roof panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.
- B. Air Infiltration: Provide manufactured roof panel assemblies with permanent resistance to air leakage through assembly of not more than 0.05 cfm/sq. ft. of fixed roof area when tested according to ASTM E1680 at a static-air pressure difference of 20 lbf/sq. ft.
- C. Water penetration: Provide manufactured roof panel assemblies with no water penetration as defined in the test method when tested according to ASTM E1646 at a minimum differential pressure of 20 psf within no leakage when exposed to rain at a rate of 5 gal/hr/sq. ft.
- D. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements:
 - 1. UL 580 for Class 90 wind-uplift resistance.
 - 2. ASTM E 1592 – Rated for the wind speed at site location.
- E. Structural Performance: Provide manufactured roof panel assemblies capable of safely supporting design loads indicated under in-service conditions with vertical deflection no greater than the following, based on testing manufacturer's standard units according to ASTM E 1592 by a qualified independent testing and inspecting agency:
 - 1. Maximum Deflection: 1/180 of the span.
 - 2. Zone 1 – Roof Interior: 39.5 PSF, Zone 2 – Roof Edge: 72.4 PSF, Zone 3 – Roof Corner: 108.9 PSF, Zone 4 and 5 – Wall Interior: 42.8 PSF, Zone 3 – Wall Corner: 52.7 PSF.

- F. FM Listing: Provide roofing system and component materials which have been evaluated by Factory Mutual System for fire spread, wind-uplift and hail damage and are listed in 'Factory Mutual Approval Guide' for Class I Construction.
 - 1. Provide roof covering materials bearing FM approval marking on bundle, package or container, indicating that the material has been subjected to FM's examination and follow-up service.
 - 2. Installation, including anchorage, to meet requirements of FM-I-90 wind load classification with FM 129S perimeter installation. Provide test data verifying compliance.
- G. Building Code Compliance: Roofing system, including edge securement, to comply with applicable sections of current International Building Code and Standard Building Code of Georgia.
 - 1. Edge metal installation shall comply with provisions of Section 1504.5 "Edge Securement for low-sloped Roofs" of the Standard Building Code of Georgia.
 - 2. Low-slope membrane roof system metal edge securement, except gutters, shall be designed and installed for wind loads in accordance with Chapter 16, except that the basic wind shall be determined from Figure 1609.
 - 3. Design, fabrication, installation and testing of edge metal shall meet ANSI/SPRI ES-1 standards.

1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer with min. ten (10) years experience in manufacture of metal roof and wall panels of type specified.
- B. Installer's Qualifications: Installer with min. five (5) years experience in installation of metal wall panels of types similar to that specified.
 - 1. Certify to five year experience requirement, list projects installed in past five years and certify that only factory-trained personnel to be utilized on Project.
 - 2. Manufacturer of metal panels certify that Installer trained by manufacturer and approved by manufacturer to apply manufacturer's specified products.
 - 3. Installation of the roof and wall systems shall be performed by erectors certified, preferred and authorized by system manufacturer as trained and qualified to erect the manufacturer's products.
 - 4. Installer shall submit, as part of shop drawings, a letter from manufacturer of roof and wall system, attesting to the date of that the installer received certification from the manufacturer and the dates that the installer attended school prior to attaining full certification.
 - a. Failure to submit necessary certification will subject submittal to rejection.
- C. Fire Resistances: Provide preformed panel systems tested and listed by UL for 2-hr fire resistance rating.
- D. Field Measurements: Where possible, prior to fabrication of prefabricated panels, take field measurements of structure or substrates to receive panel system.
 - 1. Allow for trimming panel units where final dimensions cannot be established prior to fabrication.
- E. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications, standard details, certified product test results, installation instructions and general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.
- B. Samples:
 - 1. Submit duplicate color samples for Architect's selection as specified elsewhere in this Section.
 - 2. Submit duplicate samples 12" long, of each type panel in each exposed finish material.

- C. Shop Drawings: Submit small-scale layouts of panels on walls and large scale details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details.
 - 1. Distinguish between factory and field assembly work.
- D. Certifications: Submit, to Architect prior to production of shop drawings, certifications required under "Quality Assurance".

1.06 METAL PANEL MANUFACTURER'S INSPECTION

- A. The Metal Panel Manufacturer shall visit the project site at various intervals during the installation of metal panels and related systems to verify that work is being performed in accordance with Manufacturers recommendations.
 - 1. Pre-Installation Meeting: Prior to commencing the installation of work of this section the manufacturer shall conduct a pre-installation meeting with the installer and general contractor to review manufacturer's requirements for the installation of the wall systems.
 - 2. Period Visits: The manufacturer shall visit the site a minimum of once a month during the installation of metal panel systems to verify that the installation of the system is consistent with the manufacturer's recommendations. Copies of the reports from these visits shall be sent to the architect.
 - 3. Visit at Completion of Work: Prior to requesting a Final Inspection by the Architect, the System Manufacturer shall visit the project site and perform a thorough inspection of the installed work.
 - a. Submit a copy of inspection report and findings to the Architect.
 - b. Upon Correction of noted deficiencies the System Manufacturer shall re-visit the site and verify that noted items have been corrected.
 - c. The Contractor, system erector and the manufacturer shall certify to the Architect in writing that the installed system has been installed in accordance with Manufacturers recommendations.

1.07 WARRANTIES

- A. Manufacturer's Product Warranty: Manufacturer guarantee panels for twenty (20) years against panel rupture, structural failure or perforation due to corrosion.
- B. Finish Warranty: Provide paint manufacturer's twenty (20) year guarantee against fading, cracking, peeling, blistering or wear-thru of paint film.
- C. Warranty Conditions:
 - 1. Warranty period to commence on date of final acceptance of project.
 - 2. Warranty shall be for period indicated; multiple warranties whose sum equals warranty period not acceptable.
 - 3. Warranty shall be non-prorated, with no dollar limit.
 - 4. Warranty shall not include any language which is intended to limit or exclude coverage of system components where the following conditions apply:
 - a. For "Failure to install in accordance with manufacturers instructions" or similar language.
 - b. Where panels are exposed to salt or fresh water spray.
 - c. Where panels are exposed to gale or hurricane force winds.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide products by one of following:
1. Steel Uninsulated Siding Panels:
 - a. Atas Aluminum Corp.; "DSF120".
 - b. Allied Roof Systems; "Flush Panel".
 - c. Architectural Integrated Metals (AIM)
 - d. Architectural Panels, Inc.; "F-12F".
 - e. Corrugated Metals, Inc. "FAP12".
 - f. Dimensional Metals Inc.
 - g. Fabral, Alcan Building Products; "CFP-12".
 - h. MBCI Building Components;
 - i. McElroy Metal
 - j. VicWest Steel; "(R-1)-12".

2.02 SHEET MATERIALS

- A. Steel for Painting/Coating; Provide one of the following:
1. Hot-dip zinc coated steel sheet, ASTM A 446, Grade A except where higher strength required for performance, G90 zinc coating, surface treated for maximum coating performance.
 2. Drawing quality aluminum coated sheets, complying with requirements of ASTM A463, with T1-40 coating.
 3. Galvalume sheets: Aluminum Zinc alloy coated sheets complying with ASTM A792, Coating Designation AZ55.
- B. Panel Coating: Apply temporary protective coating on surface of all panels to prevent discoloration and/or deterioration of finish of panels from exposure or handling.

2.03 METAL FINISHES

- A. General: Finish on manufacturer's standard trim items and flat sheets used for on-site fabrication shall conform to specifications for panels.
1. Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability.
 2. Provide colors or color matches as indicated or, if not otherwise indicated, selected by Architect from manufacturer's standard colors.
- B. Protective Coating: Protect panel finish by application of strippable film or removable adhesive cover, and retain until installation completed.
- C. Finish; Painted; Exposed Side: Panels, trim, and accessories shall have finish complying with following, wherever finish is exposed to view:
- D. Fluoropolymer Coating: Full-strength 70% "Kynar 500" coating baked-on for 15 minutes at 450°F (232°C), in a min. dry film thickness of 1.0 mils, 30% reflective gloss (ASTM D 523), over 0.3 mil baked-on epoxy primer.
1. Durability: Provide coating field tested under normal range of weathering conditions for min. of 20 years without significant peel, blister, flake, chip, crack or check in finish, and without chalking in excess of 8 (ASTM D 659), and without fading in excess of 5 NBS units.
- E. Finish; Painted; Non-Exposed Side: Non-exposed side (backside) of panels, trim and accessories shall have finish complying with the following:
1. Parchment Polyester Finish: Provide shop (factory)-applied parchment polyester finish to NON-EXPOSED SIDE of metal panels, and all related trim and accessory elements.
 2. Clean galvanized steel with alkaline compound, then treat with zinc phosphate conversion coating, and seal with chromic acid rinse.
 3. Apply parchment polyester top coat to a dry film thickness of 0.45 Mils minimum.

2.04 SHEET METAL ACCESSORIES

- A. General: Trim shall be designed to provide for expected movement of roof and wall system components due to thermal expansion and contraction.
 - 1. Details shall conform to the suggested details provided by the manufacturer.
- B. Accessories: Except as indicated as work of another specification section, provide components required for complete roofing/siding system, including but not limited to:
 - 1. Trim such as closures.
 - 2. Mullions.
 - 3. Sills.
 - 4. Ridge closures or seam covers.
 - 5. Flashings where not specifically indicated as other material.
 - 6. Provide sealants, gaskets, fillers or closure strips required for watertight condition.
- C. Sheet Metal Flashing:
 - 1. Minimum Gauge: 24 Gauge
 - 2. Metal: Match wall panel.
 - 3. Finish: Match wall panel.
 - 4. Color: To be selected by Architect.
 - 5. Design: As indicated on drawings; or as required for actual conditions.

2.05 MISCELLANEOUS MATERIALS

- A. Framing: Provide framing members not otherwise indicated by other trades or specified in other Sections including but not limited to:
 - 1. Furring channels.
 - 2. Lightgage framing.
 - 3. Blocking, wood or metal.
 - 4. Bracing for framing.
 - 5. Clips.
- B. Furring Channels: Where indicated provide steel furring channels and/or steel sub-girts complying with following:
 - 1. ANSI/ASTM A 446, Grade A, Minimum yield strength of 33,000 PSI, galvanized steel, G90 Zinc (galvanized) coating, of shape and gage indicated on drawings, and if not indicated as shown below:
 - 2. Configuration: Equal leg hat channel of size required to support loads and span.
 - 3. Gauge: Minimum 16 gauge
 - 4. Size: For use on walls; 7/8" minimum, unless otherwise noted.
- C. Fasteners: Manufacturer's standard noncorrosive types, with exterior heads gasketed.
 - 1. Fasteners: Provide self-tapping screws, bolts, nuts, self-locking rivets, self-locking bolts, end-welded studs, and other suitable fasteners standard with manufacturer, designed to withstand design loads.
 - 2. Use stainless steel fasteners for exterior application and galvanized or cadmium plated fasteners for interior applications.
 - 3. Where exposed fasteners required, provide metal-backed neoprene washers under heads of fasteners bearing on weather side of panels.
 - 4. Provide fasteners with heads matching color of roofing or siding sheets by means of plastic caps or factory applied coating.
- D. Panel Clips:
 - 1. Clips: Provide min. 16-ga. floating panel clips; fixed clips not acceptable.
 - 2. Clips shall be die formed SAE 1050 High Carbon Spring Steel and heat treated to Rockwell 45C to 50C.
 - 3. Panel clips shall have fluorocarbon coating for corrosion resistance.
- E. Panel Cleats: Cleats: Provide factory caulked, mechanically seamed cleats formed from 24 ga. galvanized steel complying with ASTM A 446, Grade C with G90 coating.

- F. Flexible Closure Strips:
 - 1. Provide closed-cell, expanded cellular rubber, self-extinguishing flexible closure strips.
 - 2. Cut or premold to match corrugation configuration of roofing and siding sheets.
 - 3. Provide closure strips where indicated or necessary to ensure weathertight construction.
 - G. Sealing Tape: Provide pressure sensitive 100% solids grey polyisobutylene compound sealing tape with release paper backing.
 - 1. Provide permanently elastic, non-sag, non toxic, non staining tape min. 1/2" wide and 1/8" thick.
 - H. Joint Sealant: Sealant used with the roofing shall be applied between surfaces during assembly with a minimum amount exposed on the completed installation.
 - 1. Concealed sealant shall be a non-curing polyisobutylene tape of sufficient thickness to make full contact with both surfaces.
 - 2. Exposed sealant shall be a curing elastomeric type with excellent weather and sunlight resistance. Color shall match the pre-finished exterior metal. Sealant shall be applied in accordance with the manufacturer's recommendations.
 - I. Bituminous Coating: Cold-applied asphalt mastic, SSPC paint 12, compounded for 15-mil dry film thickness per coat.
 - J. Elastomeric Flashing: Water and Ice Shield: Smooth surfaced peel and stick membrane for use as a secondary waterproofing membrane.
 - 1. Application: For use under all metal flashings, including, but not limited to, rake trim, fascias, ridge caps, valleys, vertical wall flashings, cap flashings, copings and expansion joints covers.
 - 2. Thickness: 40 Mil min.
 - 3. Approved manufacturers subject to compliance with technical provisions of the contract:
 - a. W.R. Grace Ice and Water Shield
 - b. MiraDri, WIP 200 Non Skid Film Surface
 - c. Owens Corning; Weatherlock
 - K. Building Paper: Where indicated in specifications or on drawings provide:
 - 1. Asphalt-saturated felt, without perforations, ASTM D 226, Type II, 30# (no asbestos).
 - 2. Asphalt-saturated felt, without perforations, ASTM D 226, Type I, 15# (no asbestos).
- 2.06 FABRICATION; PERFORMANCES
- A. General: Fabricate and finish panels and accessories at factory to greatest extent possible, by manufacturer's standard procedures and processes, and as required to fulfill indicated performance requirements demonstrated by factory testing.
 - 1. Comply with indicated profiles and dimensional requirements, and with structural requirements.
 - B. Required Performances: Fabricate panels and other components of roof/wall system for following installed-as-indicated performances:
 - 1. Wall Loading: 20 lbs. per sq. ft. inward; 15 lbs. per sq. ft. outward.
 - 2. Water Penetration: No significant, uncontrolled leakage at 4 lbs. per sq. ft. pressure with spray test.
 - 3. Air Infiltration: 0.02 cfm per sq. ft. for gross roof/wall areas, with 4 lbs. per sq. ft. differential pressure.
 - C. Attachment: Panel and flashing attachments shall be designed to accommodate the thermal expansion and contraction of exterior material through a 140 degree F temperature change.
 - 1. Roof panels, clips and fasteners shall have been tested and passed requirements of ASTM 1592.
 - 2. Where underside of panels are exposed to view the attachment devices (clips) shall be fully concealed from view.

- D. Panel Fabrication: Ribs shall be securely locked over the anchor clips with a tool that moves continuously along the rib length to form a water tight mechanical seam.
 - 1. Intermediate Longitudinal stiffener ribs shall be located as required to minimize oil-canning and telegraphing of structural members; provide minimum of 2 per flat of panel.
 - 2. Female leg of panel to have factory applied sealant.
 - 3. Metal Panel shall be fabricated in of lengths necessary to extend full unbroken length of roof surface or full height of wall using a single panel.
 - E. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with noncompatible substrate materials or result in corrosion or deterioration of either material or finishes.
 - F. Fabricate roof panel joints with captive gaskets or separator strips, which provide tight weather seal and prevent metal-to-metal contact in manner to minimize noise from movements within panel system.
 - G. End Laps: Not permitted; unless specifically noted otherwise.
 - H. Condensation: Fabricate panels for control of condensation, including proper inclusion of seals and provisions for breathing, venting, weeping and draining.
- 2.07 METAL WALL PANELS
- A. Provide manufacturer's standard factory-formed Wall panel system designed for concealed mechanical attachment of panels to wall girts, furring channels, metal studs, or other structural system, using fixed (not floating) concealed anchors (clip) which resist wind loads.
 - B. Metal Gages: Thicknesses shall be as required for structural performances, but not less than the following:
 - 1. Wall Panels: Min. 24 gage (0.0239"), Steel.
 - C. Panel configuration: Metal Panel shall have a vertical leg, flat type Architectural Panel, with male/female leg configuration with female leg containing factory applied sealant.
 - 1. Width: 12" to 14" nominal.
 - 2. Thickness/Joint Height: 1-1/2" nominal.
 - 3. Fastening: Concealed Fastening; with factory applied sealant.
 - 4. Description: Flush/flat with intermediate stiffening ribs.
 - 5. Type: Solid; non-perforated, unless noted.

PART 3 - EXECUTION

3.01 FIELD VERIFICATION

- A. Field Verification: Before installation of any panels, this contractor shall verify that the structure is ready to receive his work. He shall check field dimensions and alignment of structural members to assure that the roof panels and flashing are straight and true. The Architect shall be notified on any conditions where may adversely affect the appearance of the installed roof, and work on that location will not proceed until resolved by the Architect.

3.02 QUALITY CONTROL

- A. All roofing and flashing shall be installed in accordance with the approved shop details under the direct supervision of an experienced sheetmetal craftsman trained in application of the manufactured products. Attachments and joints shall allow for expansion and contraction from temperature changes without distortion or elongation of fastener holes. Flashing shall be installed without fasteners in the end laps.
- B. Completed work shall be plumb and true, free of oil-can and dents. Panel ribs shall be on the module indicated in the contract drawings within the tolerance allowed by the actual construction dimensions. Excess sealant shall be removed and touch-up paint applied to any areas where paint scrapes occur. Any panels which are badly damaged and in the judgement of the Architect cannot be adequately repaired shall be removed and replaced.

3.03 INSPECTION

- A. Prior to installing roof, wall, soffit or liner panels and trim and accessories, thoroughly inspect finish and condition of materials for deterioration and/or discoloration. Panels found to be deteriorated or discolored to be discarded.

3.04 INSTALLATION

- A. General: Comply with panel fabricator's and material manufacturers' instructions and recommendations for installation, as applicable to project conditions and supporting substrates.
 - 1. Anchor panels and other components of work securely in place, with provisions for thermal/structural movement.
 - 2. Install panels with concealed fasteners.
 - 3. Arrange and nest sidelap joints so prevailing winds blow over, not into, lapped joints.
 - 4. Lap ribbed or fluted sheets one full rib corrugation.
 - 5. Apply panels and associated items for neat and weathertight enclosure.
 - 6. Avoid "panel creep" or application not true to line.
 - 7. Protect factory finishes from damage.
 - 8. Install roof and wall panels true and square and in full alignment.
- B. Installation tolerances: Shim and align panel units within installed tolerance of 1/4" in 20'-0" on level/plumb/slope and location/line as indicated, and within 1/8" offset of adjoining faces and of alignment of matching profiles.
- C. Seaming: Complete seaming of roof panel joints by operation of portable power- driven equipment of type recommended by panel manufacturer.
 - 1. End driven standing seam caps not permitted.
- D. Joint Sealers: Install gaskets, joint fillers and sealants where indicated and where required for weatherproof performance of panel systems.
 - 1. Provide types of gaskets and sealants/fillers indicated or, if not otherwise indicated, types recommended by panel manufacturer.
 - 2. Refer to other sections of these specifications for product and installation requirements applicable to indicated joint sealers.
- E. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with noncompatible substrate materials or result in corrosion or deterioration of either material or finishes.

3.05 LIGHT GAUGE HAT CHANNELS

- A. Light Gauge hat channels furnished and installed under a Division-5 section.
- B. Light gauge hat channels to be spaced as required to satisfy structural bracing requirements for pre-engineered light gauge steel trusses.
 - 1. For the purposes of attachment it is expected that the hat channels will be spaced at a min. of 3'-0" on center and a maximum of 4'-0" on center.
 - 2. Metal roofing contractor shall coordinate location of hat channels with light gauge steel truss manufacturer and provide attachment necessary to accommodate spacing of hat channels.

3.06 WALL PANELS

- A. Install panels complete with necessary trim and accessories, straight, true and square and free of "oil-canning" and other surface distortions.
 - 1. Align bottoms of wall panels and fasten panels with blind rivets, bolts, or self-tapping screws.
- B. Furnish and install all trim detailed or required to provide a neat, watertight, and finished appearing product.

- C. Fasten wall panels to structure with concealed fasteners in accordance with manufacturer's instructions.
 - 1. Fasteners shall be spaced as required to withstand negative and positive wind loads.
 - 2. Fasten each panel to each girt at point of crossing.
 - 3. Fasten system to allow for movement due to expansion and contraction.
 - D. Apply elastomeric sealant continuously between metal base channel (sill angle) and panels.
 - E. Apply sealant tape continuously between steel structure and metal panels.
 - F. Handle and apply sealant and back-up in accordance with sealant manufacturer's recommendations.
 - G. Fasten flashings, trim around openings, and similar elements with self-tapping screws.
 - H. Where exposed fasteners required install screw fasteners with power tool having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels.
 - I. Install screws in oversized predrilled holes.
 - J. Provide elastomeric sheet flashing (membrane) under all metal flashing to serve as a secondary flashing system. Seal joints water tight.
 - K. End laps prohibited unless otherwise approved by Architect in writing. If necessary and approved by Architect at end gables, provide two rows of panels at gable ends, align lap of gable panels over wall panels at eave height.
- 3.07 CLEANING AND PROTECTION
- A. Damaged Units: Replace panels and other components of work damaged or deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures.
 - B. Cleaning:
 - 1. Remove temporary protective coverings and strippable films (if any) as each panel installed.
 - 2. Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer, and maintain in clean condition during construction.
- 3.08 DAMAGED MATERIAL
- A. Bent, twisted, torn, disfigured, discolored or otherwise damaged panels or system components, whether due to manufacturing, shipment or construction related activities, shall be removed and replaced at no cost to the contract.
- 3.09 INSTALLATION TOLERANCES
- A. System components shall be installed straight, true, plumb and square within industry standard and requirements listed herein, which ever is more stringent:
 - 1. Maximum off set from true alignment: 1/16".
 - 2. Maximum off set from true alignment of abutting members: 1/16".
 - 3. Maximum variation in plane or location indicated on drawings: 1/8"
 - 4. Maximum variation in from plumb: 1/8" in 10'-0"; non-cumulative.
- 3.10 FIELD PAINTING
- A. Apply finish coating to following factory-primed items:
 - 1. Exposed Structural framing components.
 - B. Field apply touch up paint furnished by roofing manufacturer, color to match panel as follows:
 - 1. Where prefinished members are field cut, drilled or where factory finish is damaged.

3.11 DISSIMILAR MATERIALS

- A. Separate dissimilar metals: Where aluminum surfaces come in contact with ferrous metal or other incompatible materials, keep aluminum surfaces from direct contact by applications to the other material as follows:
1. One coat zinc chromate primer, FS TT-P-645, followed by two coats of aluminum paint, SSPC-Paint 101.
 2. In lieu of 2 coats aluminum paint, apply one coat high-build bituminous paint, SSPC-Paint 12, applied to thickness of 1/16" over zinc chromate primer.
 3. Backpaint aluminum surface where impracticable to paint other surface.

END OF SECTION 07410

SECTION 07530
FLEXIBLE SHEET ROOFING SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of flexible sheet roofing (FSR) indicated on drawings and hereby defined to include non-traffic-bearing sheet membrane system intended for weather exposure as primary roofing.
- B. Types of roofing systems specified in this section utilizing flexible sheet roofing membranes include following:
 - 1. Mechanically attached flexible sheet roofing system.
- C. Flexible sheet roofing membranes include following:
 - 1. Polyvinyl Chloride (PVC)

1.03 DEFINITIONS

- A. Combustibility Characteristics: ASTM E 136.
- B. Maximum Allowable Asbestos Content of Inorganic Insulations: Provide insulations composed of mineral fibers or mineral ores which contain max. 0.25% by weight of asbestos of any type or mixture of types occurring naturally as impurities, determined by polarized light microscopy test per Appendix A of 40 CFR 763.

1.04 SUBMITTALS

- A. Product Data: Submit specifications, installation instructions and general recommendations from manufacturers of flexible sheet roofing system materials, for types of roofing required.
 - 1. Include data substantiating that materials comply with requirements.
 - 2. Submit manufacturer's current literature for each component.
- B. Samples: Submit samples of each primary component to be used in the roof system:
 - 1. Submit 12" square samples of finished roofing sheets, including "T- shaped" side/end-lap seam.
 - 2. Submit 12" square samples of vapor barrier and slip sheet (if any).
- C. Shop Drawings: Submit complete dimensioned shop drawings showing roof configuration and sheet layout, seam locations, colors (as applicable), details at perimeter, and special conditions. Provide:
 - 1. Outline of roof with roof size and elevations indicated.
 - 2. Profile details of flashing methods for penetrations.
 - 3. Technical acceptance from the manufacturers
 - 4. Pre-Roofing Conference: Submit copies of pre-roofing conference records.
- D. Written approval by the insulation manufacturer for the use and performance of the product in the proposed system.
- E. Warranty: Submit copy of sample roof warranty written to comply with requirements of contract documents.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Company with min. 5 years successful experience in manufacture of roofing systems of type specified, with record of installed projects min. of 5 years successfully in place.
 - 1. Obtain primary flexible sheet roofing from single manufacturer.
 - 2. Provide secondary materials recommended by manufacturer of primary materials.
- B. Installer: Firm shall have a min. 5 years successful experience in installation of roofing systems similar to those required for Project and acceptable to or licensed by manufacturer of primary roofing materials.
 - 1. Applicator shall perform work associated with flexible sheet roofing, including (but not limited to) vapor retarders, insulation, flashing and counter flashing, expansion joints, and flexible sheet joint sealers.
 - 2. Applicator personnel trained and authorized by the manufacturers in those procedures shall only complete all work pertaining to the installation of the roof membrane and flashings.
- C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- D. Certification by Manufacturer: Submit certifications by the manufacturers of the roofing and insulation that materials supplied comply with requirements of the identified ASTM standards.
- E. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.
- F. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification necessary in connection with fire and extended coverage insurance on roofing and associated work.
- G. Upon completion of the installation the roofing contractor will submit to the manufacturers a certification that all work has been done in strict accordance with the contract specifications and the manufacturer's requirements, an inspection shall be made by the manufacturer's technical department to review the installed roof system.
- H. There shall be no deviation made from the Project Specification or the approved shop drawings without prior written approval by the architect.

1.06 CODE REQUIREMENTS:

- A. The applicator shall submit evidence that the roof system is approved or listed by the following test organizations. These requirements are minimum standards and no roofing work shall commence without written documentation of the system's compliance, as required in the "Submittals" section of this specification.
- B. UL Listing: Provide labeled materials tested and listed by UL in "Building Materials Directory" for application indicated, with "Class A" rated materials/system for roof slopes shown:
 - 1. Fire Performance Characteristics: Provide insulation materials identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is part, determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction:
 - a. Surface Burning Characteristics: ASTM E 84.
 - b. Fire Resistance Ratings: ASTM E 119.
 - c. Combustion Characteristics: ASTM E 136.

- C. FM Listing: Provide roofing system and component materials which have been evaluated by Factory Mutual System for fire spread, wind-uplift and hail damage and are listed in 'Factory Mutual Approval Guide' for Class I Construction.
 - 1. Provide roof covering materials bearing FM approval marking on bundle, package or container, indicating that the material has been subjected to FM's examination and follow-up service.
 - 2. Installation, including anchorage, to meet requirements of FM-I-90 wind load classification with FM 129S perimeter installation. Provide test data verifying compliance.
 - D. Building Code Compliance: Roofing system, including edge securement, to comply with applicable sections of current International Building Code and Standard Building Code of Georgia.
 - 1. Edge metal installation shall comply with provisions of Section 1504.5 "Edge Securement for low-sloped Roofs" of the Standard Building Code of Georgia.
 - 2. Low-slope membrane roof system metal edge securement, except gutters, shall be designed and installed for wind loads in accordance with Chapter 16, except that the basic wind shall be determined from Figure 1609.
 - 3. Design, fabrication, installation and testing of edge metal shall meet ANSI/SPRI ES-1 standards.
- 1.07 PRODUCT DELIVERY, STORAGE AND HANDLING
- A. All products delivered to the job site shall be in the original unopened containers or wrappings bearing all seals and approvals.
 - B. Handle all materials to prevent damage. Place all materials on pallets and fully protect from moisture.
 - C. Membrane rolls shall be stored lying down on pallets and fully protected from the weather with clean canvas tarpaulins
 - D. All flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.
 - E. All materials, which are determined to be damaged by the architect or general contractor, are to be removed from the job site and replaced at no cost to the Owner.
- 1.08 JOB CONDITIONS
- A. Prior to application of roofing system, the roofing contractor shall perform a detailed inspection of the substrate onto which the roofing system will be placed and other job conditions which affect the work performed under this Section.
 - 1. Immediately notify the contractor of any discrepancies noted.
 - 2. Commencement of roofing activities shall be construed as acceptance of deck as being suitable for installation of roofing system and, upon the conclusion of the work, issuance of the specified warranties.
 - B. Roofing materials may be installed under certain adverse weather conditions but only after consultation with roofing manufacturer, as installation time and system integrity may be affected.
 - C. Only as much of the new roofing as can be made weather tight each day, including all flashing and detail work, shall be installed. All seams shall be cleaned and heat welded before leaving the job site that day.
 - D. All new and temporary construction, including equipment and accessories, shall be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.
 - E. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage.
 - F. Prior to and during application, all dirt, debris and dust shall be removed from surfaces by vacuuming, sweeping, blowing with compressed air and/or similar methods.

- G. The applicator shall take precautions that storage and/or application of materials and/or equipment does not overload the roof deck or building structure.
- H. Flammable adhesives shall not be stored and not be used in the vicinity of open flames, sparks and excessive heat.
- I. The applicator shall conduct fastener pullout tests in accordance with the latest revision of the SPRI/ANSI Fastener Pullout Standard to help verify condition of deck/substrate and to confirm expected pullout values.

1.09 SPECIAL PROJECT WARRANTY

- A. Roofing Installer furnish Owner with guarantee of watertightness.
 - 1. Elastic Sheet Roofing Manufacturer write and back said guarantee; cost of guarantee included in bid.
 - 2. Guarantee: No-dollar limit, single, straight warranty for warranty period and not combination of warranties to total warranty period.
 - 3. Warranty shall provide edge to edge coverage. Edge to edge coverage to include, but not strictly limited to, all roofing components including roof membrane, seams and joints, roof penetrations, flashing at roof drains, perimeter flashings, flashing at vertical walls and other interior conditions, and edge flashings including drip edge, fascia, and copings.
 - 4. Manufacturer re-write standard warranties to comply with requirements herein.
 - 5. Warranty period: Twenty (20) years after date of Final Acceptance.
- B. Warranty not limited to, but includes following as minimum requirements:
 - 1. Cover both labor and materials necessary to effect watertightness, including that required to repair roof leaks caused by structural movement, deck movement, failure of system-coated metal flashings, seam and joint failures, faulty materials and installation and ponding water.
 - 2. Warranty shall not include any language which limits coverage due to ponding water.
 - 3. The warranty shall not include language which limits coverage due to gale force winds. For the purpose of this requirement gale force winds shall be considered to be 60 MPH winds.
 - 4. Exclude leaks due to deliberate acts, acts of God, or negligence in maintenance.
 - 5. During guarantee period, Roofing Installer licensed by Flexible Sheet Roofing Manufacturer, as required, repair and/or replace roofing to standard of the original specifications in order to maintain water-tightness without cost to Owner including all labor and materials.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Performance: Provide roofing materials recognized to be of generic type indicated and tested to show compliance with indicated performances.
- B. Compatibility: Provide products recommended by manufacturers as fully compatible with indicated substrates, or provide separation materials required to eliminate contact between incompatible materials.
- C. The components of the mechanically attached roof system are to be products of the approved manufacturer as indicated on the contract drawings and specifications.

2.02 ROOFING MEMBRANES

- A. General: Provide one of the listed roof membranes.
- B. Membrane shall have a minimum ten (10) year track record with the same formulation.
- C. Private label, sub-manufactured products not acceptable.

2.03 POLYVINYL CHLORIDE MEMBRANE

- A. Membrane shall conform to ASTM D4434-96 (or latest revision), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type II, Grade I.
- B. Mechanically Fastened PVC Membrane, virgin polyvinyl chloride (PVC) with plasticizers and modifiers, formed into uniform flexible sheets, complying with ASTM D 4434, type to suit Project.
 - 1. Thickness: 60 mils, minimum.
 - 2. Membrane Reinforcing: Manufacturer's fiberglass fiber scrim.
 - 3. Exposed Face Color: Grey or white.
- C. Manufacturers: Subject to compliance with requirements, provide products of one of following:
 - 1. Fibertite, Inc.
 - 2. Sarnafil, Inc.
 - 3. Duro-Last, Inc.

2.04 FLASHING MATERIALS

- A. Wall/Curb Flashing (Flashing, Fasciae, Coping, Concealed Gutters): Flashings to be PVC coated metal flashings only, except where indicated.
 - 1. Flashing to be PVC-coated, heat-weldable sheet metal shop fabricated to meet field conditions for this project.
 - 2. Coated metal shall be 24 gauge, G90 galvanized metal sheet with a 20 mil unsupported membrane laminated on one side.
 - 3. Coated metal to be used at all walls, curbs and perimeters. Roof to wall at building expansion joints to be flexible membrane flashing compatible with flexible sheet roofing membrane.
 - 4. Color to be dark bronze or black, unless otherwise noted.

2.05 WALKWAY PROTECTIONS

- A. A polyester reinforced weldable membrane with surface embossment used as a protection layer from rooftop traffic.
 - 1. Traffic pad to be type recommended, approved and furnished by the manufacturer.
 - 2. Provide walkway protection from roof scuttle to, and around each roof top Hvac unit and elsewhere where indicated.

2.06 AUXILIARY MATERIALS FOR FLEXIBLE SHEET ROOFING SYSTEM

- A. Rigid Insulation Underlayment: Provide one of the following for gypsum board underlayment where indicated or where required to meet fire code requirements or other requirements of these specifications:
 - 1. Gypsum Board Base: ASTM C 36, Type X, thickness indicated.
 - a. Thickness: Minimum of 5/8", unless other noted.
 - 2. Cement-Coated Portland Cement Panels: High density portland cement surface coating on both faces, lightweight concrete core composed of portland cement and expanded ceramic aggregate; 1/4" thick x 48" x 72" long; 1150 lbs/1000sf.
 - a. "Dens-Deck"; Georgia Pacific Corp.
 - b. "Wonder-Board"; Modulars Inc.
 - c. "Durock Tile Backer Board"; Durabond Div., USG Industries, Inc.
- B. Sheet Seaming System: Manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges recommended by manufacturer of flexible sheet roofing system.
- C. Cant Strips, Tapered Edge Strips and Flashing Accessories: Types recommended by manufacturer of flexible sheet roofing material, provided at locations indicated and locations recommended by mfr., including adhesive tapes, flashing cements, and sealants.

- D. Slip Sheet: Type recommended by manufacturer of flexible sheet roofing material for protection of membrane from incompatible substrates.
 - 1. Mechanical Fasteners: Metal plates, caps, battens, accessory components, fastening devices, and adhesives to suit substrate and as recommended by flexible sheet roofing membrane manufacturer.
 - 2. Fastener pattern to meet requirements of FM I-90 wind load classification and FM 129S perimeter installation.
 - 3. Thru-bolt type fastening acceptable only in areas where ceiling occurs and not exposed to view.
 - 4. Other screw type mechanical fastening systems such as NTB, Gyptec (Buildex) fasteners acceptable only if Roofing Installer and Manufacturer perform withdrawal tests on existing roof and Roofing Manufacturer submits letter of certification indicating withdrawal tests performed and roofing system complies with above referenced wind loading and ANSI standard.
- E. Fasteners and roofing nails for flashing: Galvanized metal or corrosion resistant material with min. head diameter of 3/8" with min. fastener penetration into wood nailer of 3/4".

PART 3 - EXECUTION

- 3.01 Pre-Roofing Conference: Prior to installation of roofing and associated work, meet at project site, or other mutually agreed location, with Installer, roofing manufacturer, installers of related work, and other entities concerned with roofing performance, including (where applicable) Owner's insurer, test agencies, governing authorities, Architect, and Owner.
 - 1. Record discussions and agreements and furnish copy to each participant.
 - 2. Provide min. 72 hrs. advance notice to participants prior to convening pre-roofing conference.
- 3.02 SUBSTRATE CONDITION:
 - A. Applicator shall be responsible for acceptance or provision of proper substrate to receive new roofing materials.
 - B. Applicator shall verify that the work done under related sections meets the following conditions:
 - 1. Roof drains, roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured and prepared to receive new roofing materials.
 - 2. All surfaces are smooth and free of dirt, debris and incompatible materials.
 - 3. All roof surfaces shall be free of water, ice and snow.
- 3.03 PREPARATION OF SUBSTRATE
 - A. General: Comply with manufacturer's instructions for preparation of substrate to receive flexible sheet roofing system.
 - B. Clean substrate of dust, debris, and other substances detrimental to flexible sheet roofing system work; remove sharp projections.
 - C. Install cant strips, flashings, and accessory items as shown, and as recommended by manufacturer even though not shown.
 - D. Prevent compounds from entering and clogging drains and conductors, and from spilling or migrating onto surfaces of other work.
- 3.04 INSTALLATION
 - A. General: Comply with manufacturer's instructions, except where more stringent requirements indicated.

3.05 NAILERS

- A. Install treated wood nailers at perimeter of entire roof and around all roof projections and penetrations in accordance with Architect's drawings.
 - 1. Roofing Installer supply and install wood nailers required beyond that shown in Architect's details in order to install roofing complete, secure and watertight.

3.06 INSTALLATION OF INSULATION UNDERLAYMENT

- A. Install underlayment directly over metal decking in accordance with roofing manufacturers written instructions and as follows:
 - 1. Screw attach to metal deck.
 - 2. Stagger adjacent butt joint.
 - 3. Tightly abut joints.
- B. Install underlayment in accordance with manufacturers recommendations in order to obtain an Underwriters Class "A" service rating.

3.07 SLIP SHEET

- A. Install where recommended by Roofing Manufacturer.
- B. Lay loosely over insulation.
- C. Lap joint 2" min. on mineral sheets; 6" min. on paper sheets.
- D. Follow slip sheet installation immediately by installation of roof membrane and sufficient ballast to prevent displacement of slip sheet.

3.08 MEMBRANE INSTALLATION

- A. General:
 - 1. Start installation only in presence of manufacturer's technical representative.
 - 2. Comply with manufacturer's instructions, except where more stringent requirements indicated
- B. The surface of the insulation or substrate shall be inspected prior to installation of the roof membrane. The substrate shall be clean, dry, free from debris and smooth with no surface roughness or contamination.
- C. Install membrane by unrolling over prepared substrate, lapping adjoining sheets as recommended by manufacturer, and bonding and sealing seams.
 - 1. Roll out membrane without stretching and allow to relax min. of 15 minute if temperature above 60°F, 30 minutes if below 60°F.
 - 2. Inspect and remove damaged, folded or wrinkled membrane.
 - 3. Membrane shall lay flat and be free from "fish mouths", wrinkles, folds or other conditions detrimental to obtaining a water tight application.
- D. Mechanically Attached: Install membrane by unrolling over prepared substrate, lapping adjoining sheets as recommended by manufacturer, and heat welding seams.
 - 1. Install mechanical fasteners at spacing recommended by manufacturer or to achieve a Factory Mutual I-90 Wind-uplift rating, whichever is more stringent.
 - 2. Install all flashings as shown or as recommended by the manufacturer.
- E. Install mechanical fasteners at spacing recommended by manufacturer, covering with adhesive-applied membrane so no fasteners are exposed.
- F. Install adhesives of type and using methods recommended by manufacturer.
- G. Install flashings and counter flashings as shown or recommended by manufacturer.

- H. Follow manufacturer's instructions for non-penetrating mechanically fastened systems.

3.09 ROOFING AT ROOF TOP EQUIPMENT

- A. At roof top mechanical equipment (Roof top Units, RTUs; Energy Recovery Units, ERUs and similar equipment) roofing system to extend under roof top equipment. Omit roofing only where ducts penetrate roof system.
 - 1. Roofing system to be installed under the entire area of the roof top Hvac units other than where ducts penetrate roofing system. Provide perimeter edge and curb flashing to match other areas.

3.10 HOT-AIR WELDING OF SEAM OVERLAPS

- A. General:
 - 1. All seams shall be hot-air welded. Seam overlaps should be 3 inches wide when automatic machine welding and 4 inches wide when hand welding, except for certain details.
 - 2. All membrane to be welded shall be clean and dry.
- B. Seams: Provide with two independent seals formed by solvent welding and subsequent sealing.
 - 1. At mechanically fastened system, overlap membrane min. of 5" over itself or metal flashing to allow for installation of metal fasteners and a full 2" solvent weld at edge.
 - 2. Check for continuity and integrity and seal with manufacturer's sealant.
 - 3. Weld and seal all seams the same day.
- C. Hand-Welding: Hand-welded seams shall be completed in two stages. Hot-air welding equipment shall be allowed to warm up for at least one minute prior to welding.
 - 1. The back edge of the seam shall be welded with a narrow but continuous weld to prevent loss of hot air during the final welding.
 - 2. The nozzle shall be inserted into the seam at a 45-degree angle to the edge of the membrane. Once the proper welding temperature has been reached and the membrane begins to "flow," the hand roller is positioned perpendicular to the nozzle and pressed lightly. For straight seams, the 1-1/2 inch wide nozzle is recommended for use. For corners and compound connections, the 3/4 inch wide nozzle shall be used.
- D. Quality Control of Welded Seams: The Applicator shall check all welded seams for continuity using a rounded screwdriver. Visible evidence that welding is proceeding correctly is smoke during the welding operation, shiny membrane surfaces, and an uninterrupted flow of dark grey material from the underside of the top membrane.
 - 1. No adhesive shall be applied in seam areas that are to be welded. All panels of membrane shall be applied in the same manner, overlapping the edges of the panels as required by welding techniques.

3.11 METAL FLASHINGS

- A. Install at all intersections of roof with sloped or vertical surfaces, roof interruptions and penetrations in accordance with roofing manufacturer's currently published drawings herein specified and consistent with Architect's details and job conditions, or other drawings approved by Roofing Manufacturer.
- B. Metal details, fabrication practices and installation methods shall conform to the applicable requirements of the following:
 - 1. Factory Mutual Loss Prevention Data Sheet 1-49 (latest issue).
 - 2. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - latest issue.
- C. Complete all metal work in conjunction with roofing and flashings so that a watertight condition exists daily.
- D. Metal shall be installed to provide:
 - 1. Adequate resistance to bending to allow for normal thermal expansion and contraction.
 - 2. Metal joints shall be watertight.

- E. Metal flashings shall be securely fastened into solid wood blocking. Fasteners shall penetrate the wood nailer a minimum of 1 inch.
- F. Flashing shall extend a minimum of 8 inches above roofing level unless otherwise accepted in writing by the architect and manufacturer.
- G. Counter flashings shall overlap base flashings at least 4 inches.
- H. Securely fasten flashing and terminations to plane of roof deck with suitable fasteners to provide min. of 150 lbs./l.f. for expected life of roof.
- I. Install fasteners so to be subjected only to shear forces unless suitable expansion type fasteners used in approved manner.
 - 1. Install fasteners 8" o.c. unless otherwise specified.
- J. Make joints between longitudinal segments of Roofing Manufacturer's metal in accordance with standard details and manufacturer's instructions; weld joint strips in place prior to roofing installation.
- K. Provide scuppers in PVC-coated gravel stop at a maximum of 20'-0" on center ; coordinate location with windows, doors and HVAC units to ensure scuppers do not occur over these items.

3.12 METAL BASE FLASHINGS/EDGE METAL

- A. Flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the architect.
- B. Extend base flashing and/or vertical wall flashing up vertical surfaces 8" and onto horizontal roof surface min. 3" unless otherwise shown.
 - 1. Flashing to be metal clad only; use of membrane flashing not acceptable.
- C. Install metal base flashing, where indicated, by nailing to wood nailers; provide 2" min. overlap and solvent weld in the horizontal plane.
 - 1. Flashing to be membrane coated metal only; use of membrane flashing not acceptable.
- D. Metal flashings shall be formed and installed per the Detail Drawings.
 - 1. Metal flashings shall be fastened into solid wood nailers with two rows of post galvanized flat head annular ring nails, 4 inches on center staggered. Fasteners shall penetrate the nailer a minimum of 1 inch.
 - 2. Metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.
- E. Adjacent sheets of coated metal shall be spaced 1/4 inch apart. The joint shall be covered with 2 inch) wide aluminum tape. A 6 inch minimum wide strip of flashing membrane shall be hot-air welded over the joint.

3.13 WALKWAY INSTALLATION

- A. Roofing membrane to receive walkway shall be clean and dry. Place chalk lines on deck sheet to indicate location of Walkway. Clean the deck membrane in areas to be welded. Walkway shall be unrolled and positioned within the chalk lines. Hot-air weld the entire perimeter of the Walkway to the deck sheet. Check all welds with a rounded screwdriver. Re-weld any inconsistencies.
- B. Walkway Protection: Install walkway at locations shown, indicated herein and where required for access to roof-mounted equipment.
 - 1. Pavers required from edge of roof or from roof scuttle to and completely around major roof mounted equipment, included but not limited to, kitchen hood, roof top HVAC units, fresh air units and similar equipment.

3.14 CLEANING

- A. After completion of all roofing installation, remove all tools, excess materials and debris from roof surfaces.
- B. Clean roof surface and flashing thoroughly so that no soil or stains are evident.
- C. Inspect roof surfaces prior to Architect's final inspection to assure that no debris remains on roof from this or other trades; have removed as necessary.

3.15 COMPLETION

- A. Prior to demobilization from the site, the architect, general contractor and the applicator shall review the work. All defects noted and non-compliances with the Specifications or the recommendations of the manufacturer shall be itemized in a punch list. These items must be corrected immediately by the applicator to the satisfaction of the architect.

END OF SECTION 07530

ROOF WARRANTY AGREEMENT

NO. _____

NAME OF PROJECT: _____

LOCATION: _____

BUILDING USE: _____

SUBSTRATE: _____ INSULATION TYPE: _____

ROOFED AREA: _____ FLASHING LENGTH: _____

ROOF WORK BEGUN ON: _____ AND COMPLETED ON: _____

WARRANTY PERIODS:

CONTRACTOR: FROM _____ TO _____

INSTALLER: FROM _____ TO _____

MANUFACTURER: FROM _____ TO _____

For the periods indicated, the Contractor, the Installer and the manufacturer each warrant that the said roof will remain in a watertight condition. In the event the roof fails to so perform due to failure of workmanship or materials, each will, during his period of warranty, cause to be made the repairs or modifications to the roof to the extent necessary to enable the roof to perform as warranted, all at no cost to the Owner.

The obligations under this warranty become effective upon notification, within thirty (30) days of any failure of the roof to perform as warranted, in writing by the Owner to the parties responsible during that specific period of warranty. The Owner must grant the affected party or parties access to the roof during normal business hours.

This Warranty Agreement is not effective under following conditions:

Performance is impaired by alterations or repairs made without the written approval of all the parties hereto.

Use of the building or roof other than described herein.

Work done on roof by parties other than those agreed to by all the parties hereto.

The Contractor, the Installer and the Manufacturer will not be liable for failure of the roof to perform as warranted, due to:

- A. Natural disasters such as, but not limited to, windstorms exceeding pressures of Factory Mutual I-90 rating, hail, flooding, lightning, fire and earthquakes;
- B. structural defects of the building;
- C. continuous ponding of water exceeding two inches (2") in depth;
- D. abnormal use or abuse of the building or the roof;
- E. the acts of anyone but parties authorized by the parties to this agreement to work on the roof: or
- F. leaks caused by water entering from structures adjacent to this roof.

The Contractor, the Installer and the Manufacturer will not be liable in any respect for damage to the building described herein, contents, other property or persons; nor will they be liable for any incidental or consequential damages whether based on negligence or otherwise. The provisions of this warranty shall constitute the exclusive remedy, and will not be deemed in force unless all financial obligations of the Owner under the original installation contract have been satisfied.

This warranty agreement is in lieu of all other warranties and guarantees, expressed or implied, including warranties of merchantability and fitness, and shall not be extended or altered except by written instrument signed by the contractor, installer, manufacturer and Owner. There are no other warranties or guarantees which extend beyond the description set forth in this warranty agreement.

ry

This warranty Agreement is in effect upon being signed by Contractor, Installer, Manufacturer and Owner.

CONTRACTOR:

Name: _____

Address: _____

By: _____

Title: _____

Date: _____

MANUFACTURER:

Name: _____

Address: _____

By: _____

Title: _____

Date: _____

INSTALLER:

Name: _____

Address: _____

By: _____

Title: _____

Date: _____

OWNER:

Name: _____

Address: _____

By: _____

Title: _____

Date: _____

SECTION 07600
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.02 SUMMARY

- A. This Section includes work associated with Flexible Sheet Roofing System, Section 07530, Gutters and Downspouts, masonry walls and other related work not part of metal roofing and wall panels and includes the following:
 - 1. Metal counter flashing; and base flashing (if any).
 - 2. Metal wall flashing and expansion joints.
 - 3. Built-in metal valleys, gutters and scuppers.
 - 4. Gutters and downspouts (rain drainage).
 - 5. Metal Copings.
 - 6. Elastic/Elastomeric flashing.
 - 7. Exposed metal trim/fascia units.
 - 8. Miscellaneous sheet metal accessories.
 - 9. Elastomeric secondary flashing system for use with sheet metal flashings.
- B. Integral masonry flashings specified as masonry work in sections of Division 4.
- C. Roofing accessories installed integral with flexible sheet roofing system specified in Section 07530 Flexible Sheet Roofing System as roofing work.
- D. Roof accessory units of pre-manufactured, set-on type specified in Division 7 Section "Roof Accessories".

1.03 SUBMITTALS

- A. Product data: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
- B. Samples: Submit two each of following:
 - 1. Manufacturer's standard color line for Architect's selection of colors for factory or shop finished items.
 - 2. 8" square samples of specified sheet materials exposed as finished surfaces.
 - 3. 12" long samples of factory-fabricated products exposed as finished work, complete with specified factory finish.
- C. Shop Drawings:
 - 1. Show layout, profiles, methods of joining, and anchorages details, including major counter-flashings, trim/fascia units, gutters, downspouts, scuppers and expansion joint systems.
 - 2. Provide layouts at 1/4" scale and details at 3" scale.

1.04 QUALITY ASSURANCE

- A. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

- B. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.
 - C. Qualifications of Installers: Provide at least one person, present at all times during execution of the work of this section, who shall be thoroughly trained and experienced in materials and methods required and who shall direct the entire flashing and sheet metal fabrication and installation.
 - D. Codes and Standards: In addition to complying with applicable codes and regulations, comply with recommendations contained in 'Architectural Sheet Metal Manual', latest edition, of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).
 - E. FM Listing: Provide roofing system and component materials which have been evaluated by Factory Mutual System for fire spread, wind-uplift and hail damage and are listed in 'Factory Mutual Approval Guide' for Class I Construction.
 - 1. Provide roof covering materials bearing FM approval marking on bundle, package or container, indicating that the material has been subjected to FM's examination and follow-up service.
 - 2. Installation, including anchorage, to meet requirements of FM-I-75 wind load classification with FM 129S perimeter installation. Provide test data verifying compliance.
 - F. Building Code Compliance: Roofing system, including edge securement, to comply with applicable sections of current International Building Code and Standard Building Code of Georgia.
 - 1. Edge metal installation shall comply with provisions of Section 1504.5 "Edge Securement for low-sloped Roofs" of the Standard Building Code of Georgia.
 - 2. Low-slope membrane roof system metal edge securement, except gutters, shall be designed and installed for wind loads in accordance with Chapter 16, except that the basic wind shall be determined from Figure 1609.
 - 3. Design, fabrication, installation and testing of edge metal shall meet ANSI/SPRI ES-1 standards.
- 1.05 PRODUCT HANDLING:
- A. Protection: Use all means necessary to protect flashing and sheet metal materials before, during and after installation and to protect the installed work and materials of other trades.
 - 1. Stack preformed materials to prevent twisting, bending, or abrasion and in a manner to ensure adequate ventilation.
 - 2. Prevent contact with material or metals during storage which may cause discoloration or staining.
- 1.06 WARRANTIES
- A. Manufacturer's Product Warranty: For factory or shop finished fabrications, provide paint manufacturer's twenty (20) year guarantee against fading, cracking, peeling, blistering or wear-thru of paint film.
 - B. Installer's Warranty: Furnish to Owner a guarantee covering maintenance of products herein specified for a period of two (2) years from date of final acceptance. Within warranty period, replace or correct any defective materials or workmanship without cost to owner.
- 1.07 PROJECT CONDITIONS
- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation.
 - 1. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide flashings and sheet metal designed and fabricated to fit applications indicated and to perform optimally with respect to weather resistance, water tightness, durability, strength, and uniform appearance.
- B. Expansion provisions: Fabricate flashings and sheet metal to allow controlled expansion in running lengths not only for movement of metal components in relationship to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in manner sufficient to prevent water leakage, deformation or damage.
- C. Copings, fascia, edge metals and other similar materials to be furnished and warranted, as part of roof system warranty, by roof system manufacturer.
 - 1. Copings, fascia and edge metals to be tested by FM and shall be approved for listed uplift.

2.02 MATERIALS

- A. Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 526 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphatized for painting where indicated;
 - 1. Thickness: Minimum 0.0359 inch thick (20 gage) except as otherwise indicated.

2.03 METAL FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated.
 - 1. For components assembled or welded in factory, apply finish after fabrication completed.
- B. Provide colors or color matches as indicated or, if not indicated, selected by Architect from manufacturer's standard colors.
 - 1. Colors selected for products of this section match the colors selected for the metal siding and roofing specified in Division-7 Section; Pre-Formed Metal Roofing and Siding.
- C. Fluorocarbon Coating: Inhibitive thermo-cured primer, 0.2 min. mil. dry film thickness, and thermo-cured fluorocarbon coating containing "Kynar 500" resin, 1.0 mil. min. dry film thickness.

2.04 ELASTOMERIC FLASHING

- A. Water and Ice Shield: Smooth surfaced peel and stick membrane for use as a secondary waterproofing membrane.
 - 1. Application: For use under all metal flashings, including, but not limited to, rake trim, fascias, ridge caps, valleys, vertical wall flashings, cap flashings, copings and expansion joints covers.
 - 2. Thickness: 40 Mil min.
- B. Approved manufacturers subject to compliance with technical provisions of the contract:
 - 1. W.R. Grace Ice and Water Shield
 - 2. MiraDri, WIP 200 Non Skid Film Surface
 - 3. Owens Corning; Weatherlock

2.05 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Solder: Provide 60–40 tin/lead solder (ASTM B32), with acid–chloride type flux, except use resin flux over tinned surfaces.
- B. Lead Flashing: ASTM B 749, Type L51121, copper-bearing sheet lead, minimum 4 lbs./sq. ft. (0.0625-inch thick) except not less than 6 lbs./sq. ft. (0.0937-inch thick) for burning (welding) unless otherwise indicated
- C. Fasteners: Same metal as flashing/sheet metal or, other non-corrosive metal as recommended by sheet manufacturer; match finish of exposed heads with material being fastened.

- D. Bituminous Coating: SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- E. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.
- F. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants specified in Division 7 Section "Joint Sealers."
- G. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.
- H. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.
- I. Paper Slip Sheet: 5-lb. rosin-sized building paper.
- J. Polyethylene Underlayment: Min. 6-mil carbonated polyethylene film; resistant to decay when tested in accordance with ASTM E 154.
- K. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, noncorrosive.
- L. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.
- M. Gutter and Conductor-Head Guards: 20-gage bronze or nonmagnetic stainless steel mesh or fabricated units, with selvaged edges and noncorrosive fasteners; select materials for compatibility with gutters and downspouts.
- N. Gutter Leaf Guards: Expanded metal guards of size required by gutter to prevent leaves or other foreign materials from entering gutter and as follows:
 - 1. Width: +/- 5"; coordinate with gutter size.
 - 2. Length: Min. 4'-0"; coordinate with gutter supports.
 - 3. Material: Aluminum.
 - 4. Type: Hinged
- O. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with min. stress on flashing sheet.
- P. Roofing Cement: ASTM D 2822, asphaltic.

2.06 METAL FABRICATION

- A. General: Shop-fabricate work to greatest extent possible.
 - 1. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices.
 - 2. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of work.
 - 3. Form work to fit substrates.
 - 4. Comply with material manufacturer instructions and recommendations for forming material.
 - 5. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
 - 6. Fabricate sections to true uniform lines without overstressing or splitting metal and without marring exposed surfaces.
- B. Seams:
 - 1. Fabricate non-moving seams in sheet metal with flat-lock seams.
 - 2. For metal other than aluminum, tin edges seamed, form seams, and solder.
 - 3. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

- C. Transitions, corners, and intersections of copings shall be one piece all soldered sections.
- D. Formed Profiles: Joints for formed profiles, including but not limited to, expansion joint caps, gravel stops, counter flashings, ect., shall be butt joints (min. 1/8" to 1/4" max. separation) with concealed backup plates formed to exact profile of sheet metal component.
- E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work not used, or not sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, min. 1" deep, fill with mastic sealant (concealed within joints).
- F. Sealant Joints: Where movable, non-expansion type joints indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- G. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation recommended by manufacturer/fabricator.

2.07 SHEET METAL FLASHING AND TRIM MATERIALS

- A. This section includes various types of metal flashings, including but not limited to: cap flashing, counter flashing, vertical wall flashings and other flashings not specifically addressed elsewhere.
- B. Flashings to be fabricated of minimum 10'-0" lengths of manufacturer's standard pre-formed sections and in accordance with the following:
 - 1. Shape and Size: As detailed and required
 - 2. Thickness: Min. 0.0239 thick (24 gage)
 - 3. Material: Zinc coated metal
 - 4. Finish: "Kynar" finish
 - 5. Color: Color selected by Owner/Architect

2.08 RAIN DRAINAGE

- A. Gutters and Downspouts to be fabricated of minimum 10'-0" lengths of manufacturer's standard pre-formed sections and in accordance with the following:
 - 1. Gutter Shape and Size: Box type; Minimum 6" X 6" unless detailed otherwise.
 - 2. Downspout Shape and Size: Box type; Minimum 4" X 4" unless detailed otherwise.
 - 3. Thickness: Min. 0.0239 thick (24 gage)
 - 4. Material: Zinc coated metal
 - 5. Finish: "Kynar" finish
 - 6. Color: Color selected by Owner/Architect
- B. Fabricate cleats of same material as gutter.
- C. Miter gutters corners, shop form and weld to provide high quality, uniform, neat corner.
- D. Securely fasten and seal all necessary downspout seams watertight.

2.09 METAL COPING

- A. Coping to be fabricated of minimum 10'-0" lengths of manufacturer's standard pre-formed sections and in accordance with the following:
 - 1. Shape and Size: Standing Seam Type of Shape and Size indicated
 - 2. Thickness: Min. 0.0239 thick (24 gage)
 - 3. Material: Zinc coated metal
 - 4. Finish: "Kynar" finish
 - 5. Color: Color selected by Owner/Architect

- B. Coping Covers: Provide joint covers min. 24" wide. Covers to be of same material and finish as coping.
 - 1. Corners: Miter inside and outside corners.
 - 2. Seams: Standing Seam Type.

2.010 ELASTIC EXPANSION JOINTS

- A. General: Provide factory-fabricated units of size and profile indicated, complete with prefabricated corner units, intersection units and splicing materials.
 - 1. Provide complete with elastic sheet flashing forming primary joint membrane, in supported, "bellows" arrangement designed for securement to both sides of expansion joints.
 - 2. Insulate underside of bellows with adhesively applied, flexible, closed-cell rubber or plastic, min. 3/8" thick.
- B. Type: Metal flanged edges, 3" to 4" wide, formed to profiles indicated to fit curbs, and designed for nailing to curb substrate.
 - 1. Provide metal flanges of one of the following in thicknesses listed:
 - a. Zinc-coated steel: 0.0179" (26 gage).
 - b. Aluminum: 0.032".
- C. Looped Bellows Width: 5" to 6", exclusive of flanges.

2.011 METAL FASCIA

- A. Fascia to be fabricated of minimum 10'-0" lengths of manufacturer's standard pre-formed sections and in accordance with the following:
 - 1. Shape and Size: Shape and Size indicated
 - 2. Thickness; Less than 8" high: Minimum 0.0239 inch thick (24 gage).
 - 3. Thickness; Greater than 8" high: Minimum 0.0359 inch thick (20 gage).
 - 4. Material: Zinc coated metal
 - 5. Finish: "Kynar" finish
 - 6. Color: Color selected by Owner/Architect

2.012 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of following:
- B. Gutters and Downspouts; Copings, Fascia, Flashings:
 - 1. Merchant and Evans Industries, Inc.
 - 2. MM Systems Corp.
 - 3. Metal-Era, Inc. Waukesha, Wisconsin
 - 4. Reynolds Aluminum Company
 - 5. W. P. Hickman Company
 - 6. Construction Specialties.
- C. Elastic Expansion Joints:
 - 1. Afco Products, Inc.
 - 2. Celotex Corporation/Roofing Products Division
 - 3. BF Goodrich Construction Products
 - 4. Manville/Roofing Systems Division.
 - 5. Phoenix Building Products
 - 6. York Manufacturing, Inc.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual".
 - 1. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level indicated.
 - 2. Install work with laps, joints and seams permanently watertight and weatherproof.
- B. Underlayment: Where stainless steel or aluminum installed directly on cementitious or wood substrates, install slip sheet of red rosin paper and course of polyethylene underlayment.
- C. Bed flanges of work in thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install reglets to receive counter flashing in manner and by methods indicated.
 - 1. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections.
 - 2. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.
- E. Secondary flashing system: Provide and install secondary flashing system of elastomeric flashing (ice and water shield) below all metal flashings installed as part of this section.
- F. Install counter flashing in reglets, either by snap-in seal arrangement, or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.
- G. Install elastic flashing in accordance with manufacturer's recommendations.
 - 1. Where required, provide for movement at joints by forming loops or bellows in width of flashing.
 - 2. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing.
 - 3. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.
- H. Nail flanges of expansion joint units to curb nailers, at max. spacing of 6" o.c.
 - 1. Fabricate seams at joints between units with min. 3" overlap, to form a continuous, waterproof system.

3.02 FLASHINGS

- A. Adjacent sections of flashing shall be lapped a minimum of 4" in the direction of water flow. Laps shall be sealed water tight with a 2" wide bed of sealant compressed between two (2) surfaces.
- B. Flashing shall be secured to structure with nails at 4" on center. All fastener heads shall be sealed watertight with plastic cement.

3.03 RAIN DRAINAGE SYSTEMS

- A. Gutter System:
 - 1. Install gutters in a manner that allows for collection of water from the roof and, in the event of overflow, forces the water to spill over the front edge of the gutter away from the building.
 - a. Unless otherwise noted, the front edge of the gutter to be 1" below the back edge of the gutter and 1" below the edge of the roof.

2. Support vertical side of gutter exposed to view (front side) with min 1/8" thick X 1" wide anchor straps spaced maximum of 2'-6" o.c.. Attach anchor strap to front of gutter with blind type pop-rivets; extend other end of anchor strap over continuous anchor cleat min, 2" and attach to wood nailers with two fasteners.
 - a. Provide 1/2" X 3/4" galvanized steel stiffener bar attached to gutter with 1/4" stainless steel bolts at each gutter strap.
 - b. Extend strap to top of wood nailers. Anchor strap to nailers through back flange of gutter.
 - c. Secure gutter back to wood nailer with 2-1/2" long stainless steel wood screws, in slotted holes, at 16" on center.
 - d. Do not permit attachment to interfere with expansion and contraction.
 3. Lap joints in straight runs of gutters min. 3", in direction of flow, anchor with blind type pop-rivets and seal watertight; match color of sealant to color of gutters.
 4. Slope gutters uniformly to downspouts only as required to provide positive drainage.
 5. Provide lap type expansion joint in gutters, constructed in accordance with SMACNA, Architectural Sheet Metal Manual, 1987 edition, Plate 7; space max. 40' o.c.
 6. Install continuous gutter guards on gutters, arranged as hinged units to swing open for cleaning gutters.
 - a. Coordinate location of ends of gutter guard with gutter supports. Ends of guards to occur over each gutter support.
- B. Downspout System:
1. Coordinate locations of downspouts with expansion joints in gutters so as not to block waterflow.
 - a. Space downspouts as indicated, but not more than 30' on center.
 - b. At gutter expansion joints provide downspout at each end of gutter section at downspout.
 2. Secure downspouts to abutting walls with u-shaped 18 gage steel straps for steel downspouts securely anchored to wall.
 - a. Provide one strap each at top and bottom with intermediate straps spaced maximum 6'-0" o.c.
 - b. Secure straps to masonry with expansion type anchors and attach to metal panels with waterproof fasteners.
 3. No joints permitted in straight runs of downspouts, only at changes in directions.
 - a. Lap joints min. 3" in direction of flow, and anchor with blind type aluminum pop rivets.
 - b. Seal joints watertight; color of sealant to match downspout.
 4. Make connection of downspout to gutter watertight and provide clean, neat and uniform appearance.
 5. Connect each downspout to underground storm drainage system indicated, whether shown drawings or not.
 - a. Seal joints watertight and adequate to resist a 15'-0" water column (head).
 6. Where downspouts extend to low roof area, turn bottom of downspout out from face of wall at 45 degree angle; terminate 6" above low roof and 8" from face of wall.
 - a. At metal roofing provide and install a min. 18 gage, galvanized steel, pre-finished metal ripple pan at each downspout. Fully adhere metal ripple pan to metal roofing.
 - b. Where downspout spills out on metal roofing system, turn downspout outlet so that water flows down roof slope and not towards metal roofing seam.
 - c. At roofing system provide concrete block splash block. Splash block to be placed on additional layer of modified bitumen roof flashing.
- C. Drainage System: Install gutters and downspouts complete with all trim and accessories required to provide straight, uniform and neat installation.
- 3.04 METAL COPING
- A. Install coping as specified and in accordance with Architect's details.
 - B. Install modified bitumen flashing under coping, extending from 2" down inside face of parapet, across top and down outside face of parapet 2". Lap joints 12" and seal water tight.
 - C. Install coping with all accessories and trim required to provide watertight, straight, uniform and neat appearance, and render water tight installation.
 - D. Joints to be butt type with full bed of sealant between ends. Cover joints with 24" long joint cover of shape to match coping, centered on each joint and set in full bed of sealant.

- E. At approximately 40'-0" o.c. provide slip-joint type expansion joints with 1" expansion capability.
- F. Form bottom edge of coping and joint cover outward at 45° to form drip and bend back on itself to stiffen edge and provide slot to receive anchor cleats.
 - 1. Anchor bottom edge with 18 gauge x 2" concealed anchor cleats 2'-0" o.c.
 - 2. Exposed fasteners not permitted.
- G. Cover corners with one piece pre-formed corner sections extending min. 3'-0" in each direction. Shape and finish corner sections to match coping sections and provide tight, uniform and neat appearance.

3.05 METAL FASCIA INSTALLATION

- A. Install metal fascia as herein specified and indicated.
 - 1. Where conflicts exist between specification and plans, the more stringent of the two shall govern.
- B. Provide all accessories and trim required to provide watertight, straight, uniform and neat appearance with expansion and contraction capabilities.
- C. Where metal fascia is applied directly over metal substrate, without use of wood nailers, provide separation between metal fascia and metal substrate. Separation shall consist of continuous elastomeric flashing or 15# asphalt impregnated building paper.
- D. Install with 1/4" opening between sections covered with 6" wide cover plate of same material and profile of metal fascia.
 - 1. Embed cover plate in mastic, nail through opening between top horizontal flanges of gravel stop sections and loose lock to drip edge.
 - 2. See SMACNA Architectural Sheetmetal Manual, 79 edition, plate 38, figure A.
 - 3. Provide slip-joint type expansion joints with 1" expansion capability, approx. 30' o.c.
- E. Where metal fascia consists of two or more vertical sections, extend top edge of lower sections up min. 3" behind upper sections and secure with fasteners through slotted holes 2'-0" o.c.
 - 1. Bend out and hem bottom edge of fascia 45° to form drip, to stiffen and to provide slot to receive anchor cleats.
 - 2. Anchor bottom edge of fascia with 18-gauge concealed anchor cleats 2'-0" o.c.; exposed fasteners not permitted.
- F. Trim corners with one piece corner sections extending min. 12" in each direction.
 - 1. Shop or factory miter corner sections and weld into one piece units.
 - 2. Shape and finish corner sections to match fascia sections and provide tight, uniform and neat appearance.
 - 3. Set corners in full bed of mastic.

3.06 CORROSION PREVENTION

- A. Apply Bituminous Paint to aluminum surfaces before placing in contact with masonry, concrete or other corrosive material.
- B. Separate dis-similar materials using one of the following methods:
 - 1. One (1) layer of 30# asphalt impregnated felt.
 - 2. One (1) coat of heavy bodied bituminous paint.
 - 3. Good quality caulking.
 - 4. A non-absorptive tape or gasket.

3.07 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure work without damage or deterioration, other than natural weathering at time of Final Acceptance.

END OF SECTION 07600

SECTION 07700
ROOF SPECIALTIES AND ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent and locations of roof accessories indicated on drawings and by provisions of this Section.
- B. Types of units specified in this Section include following:
 - 1. Roof hatches.
 - 2. Prefabricated curb and equipment support units.
 - 3. Prefabricated curbset roof expansion joints.
- C. Refer to roofing system sections of these specifications for roofing accessories built into roofing system (not work of this section).

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, rough-in diagrams, details, installation instructions and general product recommendations.
- B. Samples: Submit 2 samples, min. 8" square, of each exposed metal and plastic sheet materials, and 2 samples, min. 24" long, of formed or extruded exposed metal member; color and finish as specified.
- C. Coordination Drawings: Submit coordination drawings for items interfacing with or supporting mechanical or electrical equipment, ductwork, piping, or conduit.
 - 1. Indicate dimensions and locations of items provided under this Section, together with relationships and methods of attachment to adjacent construction and to mechanical/electrical items.

1.04 QUALITY ASSURANCE

- A. Standards: Comply with SMACNA "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap-flashing to coordinate with type of roofing indicated.
 - 1. Comply with "NRCA Roofing and Waterproofing Manual" details for installation of units.
- B. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- C. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.
- D. Qualifications of Installers: Provide at least one person, present at all times during execution of the work of this section, who shall be thoroughly trained and experienced in materials and methods required and who shall direct the entire flashing and sheet metal fabrication and installation.

- E. Codes and Standards: In addition to complying with applicable codes and regulations, comply with recommendations contained in 'Architectural Sheet Metal Manual', latest edition, of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).
 - F. FM Listing: Provide roofing system and component materials which have been evaluated by Factory Mutual System for fire spread, wind-uplift and hail damage and are listed in 'Factory Mutual Approval Guide' for Class I Construction.
 - 1. Provide roof covering materials bearing FM approval marking on bundle, package or container, indicating that the material has been subjected to FM's examination and follow-up service.
 - 2. Installation, including anchorage, to meet requirements of FM-I-75 wind load classification with FM 129S perimeter installation. Provide test data verifying compliance.
 - G. Building Code Compliance: Roofing system, including edge securement, to comply with applicable sections of current International Building Code and Standard Building Code of Georgia.
 - 1. Edge metal installation shall comply with provisions of Section 1504.5 "Edge Securement for low-sloped Roofs" of the Standard Building Code of Georgia.
 - 2. Low-slope membrane roof system metal edge securement, except gutters, shall be designed and installed for wind loads in accordance with Chapter 16, except that the basic wind shall be determined from Figure 1609.
 - 3. Design, fabrication, installation and testing of edge metal shall meet ANSI/SPRI ES-1 standards.
- 1.05 PRODUCT HANDLING:
- A. Protection: Use all means necessary to protect flashing and sheet metal materials before, during and after installation and to protect the installed work and materials of other trades.
 - 1. Stack preformed materials to prevent twisting, bending, or abrasion and in a manner to ensure adequate ventilation.
 - 2. Prevent contact with material or metals during storage which may cause discoloration or staining.
- 1.06 WARRANTIES
- A. Manufacturer's Product Warranty: For factory or shop finished fabrications, provide paint manufacturer's twenty (20) year guarantee against fading, cracking, peeling, blistering or wear-thru of paint film.
 - B. Manufacturer's Product Warranty: For roof expansion joints, provide paint manufacturer's five (5) year guarantee against defects in material and/or installation.
 - C. Installer's Warranty: Furnish to Owner a guarantee covering maintenance of products herein specified for a period of two (2) years from date of final acceptance. Within warranty period, replace or correct any defective materials or workmanship without cost to owner

PART 2 - PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

- A. Provide manufacturers' standard units, modified as necessary to comply with requirements; shop fabricate each unit to greatest extent possible.

2.02 MATERIALS, GENERAL

- A. Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 525, G90 hot-dip galvanized, mill phosphatized.
- B. Aluminum Sheet : ASTM B 209, alloy 3003, temper required for forming and performance; AA-C22A41 clear anodized finish, except prepared mill finish where field painting indicated.
- C. Extruded Aluminum: Manufacturer's standard extrusions of sizes and general profiles indicated, alloy 6063-T52; 0.078" min. thicknesses for primary framing and curb member legs, 0.062" for secondary legs; AA-C22A41 clear anodized finish on exposed members, except as otherwise indicated.

- D. Insulation: Manufacturer's standard rigid or semi-rigid board of glass fiber of thicknesses indicated.
 - E. Wood Nailers: Softwood lumber, pressure treated with water-borne preservatives for above-ground use, complying with AWPB LP-2; min. 1-1/2" thick.
 - F. Fasteners: Same as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal recommended by manufacturer.
 - 1. Match finish of exposed fasteners with finish of material being fastened.
 - 2. Where removal of exterior exposed fasteners affords access to building, provide nonremovable fastener heads.
 - G. Gaskets: Tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.
 - H. Bituminous Coating: FS TT-C-494 or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coating.
 - I. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
 - J. Elastomeric Sealant: Generic type recommended by unit manufacturer, compatible with joint surfaces; comply with FS TT-S-00227-E, TT-S-00230C, or TT-S-001543A.
 - K. Roofing Cement: ASTM D 2822, asphaltic.
- 2.03 METAL FINISHES
- A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated.
 - 1. For components assembled or welded in factory, apply finish after fabrication completed.
 - B. Fluorocarbon Coating: Inhibitive thermo-cured primer, 0.2 min. mil. dry film thickness, and thermo-cured fluorocarbon coating containing "Kynar 500" resin, 1.0 mil. min. dry film thickness.
 - C. Provide colors or color matches as indicated or, if not indicated, selected by Architect from manufacturer's standard colors.
 - 1. Colors selected for products of this section match the colors selected for the metal siding and roofing specified in Division-7 Section; Pre-Formed Metal Roofing and Siding.
- 2.04 ELASTOMERIC FLASHING
- A. Water and Ice Shield: Smooth surfaced peel and stick membrane for use as a secondary waterproofing membrane.
 - 1. Application: For use under all metal flashings, including, but not limited to, vertical wall flashings, cap flashings, and expansion joints covers.
 - 2. Thickness: 40 Mil min.
 - B. Approved manufacturers subject to compliance with technical provisions of the contract:
 - 1. W.R. Grace Ice and Water Shield
 - 2. MiraDri, WIP 200 Non Skid Film Surface
 - 3. Ownes Corning; Weatherlock

2.05 PREFABRICATED ROOF HATCHES

- A. General: Fabricate units of sizes shown, single-leaf type unless otherwise indicated, for 40 lbs./sq. ft. external loading and 20 lbs./sq. ft. internal loading pressure and in compliance applicable OSHA requirements and with the following:
 - 1. Roof hatch:
 - a. Type One: 2'-6" X 3'-0" for ladder access.
 - b. Type Two: 3'-0" x 8'-0" for ships ladder access.
 - 2. Metal Gage:
 - a. Cover & Curb: Minimum 14 Gage.
 - b. Liner: Minimum 22 Gage.
 - 3. Finish: Factory applied Fluorocarbon Coating of color selected by architect.
 - 4. Safety Features: Equip with hatch mounted galvanized steel perimeter protective railing system to protect hatch opening when open. Use of plastic or fiberglass rail system not acceptable.
 - a. Use of plastic or fiberglass rail systems not acceptable.
 - b. Railing system to be equal to Kee Hatch Model RHSR-SS (Phone 877-723-3766) for use with 2'-6' X 3'-0" roof hatch. Other acceptable manufacturers listed below in paragraph 2.05 D.
- B. Fabrication: Frame with 9" high integral-curb double-wall construction with 1-1/2" insulation, cant strips and cap flashing (roofing counter-flashing), with welded or sealed mechanical corner joints.
 - 1. Provide double-wall cover (lid) construction with 1" insulation core.
 - 2. Equip units with complete hardware set including hold-open devices, interior padlock hasps, and both interior and exterior latch handles.
 - 3. Provide master keyed padlocks, Master Padlock #3206 for each hatch.
 - 4. Provide gasketing.
 - 5. Fabricate units of Aluminum or zinc-coated steel, or in combination, at Contractor's option.
- C. Sloping Roofs: Where slope of roof deck exceeds 1/4" per ft., fabricate hatch curbs with height tapered to match slope, to result in level installation of tops of units.
- D. Manufacturer: Subject to compliance with requirements, provide prefabricated roof hatch units by one of following:
 - 1. Babcock-Davis
 - 2. Bilco Co.; New Haven, CT
 - 3. Dur-Red Products; Cudahy, CA
 - 4. Milcor Inc.; Lima, OH
 - 5. Nystrom Building Products
 - 6. O'keeffe's Inc.
 - 7. TriStar Skylights

2.06 PREFABRICATED CURBS/EQUIPMENT SUPPORTS

- A. Comply with loading and strength requirements indicated where units support other work.
 - 1. Coordinate dimensions with rough-in sheets or shop drawings of equipment supported.
 - 2. Fabricate of structural quality galvanized sheet steel (ASTM A 570, Grade as required) prepared for painting and factory-primed and painted with 2-mil thickness of baked-on synthetic enamel, after fabrication.
- B. Curb to be complete with integral cant and base plates (for deck support), and internally reinforced with 1" X 1" X 1/8" steel angle where curbs longer than 3'-0" along any side. Base profile to be coordinated with roof insulation thickness.
 - 1. Provide preservative-treated wood nailers at tops of curbs, coordinate with thickness of insulation and roof flashing indicated, tapered as necessary to compensate for roof deck slopes of 1/4" per ft. and less.
- C. Except as otherwise indicated or required for strength and/or depth of insulation, fabricate units of min. 14-gage (0.0747") metal, and to min. height of 12".
 - 1. Fabricate with continuously mitered and welded corner joints.

- D. Curb to be lined with factory installed 1-1/2" thick, 3 pound density rigid fiberglass insulation board, vertically and horizontally, full height and length of curb.
- E. Sloping Roofs: Where slope of roof deck exceeds 1/4" per ft., fabricate curb/support units with height tapered to match slope, to result in level installation of tops of units.
- F. Finish: Factory applied Fluorocarbon Coating of color selected by architect.
- G. Manufacturer: Subject to compliance with requirements, provide prefabricated curbs/equipment supports by one of following:
 - 1. Custom Curb, Inc.; Chattanooga, TN
 - 2. The Pate Company; Broadview, IL
 - 3. ThyCurb Div./ThyBar Corp.; Addison, IL

2.07 PREFABRICATED CURB SET EXPANSION JOINTS

- A. Description: Provide extruded aluminum expansion joint units designed for installation on raised curbs.
 - 1. Units to be multi-part assembly designed to facilitate the horizontal and lateral movement of curbs or roof sections. The complete system shall consist of a membrane condensate and air seal with batten insulation, continuous galvanized rails, special anchor cleat fasteners, a continuous galvanized cleat and a formed metal cover.
 - 2. Provide a continuous galvanized cleat with pre-punched elongated fastener holes along the length and width to allow bi-lateral movement of roof sections.
 - 3. The top edge of the roof curbs shall be covered with a continuous galvanized rail to permit unrestricted movement between the cleat and rails.
 - 4. Provide Internal gutter-chair plates at all expansion cover joints.
 - 5. Cleats to secured with special 1-5/8" long shouldered screw fasteners furnished by the manufacturer.
 - 6. Provide mineral fiber insulation, concealed under curb cap between curbs; to form waterproof, airtight, insulated expansion joint system.
- B. Expansion Provide units of manufacturer's standard lengths; in styles required for roof-to-roof, roof-to-wall, and wall-to-wall applications indicated; complete with prefabricated corner and intersection units required; equipped with special field splice provisions to ensure permanent continuous waterproof installation of expansion joint system. and in accordance with the following:
 - 1. Shape and Size: As detailed and required
 - 2. Thickness: Min. 0.0239 thick (24 gage)
 - 3. Material: Zinc coated metal
 - 4. Finish: Factory applied Fluorocarbon Coating of color selected by architect.
 - 5. Color: Color selected by Owner/Architect
- C. Basis of Design: The design has been based on products manufactured by W. P. Hickman Company. Products include:
 - 1. Roof to Roof Conditions: Permaspan Model PSRR Expansion Joint System
 - 2. Roof to Wall Conditions: Permaspan Model PSRW Expansion Joint System.
- D. Manufacturer: Subject to compliance with requirements and subject to products being equal to product specified as 'Basis for Design', provide curbset expansion joint units by one of following:
 - 1. Afco Products, Inc.; Somerville, MA
 - 2. BF Goodrich Company; Akron, OH
 - 3. W. P. Hickman Company; Asheville, NC
 - 4. Manville Roofing Systems Div.; Denver, CO
 - 5. York Manufacturing, Inc.; Sanford, ME

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual".
 - 1. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level indicated.
 - 2. Install work with laps, joints and seams permanently watertight and weatherproof.
- B. Underlayment: Where stainless steel or aluminum installed directly on cementitious or wood substrates, install slip sheet of red rosin paper and course of polyethylene underlayment.
- C. Bed flanges of work in thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install reglets to receive counter flashing in manner and by methods indicated.
 - 1. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections.
 - 2. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.
- E. Secondary flashing system: Provide and install secondary flashing system of elastomeric flashing (ice and water shield) below all metal flashings installed as part of this section.
- F. Install counter flashing in reglets, either by snap-in seal arrangement, or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.
- G. Install elastic flashing in accordance with manufacturer's recommendations.
 - 1. Where required, provide for movement at joints by forming loops or bellows in width of flashing.
 - 2. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing.
 - 3. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.
- H. Nail flanges of expansion joint units to curb nailers, at max. spacing of 6" o.c.
 - 1. Fabricate seams at joints between units with min. 3" overlap, to form a continuous, waterproof system.

3.02 INSTALLATION

- A. General: Coordinate with installation of roof deck and other substrates to receive accessory units, and vapor barriers, roof insulation, roofing and flashing; as required to ensure that each element of work performs properly, and combined elements are waterproof and weathertight.
 - 1. Comply with manufacturer's instructions and recommendations.
 - 2. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures. Unless noted otherwise weld prefabricated curbs to structural steel/bar joists in accordance with manufacturers written instructions and as necessary to adequately support loads imposed upon curb.
 - 3. Except as otherwise indicated install roof accessory items in accordance with construction details of "NRCA Roofing and Waterproofing Manual".
- B. Isolation: Where metal surfaces of units installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.
- C. Flange Seals: Except as otherwise indicated, set flanges of accessory units in thick bed of roofing cement, to form seal.
- D. Cap Flashing: Where cap flashing required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter flashing).
 - 1. Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

- E. Operational Units:
 - 1. Test operate units with operable components.
 - 2. Clean and lubricate joints and hardware.
 - 3. Adjust for proper operation.

3.03 ROOF HATCH INSTALLATION

- A. Frame rough opening for roof hatch as indicated on drawings, if not indicated frame utilizing two steel angle surrounding the opening in accordance with the following:
 - 1. Angle #1; Deck Support Angle; 3 X 4 X 1/4"
 - 2. Angle #2; Joist Header; 2 X 6 X 1/4" LLV
- B. Construct roof curb of pressure treated lumber, minimum of two (2) layers, surrounding opening. Pressure treated lumber to be bolted to angles with 3/8" diameter bolts at maximum 8" on center. Top of nailers to be flush with top of rigid insulation.
- C. Set horizontal flange of roof hatch in full bed of sealant and secure to roof curb with minimum of 3/8" diameter X 4" long lag screws at 6" on center.

3.04 EXPANSION JOINT INSTALLATION:

- A. General: Products to be installed in strict accordance with manufacturer's written instructions.
- B. Inspection: Inspect vertical wood expansion joint curbs prior to beginning expansion joint cover installation. Curbs shall be straight, level, and securely anchored to the substrates.
- C. Installation: Set membrane air and condensate seal into the expansion cavity. Securely attach the outer edges of the membrane seal to wood curb or wall surfaces.
 - 1. Secure using galvanized steel rails as termination plates, placing them over the membrane and inserting fasteners through the rail and membrane into the top of the wood curb or wall surface.
 - 2. Fold and close ends of the membrane seal.
 - 3. Fill the open bellows of the membrane seal with fiberglass insulation material provided with the system.
 - 4. Loosely lay ten foot lengths of 20ga galvanized steel articulatory anchor cleat over the previously installed membrane seal and rails.
 - 5. Cut intermediate length cleat sections as required to fully cover the expansion cavity.
 - 6. Center the horizontal cleat slots over the top of the standing wood curb.
 - 7. Secure the continuous cleat lengths at 18" on center through pre-punched slotted holes using 1-5/8" shouldered screws with washers.
 - 8. Secure through both horizontal and vertical slotted holes.
 - 9. Install the expansion joint cover onto installed articulatory cleats.
 - a. Install prefabricated corners, end terminations, or other accessories.
 - b. Place a gutter joint plate under each joint in the exterior cover.
 - c. Hook the cover on the extended (free) side of the expansion joint.
 - d. Leave 1/8" gap between sections in moderate weather.
 - e. Increase space between cover sections to 1/4" below 32° F.
 - f. Rotate the cap snapping into place for type PSRR, or anchoring to wall surfaces for type PSRW.

3.05 CLEANING AND PROTECTION

- A. Clean exposed metal and plastic surfaces in accordance with manufacturer's instructions; touch up damaged metal coatings.

3.06 PAINTING

- A. Refer to Section 09900, Painting and Finishing for painting requirements.
 - 1. All surfaces of hatch and curb, inside and out, shall be painted with fire retardant paint.

END OF SECTION 07700

**SECTION 07900
JOINT SEALERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of each form and type of joint sealer indicated on drawings and schedules.
- B. Section includes joint sealers for following locations:
 - 1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces, elastomeric joint sealant, use NT, as indicated below:
 - a. Joints between architectural precast concrete units.
 - b. Control and expansion joints in unit masonry.
 - c. Joints of stonework set without mortar.
 - d. Joints of stonework set with mortar including copings and cornices.
 - e. Joints between different materials listed above.
 - f. Perimeter joints between materials listed above and frames of doors and windows.
 - g. Other joints as indicated.
 - 2. Exterior joints in horizontal traffic surfaces, elastomeric joint sealant, use T as indicated below:
 - a. Control and expansion joints in brick pavers.
 - b. Control, expansion, and isolation joints in cast-in-place concrete slabs for floors and paving.
 - c. Tile control and expansion joints.
 - d. Joints between different materials listed above.
 - e. Other joints as indicated.
 - 3. Interior joints, 3/8" or less in width, in vertical surfaces and horizontal nontraffic surfaces, solvent-release-curing joint sealants as indicated below:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - e. Perimeter joints of toilet fixtures.
 - f. Other joints as indicated.
 - 4. Interior joints, greater than 3/8" in width, in vertical surfaces and horizontal nontraffic surfaces, elastomeric joint sealant, use NT, as indicated below:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - c. Joints on underside of precast beams and planks.
 - d. Other joints as indicated.
 - 5. Other interior joints, miscellaneous sealants, as indicated below:
 - a. Sight exposed locations, to provide finished appearance, where not specified above.
- C. Sealing joints in exterior insulation and finish system specified in Division-7 section: "Exterior Insulation and Finish System".
- D. Sealing joints related to flashing and sheet metal for roofing specified in Division-7 Section: "Flashing and Sheet Metal."
- E. Sealants for glazing purposes specified in Division-8 Section "Glass and Glazing."
- F. Sealing concealed perimeter joints of gypsum drywall partitions to reduce sound transmission characteristics specified in Division-9 Section "Gypsum Drywall."

- G. Sealing tile joints specified in Division-9 Section "Tile."
- 1.03 SYSTEM PERFORMANCES
- A. Provide joints sealers produced and installed to establish and maintain watertight and airtight continuous seals.
- 1.04 SUBMITTALS
- A. Product Data from manufacturer's for each joint sealer product required, including instructions for joint preparation and joint sealer application.
 - B. Samples for Initial Selection Purposes: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available, for each product exposed to view.
 - C. Samples for verification purposes of each type and color of joint sealer required.
 - 1. Install joint sealer samples in 1/2 inch wide joints formed between two 6" long strips of material matching appearance of exposed surfaces adjacent to joint sealers.
 - D. Certificates from manufacturers of joint sealers attesting that products comply with specification requirements and are suitable for use indicated.
 - E. Qualification data complying with requirements specified in "Quality Assurance" article.
 - 1. Include list of completed projects with project name, addresses, names of Architects and Owners, plus other information specified.
 - F. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings tested for compatibility and adhesion with joint sealants.
 - 1. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
 - G. Product test reports for each type of joint sealers indicated, evidencing compliance with requirements specified.
- 1.05 QUALITY ASSURANCE
- A. Installer Qualifications: Installer successfully completed within last 3 years at least 3 joint sealer applications similar in type and size to that of this Project.
 - B. Testing Laboratory Qualifications: To qualify for acceptance, independent testing laboratory demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has experience and capability to conduct satisfactorily testing indicated without delaying progress of Work.
 - C. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from single manufacturer for each different product required.
 - D. Preconstruction Compatibility and Adhesion Testing: Submit samples of all materials that contact or affect joint sealers to joint sealer manufacturers for compatibility and adhesion testing, as indicated below:
 - 1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques required to obtain rapid, optimum adhesion of joint sealers to joint substrates.
 - 2. Perform tests under normal environmental conditions that exist during actual installation.
 - 3. Submit min. 9 pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
 - 4. Schedule sufficient time for testing and analysis of results to prevent delay in progress of Work.
 - 5. Investigate materials failing compatibility or adhesion tests and obtain joint sealer manufacturer's written recommendations for corrective measures, including use of specially formulated primers.
 - 6. Testing not required when joint sealer manufacturer able to submit joint preparation data required above acceptable to Architect and based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

- E. Product Testing: Provide comprehensive test data for each type of joint sealer based on tests conducted by qualified independent testing laboratory on current product formulations within 24-month period preceding date of Contractor's submittal of test results to Architect.
 - 1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920.
 - 2. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low-temperature flexibility, modulus of elasticity at 100% strain, effects of heat aging, and effects of accelerated weathering.
 - 3. Include test results performed on jointsealers after curing 1 year.
 - F. Field-Constructed Mock-Ups: Prior to installation of joint sealers, apply elastomeric sealants to following selected building joints indicated below for further verification of colors selected from sample submittals and to represent completed work for qualities of appearance, materials and application:
 - 1. Joints in field-constructed mock-ups of assemblies specified in other sections indicated to receive elastomeric joint sealants in this Section.
 - 2. Retain mock-ups during construction as standard for judging completed construction.
- 1.06 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.
 - B. Store and handle materials in compliance with manufacturer's recommendations to prevent deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
- 1.07 PROJECT CONDITIONS
- A. Environmental Conditions: Do not proceed with installation of joint sealers under following conditions:
 - 1. When ambient and substrate temperature conditions outside limits permitted by joint sealer manufacturers or as listed below; which ever is the most stringent.
 - 2. When ambient and substrate temperature conditions outside limits permitted by joint sealer manufacturer or below 40°F (4.4°C).
 - 3. When joint substrates wet due to rain, frost, condensation or other causes.
 - B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths less than allowed by joint sealer manufacturer for application indicated.
 - C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with adhesion removed from joint substrates.
- 1.08 SEQUENCING AND SCHEDULING
- A. Sequence installation of joint sealers to occur min. 21 nor max. 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealers, joint fillers and other related materials compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealer indicated or, if not otherwise indicated, selected by Architect from manufacturer's standard colors.
- C. Except as noted formulate sealant for interior joints to accept and hold paint after curing.

2.02 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class and Uses.
- B. One-Part Nonsag Urethane Sealant for Use NT: Type S; Grade NS; Class 25; and Uses NT, M, A, and, as applicable to joint substrates indicated, O.
- C. One-Part Nonsag Urethane Sealant for Use T: Type S; Grade NS; Class 25, and complying with following requirements for Uses:
 - 1. Uses T, NT, A, and, as applicable to joint substrates indicated, O.
- D. Products: Subject to compliance with requirements, provide one of following:
 - 1. One-Part Nonsag Urethane Sealant for Use NT:
 - a. "Chem-Calk 900"; Bostik Construction Products Div.
 - b. "Chem-Calk 2639"; Bostik Construction Products Div.
 - c. "Vulkem 116"; Mameco International, Inc.
 - d. "Vulkem 921"; Mameco International, Inc.
 - e. "Dynatrol I"; Pecora Corp.
 - f. "Permapol RC-1"; Products Research & Chemical Corp.
 - g. "Sikaflex-1a"; Sika Corp.
 - h. "Sikaflex-15LM"; Sika Corp.
 - i. "Sonolastic NP 1"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
 - j. "Dymonic"; Tremco, Inc.
 - 2. One-Part Nonsag Urethane Sealant for Use T:
 - a. "Chem-Calk 900"; Bostik Construction Products Div.
 - b. "Permapol RC-1"; Products Research & Chemical Corp.
 - c. "Sikaflex-1a"; Sika Corp.
 - d. "Sikaflex-15LM"; Sika Corp.

2.03 SOLVENT-RELEASE-CURING JOINT SEALANTS

- A. Flexible Polyurethane Security Sealant: Manufacturer's standard two-part, non-sag, tamper resistant elastomeric polyurethane joint sealant designed to achieve high tensile and tear strength, abrasion resistance and an ultimate Shore A Hardness at 55, yet withstand 25% total joint movement.
 - 1. Application: All interior joints where Solvent-Release-Curing Joint Sealants specified except where sealant is to be used in Food Preparation areas. Where sealant used in food preparation area provide either Butyl or Pigmented Small Joint Sealant listed below.
- B. Products: Subject to compliance with requirements, provide one of following as indicated:
 - 1. Flexible Polyurethane Security Sealant:
 - a. Pecora Corporation, DynaFlex
 - b. Bostik Construction Products Div.
 - c. Protective Treatments Inc.
 - d. Tremco Inc.
- C. Butyl Sealant: Manufacturer's standard one part, nonsag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657 for Type I and formulated with min. of 75% solids nonstaining, paintable, and have tackfree time of 24 hours or less.
- D. Pigmented Small Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented, synthetic rubber sealant formulated for sealing joints 3/16" or smaller in width.

- E. Products: Subject to compliance with requirements, provide one of following as indicated:
 - 1. Butyl Sealant:
 - a. "Chem-Calk 300"; Bostik Construction Products Div.
 - b. "BC-158"; Pecora Corp.
 - c. "PTI 757"; Protective Treatments Inc.
 - d. "Tremco Butyl Sealant"; Tremco Inc.
 - 2. Pigmented Small Joint Sealant:
 - a. "PTI 200"; Protective Treatments, Inc.
 - b. "Tremco Seam Sealer"; Tremco Inc.
 - c. "Chem-Calk 300"; Bostik Construction Products Div.

2.04 MISCELLANEOUS JOINT SEALANTS

- A. Butyl-Polyisobutylene Sealant: Manufacturer's standard, solvent-release-curing, butyl-polyisobutylene sealant complying with AAMA 809.2, recommended for concealed joints.
- B. Butyl-Polyisobutylene Tape Sealant: Manufacturer's standard, solvent-free, butyl-polyisobutylene tape sealant with solids content of 100% complying with AAMA 804.1; formulated nonstaining, paintable, and nonmigrating in contact with nonporous surfaces; packaged on rolls with release paper on one side; with or without reinforcement thread to prevent stretch.
- C. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Butyl-Polyisobutylene Sealant:
 - a. "BR-96 Curtain Wall Sealant"; Pecora Corp.
 - b. "PTI 404"; Protective Treatments, Inc.
 - c. "Butyl Sealant"; Tremco Inc.
 - 2. Butyl-Polyisobutylene Tape Sealant:
 - a. "Extru-Seal Tape"; Pecora Corp.
 - b. "Shim-Seal Tape"; Pecora Corp.
 - c. "PTI 606"; Protective Treatments, Inc.
 - d. "Tremco 440 Tape"; Tremco Inc.

2.05 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type which are nonstaining; compatible with joint substrates, sealants, primers and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Elastomeric Foam Joint Fillers:
 - 1. Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, non-absorbent to water and gas, capable of remaining resilient at temperatures down to -26 degrees F.
 - 2. Provide products with low compression set and of size and shape to provide secondary seal, to control sealant depth and otherwise contribute to optimum sealant performance.
- C. Bond-Breaker Tape:
 - 1. Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure.
 - 2. Provide self-adhesive tape where applicable.

2.06 MISCELLANEOUS MATERIALS

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaners of type acceptable to manufacturer of sealants and sealant backing materials, not harmful to substrates and adjacent nonporous materials, and not leave oily residues or otherwise have detrimental effect on sealant adhesion or in-service performance.

- C. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.

2.07 JOINT FILLERS FOR CONCRETE PAVING

- A. General: Provide joint fillers of thickness and widths indicated or required.
- B. Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751:
 - 1. Asphalt saturated fiberboard, 1/2" thick unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance.
 - 1. Do not proceed with installation of joint sealers until unsatisfactory conditions corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and following requirements:
 - 1. Remove all foreign material from joint substrates interfering with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellents; water; surface dirt and frost.
 - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or combination of these methods to produce clean, sound substrate capable of developing optimum bond with joint sealers.
 - 3. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 - 4. Remove laitance and form release agents from concrete.
 - 5. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other non-porous surfaces by chemical cleaners or other means not harmful to substrates or leaving residues capable of interfering with adhesion of joint sealers.
- B. Joint Priming:
 - 1. Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer substrate tests or prior experience.
 - 2. Apply primer to comply with joint sealer manufacturer's recommendations.
 - 3. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
 - 4. Masking Tape:
 - a. Use masking tape where required to prevent contact of sealant with adjoining surfaces otherwise permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears.
 - b. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Solvent-Release-Curing Sealant Installation Standard: Comply with requirements of ASTM C 804 for use of solvent-release-curing sealants.

- D. Installation of Sealant Backings: Install sealant backings to comply with following requirements:
 - 1. Install joint-fillers of type indicated to provide support of sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
 - 2. Do not leave gaps between ends of joint-fillers.
 - 3. Do not stretch, twist, puncture or tear joint fillers.
 - 4. Remove absorbent joint fillers if wet prior to sealant application and replace with dry material.
 - 5. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where adhesion of sealant to surfaces at back of joints result in sealant failure.
- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants:
 - 1. Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint.
 - 2. Remove excess sealants from surfaces adjacent to joint.
 - 3. Do not use tooling agents which discolor sealants or adjacent surfaces or not approved by sealant manufacturer.
 - 4. Provide concave joint configuration per Figure 6A in ASTM C 962, unless otherwise indicated.
 - 5. Provide flush joint configuration per Figure 6B in ASTM C 962, where indicated.
 - 6. Use masking tape to protect adjacent surfaces of recessed tooled joints.
 - 7. Provide recessed joint configuration per Figure 6C in ASTM C 962, of recess depth and at locations indicated.

3.04 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.05 PROTECTION

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so they are without deterioration or damage at time of Final Acceptance.
 - 1. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

END OF SECTION 07900

SECTION 08110
STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of standard steel doors and frames indicated and scheduled on drawings. This Section includes:
 - 1. Fire rated and non-rated steel doors and frames.
 - 2. Fire rated and non-rated interior window frames.
 - 3. Non-rated exterior window frames.
- B. Finish hardware specified elsewhere in Division 8.
- C. Building in of anchors and grouting of frames in masonry construction specified in Division 4.

1.03 REFERENCES

- A. ASTM E152; Method of Fire Tests of Door Assemblies.
- B. DHI; Installation Guide for Doors and Hardware.
- C. NFPA 80; Fire Doors and Windows
- D. NFPA 252; Fire Tests for Door Assemblies
- E. SDI 100; Standard Steel Doors and Frames
- F. SDI 105; Recommended Erection Instruction for Steel Frames.
- G. UL 10B and UL 10C; Fire Tests of Door Assemblies.
- H. ANSI A151.1; Endurance Test
- I. ANSI 115; Hardware Preparation

1.04 QUALITY ASSURANCE

- A. All doors and frames to be manufactured by a single manufacturer.
- B. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.
 - 1. Test reports shall be submitted upon request.
- C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

1.05 REGULATORY REQUIREMENTS

- A. Doors and Frames shall conform to applicable codes for fire ratings.
 - 1. Provide labeled doors, view windows and frames for all openings in fire rated partitions. Labels to be appropriate for rating of wall in which opening is being placed.
 - 2. A physical label or approved marking shall be affixed to the fire door and/or frame at authorized facility as evidence of compliance with procedures of labeling agency.
 - 3. All interior stairwell doors shall carry a minimum 450 temperature rise rating in addition to the required fire rating.
 - 4. Side hinged fire doors to comply with requirements of NFPA 252 or UL 10C
 - 5. Fire doors in corridors and smoke barriers shall meet, in addition to the requirements of NFPA 252 / UL 10C, the requirements of UL 1784.
- B. If any door or frame specified by Architect as fire-rated cannot qualify for appropriate labeling because of design, hardware or any other reason, advise Architect before fabricating work on that item. Modify unit in manner acceptable to Architect at no cost to contract.
- C. Fire-Rated Door and View Window Assemblies: Where fire-rated door/window assemblies indicated or required, provide fire-rated door/window and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows", and tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Glazing in door assemblies to be tested in accordance with NFPA 257.
 - 2. Glass panels in corridor and other rated walls to be tested in accordance with NFPA 257 .
 - 3. Where unable to provide fully labeled 20-minute openings due to hardware requirements, frame requirements, etc, provide label stating construction of door is equal to 20-minute rating.
 - 4. Oversize Fire-Rated Door Assemblies: For door assemblies required fire-rated and exceeding sizes of tested assemblies, provide certificate or label from approved independent testing and inspection agency, indicating that door and frame assembly conforms to requirements of design, materials and construction established by individual listings for tested assemblies.
 - 5. Temperature Rise Rating: At stairwell enclosures, provide doors which have Temperature Rise Rating of 450°F (232°C) max. in 30 minutes of fire exposure.
 - 6. Fire label to be screw or rivet attached metal plate. Do not use adhesive attached paper type labels.

1.06 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.
- B. Shop Drawings:
 - 1. Submit for fabrication and installation of steel doors and frames.
 - 2. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections.
 - 3. Show anchorage and accessory items.
 - 4. Provide schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
 - 5. Indicate coordination of glazing frames and stops with glass and glazing requirements.
- C. Label Construction Certification: Where door assemblies required to be fire-rated and where assemblies exceed sizes of tested assemblies, submit manufacturer's certification that each door and frame assembly constructed to conform to design, materials and construction equivalent to requirements for labeled construction.
- D. Samples: Submit, with shop drawings, 2 (two) 12" x 12" samples of complete corner section of door and frame representative of minimum quality of work to be furnished.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage.
- B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished items equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
 - 1. Where minor damage detected promptly clean and touch-up scratches or disfigurement caused in shipping or handling with rust-inhibitive primer.
- C. Store doors and frames at building site under cover.
 - 1. Place units on min. 4" high wood blocking.
 - 2. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber.
 - 3. If cardboard wrapper on door becomes wet, remove carton immediately.
 - 4. Provide 1/4" spaces between stacked doors to promote air circulation.
 - 5. Store in upright (vertical) position.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide steel doors and frames by one of following:
 - 1. Allied Steel Product, Inc.
 - 2. Amweld/Div. American Welding & Mfg. Co.
 - 3. Ceco Corp.
 - 4. Curries Mfg., Inc.
 - 5. D & D Specialties, Inc.
 - 6. Dittco Products, Inc.
 - 7. Fenestra Corp.
 - 8. Firedoor Corp. of Florida
 - 9. Georgia Detention Window, Inc.
 - 10. Kewanee Corp.
 - 11. Mesker Industries, Inc.
 - 12. Pioneer Bldrs. Products Corp./Div. CORE Industries, Inc.
 - 13. Steelcraft/Div. American Standard Co.
 - 14. Republic Builders Products Corp./Subs. Republic Steel.

2.02 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.
- B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.
- C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G60 zinc coating, mill phosphatized.
 - 1. Coating weight min. 0.60 oz./s.f. (0.30 oz./s.f. per side).
- D. Supports and Anchors: Fabricate of min. 18-gage galvanized sheet steel.
- E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot dip galvanized items built into exterior walls, complying with ASTM A 153, Class C or D as applicable.
- F. Shop Applied Paint:
 - 1. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as base for specified finish paints.

2.03 HARDWARE LOCATIONS

- A. Location of hardware on doors and frames: NAAMA Standard, HMMA 861-87, except as otherwise specified herein or required by applicable handicapped codes.

2.04 CLEARANCES

- A. Comply with the following requirements:
 - 1. Clearances & tolerances of doors & frames: NAAMA Stand. HMMA 861-87.
 - 2. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
 - 3. Place fire-rated doors with clearance as specified in NFPA Standard 80.

2.05 FABRICATION, GENERAL

- A. Fabricate steel door and frame units rigid, neat in appearance and free from defects, warp or buckle.
 - 1. Wherever practicable, fit and assemble units in manufacturer's plant.
 - 2. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site.
- B. Unless more stringent requirements noted, comply with SDI-100 requirements as follows:
 - 1. Interior Doors: SDI-100, Grade III, extra-heavy-duty, Model 2, Minimum 16-gage faces, unless noted otherwise.
 - 2. Exterior Doors: SDI-100, Grade III, extra-heavy-duty, Model 2, Minimum 16-gage faces, unless noted otherwise.
- C. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel.
- D. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).
- E. Fabricate exterior doors, panels and frames (door and window) from hot dipped galvanized sheet steel.
- F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.
- G. Ventilation: Fabricate doors and frames with adequate provisions for ventilation of concealed spaces and as necessary to prevent accumulation of moisture within door and frame components.
 - 1. Provide weep holes as necessary.
- H. Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier.
 - 1. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.
 - 2. Reinforce doors and frames to receive surface-applied hardware; perform drilling and tapping for surface-applied finish hardware at project site.
 - 3. Locate finish hardware indicated on final shop drawings or, if not shown, in accordance with "Recommended Locations for Builder's Hardware," published by Door and Hardware Institute.
- I. Shop Painting:
 - 1. Dress, fill and sand, after fabrication, all tool marks and surface imperfections, as required to make all faces and vertical edges smooth, level and free of all irregularities.
 - 2. Clean, chemically treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
 - 3. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
 - 4. Apply shop coat of prime paint of even consistency to provide uniformly finished surface ready to receive finish paint. Coat all exposed surfaces, with rust-inhibitive primer; primer to be baked on and allow to fully cure before shipment.

2.06 STANDARD STEEL DOORS

- A. "Steel" doors also referred to as "hollow metal" and "metal" doors elsewhere on plans and in specifications. The terms shall be considered interchangeable.
- B. Provide steel doors of types and styles indicated on drawings or schedules. Minimum thickness, unless noted otherwise, to be 1-3/4".
- C. Fabricate doors of face sheets not less than gage indicated below:
 - 1. Interior Applications:
 - a. 16 Gage, unless noted otherwise.
 - 2. Exterior Applications:
 - a. 16 Gage, unless noted otherwise.
- D. Doors to be of fully, continuously welded, seamless construction with no visible seams or joints on faces or vertical edges.
 - 1. Doors to be strong, rigid and neat in appearance, free from warpage or buckle. Corner bends to be true, straight, of min. radius for gauge of metal used.
 - 2. Join door faces at vertical edges by continuous weld extending full height of door, ground, filled and dressed smooth to make them invisible and provide smooth flush surface.
- E. Doors Cavity: Sound deaden and insulate spaces between stiffeners full height of door with inorganic non-combustible batt-type material.
- F. Stiffeners: Stiffen Face sheet with continuous vertically formed steel sections spanning full thickness of interior space between door faces.
 - 1. Stiffeners to be hat shaped sections, of 20 gage steel, spaced 6" apart, and securely spot welded to face sheet at maximum 5" on center.
- G. Doors Top and Bottom: Close top and bottom edges of doors with continuous recessed steel channel, min. 16-gauge, extending full width of door and spot welded to both faces.
 - 1. Provide exterior doors with an additional flush closing channel at top edges and, where required for attachment of weatherstripping, flush closure at bottom edges.
 - 2. Provide openings in bottom closure of exterior doors to permit escape of entrapped moisture.
 - 3. Seal all joints water tight.
- H. Doors Edges: Provide edge profiles on both vertical edges of doors as follows:
 - 1. Single-acting swing doors: Bevel 1/8" in 2"
 - 2. Double-acting swing doors: Round on 2-1/8" radius
- I. Hardware Reinforcing for Doors: Hardware Reinforcements for Door: Reinforce frames as specified herein and as recommended by the SDI 100 to receive specified hardware:
 - 1. Mortise, reinforce, drill and tap at factory for fully templated hardware only, in accord with approved hardware schedule and templates provided by Hardware Installer; where surface-mounted hardware to be applied, provide reinforcing plates only, all drilling and tapping to be performed in the field.
 - 2. Minimum gauges for hardware reinforcing plates as follows:
 - a. Hinge and pivot: 7 gage
 - b. Lock face & flush bolts: 12 gage
 - c. Concealed holders: 12 gage
 - d. Concealed or surface-mounted closers: 12 gage
 - e. All other surface-mounted Hardware: 16 gage
 - 3. Galvanized doors shall have galvanized hardware reinforcing.
- J. Glass Moldings at Door Lights: Where specified or required, provide with hollow metal moldings to secure glazing by others in accordance with glass opening sizes shown on contract documents.
 - 1. Provide loose surface applied stops minimum 18-gauge steel of beveled channel shape, with mitered corner joints, secured to frame opening by cadmium- or zinc-coated countersunk "sex nut" type, tamper-proof posts and screws.
 - 2. Metal glass stop for metal doors to match stop for wood doors.

3. Snap-on attachments or the use of the manufacturers standard rectangular glass stop and fixed leg configuration not acceptable.
- K. Louvers: Provide site proof stationary louvers for doors where indicated. Louvers to be constructed of inverted V-shaped or Y-shaped blades formed of 24 gage cold rolled steel set into a 20 gage steel frame.
 1. Louvers pierced into face sheets not permitted.

2.07 STANDARD STEEL FRAMES

- A. "Steel" frames also referred to as "hollow metal" and "metal" frames elsewhere on plans and in specifications. The terms shall be considered interchangeable.
- B. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules.
 1. Conceal fastenings, unless otherwise indicated.
- C. Fabricate door frames of not less than gage indicated below:
 1. Interior Applications:
 - a. 16 Gage, unless noted otherwise.
 2. Exterior Applications:
 - a. 14 Gage.
- D. Fabricate window frames of not less than gage indicated below:
 1. All Applications: 16 Gage
- E. Frame Fabrication:
 1. Units to be fully welded with integral trim, of sizes and shapes indicated.
 2. Fabricate finished work strong and rigid, neat in appearance, square, true and free of defects, warp or buckle with molded members clean cut, straight and of uniform profile throughout their lengths.
 3. Fabricate frames with mitered and welded corners.
 4. Frames to be face welded and fully welded on back side across entire throat width and depth; with holes filled with mineral filler and ground smooth.
 5. Close contact edges of corners tight, miter trim faces and continuously weld, miter or butt stops; use of gussets not permitted.
 6. Mullions and Rails: Provide closed tubular shapes having no visible seams or joints for mullion or rail members of frames for multiple or special openings. Continuously weld joints between faces of abutting members continuously and finish smooth.
 7. Stop: Stop portion of frame to be an integral part of frame. If joint in frame occurs at stop, said joint shall be continuously welded, filled and ground smooth.
 8. Silencers: Furnish door frames to project site with silencers installed in frames.
- F. Exterior Window Frame Fabrication: Exterior Window frames to be fabricated in accordance with above an requirements contained herein:
 1. Fabricate frames in manner to prevent leakage.
 2. Fabricate frames for exterior glazing of type indicated.
 3. Joints between all members to be welded continuously and solidly so as eliminate the passage of water through the frame.
 4. View all joints to verify that no light is visible through joints and connections. Where light is visible re-weld.
 5. Test all joints with water to verify that intersections and joints prevent the passage of water. Re-weld frame as necessary.
 6. After welding and testing of joints, joints to be filled with mineral filler and ground smooth and sealed with continuous, non shrink, paintable sealant.

- G. Glass Stops at Fixed Windows: Where specified or required, provide with hollow metal glass stop to secure glazing in accordance with glass opening sizes shown on contract documents.
1. Glass stops to be of tubular (not channel) design, of size and length required for glass size indicated.
 - a. Maximum gap between end of stop and frame member shall not exceed 1/32".
 2. Install glass stop on side of frame indicated:
 - a. At interior view windows place glass stop on security (office) side of frame.
 - b. At exterior hollow metal frame install glass stops on exterior side of frame.
- H. Frame Profile and Size:
1. Jamb depths, trim, profile and backbends: As scheduled and indicated.
 2. Rabbet on each side to be of equal width with each side being capable of receiving a door regardless of door hand (swing) shown on drawings.
 3. Minimum stop depth: 5/8".
- I. Frame Head Size:
1. Fabricate frames of size to accommodate masonry coursing. Where necessary and where indicated provide 4" head member(s).
- J. Frame Size Limitations: When shipping limitations dictate, fabricate frames for large openings in sections designed for splicing in field.
1. Field splices to be performed by manufacturer in accordance with provisions contained herein.
 2. Joints between members to be fully and continuously welded; inside and out, filled with mineral filler and ground smooth.
- K. View Window Size Limitations: Where view window frames are located in fire-rated walls of 1/2 hour, 1/2 hour, 3/4 hour or 1 hour designation the maximum glass opening size shall not exceed 1296 square inches or largest size for which manufacturer's frame has been tested; whichever ever is the most stringent. Where necessary to comply with maximum glass size, provide additional horizontal and/or vertical mullions of 2" thickness, width to match frame, at no additional cost to the contract.
- L. Hardware Reinforcing for frames: Hardware Reinforcements for Door Frames: Reinforce frames as specified herein and as recommended by the SDI 100 to receive specified hardware:
1. Mortise, reinforce, drill and tap at factory for fully templated hardware only, in accord with approved hardware schedule and templates provided by Hardware Installer; where surface-mounted hardware to be applied, provide reinforcing plates only, all drilling and tapping to be performed in the field.
 2. Minimum gauges for hardware reinforcing plates as follows:
 - a. Hinge and pivot: 7 gage, 1-1/4" x 10" min. size
 - b. Strike: 12 gage
 - c. Flush bolt: 12 gage
 - d. Closer: 12 gage
 - e. Surface-mounted hardware: 12 gage
 - f. Hold-open arms: 12 gage
 - g. Surface panic devices: 12 gage
 3. Galvanized door frames shall have galvanized hardware reinforcing.
- M. Floor Anchors: Weld securely inside each jamb, with two (2) holes provided at each jamb for floor anchorage.
1. Where so scheduled or specified, provide adjustable floor anchors, with min. 2" height adjustment.
 2. Minimum thickness: 14 gage.
- N. Jamb Anchors - Masonry: Adjustable jamb anchors of T-strap type.
1. Minimum thickness: 16 ga. steel.
 2. "T" Type Straps: Min. 2" x 10" in size, corrugated and/or perforated.
 3. Minimum number of anchors each jamb as follows:
 - a. Frames up to 7'-6" height: 3 anchors
 - b. Frames 7'-6" to 8'-0" height: 4 anchors
 - c. Frames over 8'-0" height: 1 anchor of each 2' or fraction thereof in height

- O. Jamb Anchors - Stud Partitions: Steel anchors of suitable design, min. 18-gauge thickness, securely welded inside each jamb as follows:
 - 1. Minimum number of anchors per jamb as follows:
 - a. Frames up to 7'-6" height: 4 anchors
 - b. Frames 7'-6" to 8'-0" height: 5 anchors
 - c. Frames over 8'-0" height: 5 anchors plus one additional for each 2' or fraction thereof over 8'-0"
- P. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 4 silencers on heads of double-swing frames.
- Q. Plaster/Mortar Guards: Provide 26-gage steel plaster/mortar guards or mortar boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- R. Frame Stiffeners: Provide min. 12 ga. steel angle or channel stiffener factory welded into head of frames installed in masonry wall openings more than 4'-0" wide, not longer than opening width; do not use as lintel or load bearing member.
- S. Frame Spreaders: Provide steel spreader temporarily attached to feet of both jambs to serve as brace during shipping and handling; not permitted for installation purposes.
- T. Insect Screen; Contractor to select one of the following:
 - 1. Aluminum Wire Fabric: 18x16 or 8x14 mesh of 0.013" dia. coated aluminum wire; FS RR-W-365, Type VII; black in color.
 - 2. Glass Fiber Mesh: 18x16 or 18x14 mesh of plastic-coated glass fiber threads, woven and fused to form fabric mesh resistant to corrosion, shrinkage, stretch, impact damage and weather deterioration: FS L-S-125; black in color.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.
- B. Responsibility of Contractor to perform following: Prior to installation, check and correct frames for size, swing, squareness, alignment, twist and plumbness; permissible installation tolerances not to exceed following:
 - 1. Squareness $\pm 1/16"$: Measured on line, 90° from one (1) jamb, at upper corner of frame at other jamb.
 - 2. Alignment $\pm 1/16"$: Measured on jambs on horizontal line parallel to plane of wall.
 - 3. Twist $\pm 1/16"$: Measured at face corners of jambs on parallel lines perpendicular to plane of wall.
 - 4. Plumbness: $\pm 1/16"$: Measured on jamb at floor.
- C. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.
 - 1. Prior to placement of frames ensure that all silencers are in place.
 - 2. Except for frames located at in-place concrete or masonry and at drywall installations, place frames prior to construction at enclosing walls and ceilings.
 - 3. Set frames plumb, true and straight; anchor and brace until surrounding walls in place.
 - 4. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors set.
 - 5. After wall construction completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
 - 6. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels.
 - 7. Where frames to be grouted solid, apply (adhere) extruded polystyrene insulation, $1/2"$ thick by width of stop, in door stop.
 - 8. Frames in masonry walls to be grouted solid. Use of mortar as a substitute for grout not acceptable.
 - 9. At in-place concrete or masonry construction, set frames and secure to adjacent construction with $1/4"$ Redhead sleeve anchors, 16" o.c.
 - 10. Install fire-rated frames in accordance with NFPA Std. No. 80.

11. In metal stud partitions, install min. 3 wall anchors per jamb at hinge and strike levels.
 - a. In open steel stud partitions, place studs in wall anchor notches and wire tie.
 - b. In closed steel stud partitions, attach wall anchors to studs with tapping screws.

 - D. Installation of Exterior Window Frames:
 1. Install exterior window frames in masonry openings straight, true, square and plumb.
 2. Anchor windows to masonry using 'T' type masonry wall anchors. Provide one anchor 8" from top and bottom edges of frame and additional anchors at a maximum of 16" on center.
 - a. Do not provide anchors at head and sill.
 3. Provide 16 gage galvanized steel, primed 'Z' shaped sub sill at each window sill.
 4. Seal joints between frame and masonry, on interior and exterior side of frame, with continuous bead of sealant.
 5. Seal all exterior joints in frame with sealant.
 6. Install glass stop in a manner to prevent passage of water and in accordance with the following:
 - a. Materials specified for installation of glass to comply with requirements of Section 08800, Glass and Glazing.
 - b. Apply continuous pre-shimed sealant tape between metal frame and stop, between glass and stop, between glass and frame and between stop ends and frame.
 - c. Set glass in place on continuous neoprene setting block.
 - d. Secure glass stop in place using stainless steel non-removable screws.
 - e. Apply continuous bead of paintable sealant of type specified along all edges of glass and glass stop.
 - f. Seal screw heads with sealant.

 - E. Door Installation:
 1. Hang and fit doors utilizing hardware scheduled and in accordance with manufacturer's written instructions.
 2. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
 3. Maintain proper door clearances specified, except for special conditions otherwise noted.
 4. Place fire-rated doors with clearances as specified in NFPA Standard No. 80.

 - F. Hardware Installation:
 1. Apply hardware in accordance with hardware manufacturer's templates and instructions.
- 3.02 ADJUST AND CLEAN
- A. Prime Coat Touch-up: Immediately after erection and periodically during construction, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
 - B. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.
- 3.03 DOOR FRAME SILENCERS
- A. Remove silencers prior to painting of door frames. Upon completion of painting door frames install 'new' silencers in all locations where door frame prepared to receive silencers.
 1. Adhere silencers to frame using liquid epoxy adhesive.
- 3.04 CONDITIONS FOR ACCEPTANCE:
- A. Exterior Window Frames: The exterior window frames to be installed in a manner to prevent the passage of water to the interior of the building.
 1. Complete installation to be water tight

END OF SECTION 08110

**SECTION 08211
FLUSH WOOD DOORS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to Work of this Section.

1.02 SUMMARY

- A. Extent and location of each type of flush wood door indicated on drawings and in schedules.
- B. Types of doors required include following:
 - 1. Solid core flush wood doors with wood veneer faces; fire rated and non-rated.
- C. Contractor's Option: The contractor has the option of factory or field finishing wood doors:
 - 1. If factory-finishing selected: Factory-finishing of flush wood doors included in this Section.
 - 2. If field finishing selected finish in accordance with provisions of Section 09900.
- D. Solid core wood doors for Teachers and Storage Cabinets specified in Division-6 section 06400, "Architectural Woodwork".
- E. Metal door frames for flush wood doors specified in another Division-8 section.

1.03 SUBMITTALS

- A. Product Data: Door manufacturer's technical data for each type door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.
- B. Shop Drawings:
 - 1. Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.
 - 2. For factory-premachined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.
- C. Samples: Submit samples, 1-0" square or as indicated, for following:
 - 1. Doors for Transparent Finish: Door faces with solid wood edging representing typical range of color and grain for each species of veneer and solid lumber required.
 - 2. Factory-Finished Doors: Each type of factory finish required.
 - 3. Corner sample of door with partially removed face veneer to expose construction type.
 - 4. Metal Frames for Light Openings: Metal light frames in 6" lengths; for each material, type and finish required.

1.04 QUALITY ASSURANCE

- A. Quality Standards: Comply with following standards:
 - 1. WDMA Quality Standard: I.S.1 "Industry Standard for Wood Flush Doors", of Window and Door Manufacturer's Association (WDMA).
 - 2. AWI Quality Standards: "Architectural Woodwork Quality Standards", including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDS quality standard.
 - a. Provide Type I glue for all applications.

- B. Fire-Rated Wood Doors Requirements and Standards: Comply with following:
 - 1. Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152 and labeled and listed for ratings indicated by UL, Warnock Hersey or other testing and inspection agency acceptable to authorities having jurisdiction.
 - a. Securely attach fire rating label to door.
 - 2. Where unable to provide fully labeled 20-minute openings due to hardware requirements, frame requirements, etc, provide label stating construction of door is equal to 20-minute rating.
 - 3. Oversize Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide manufacturer's certificate in stating that doors conform to all standard construction requirements of tested and labeled fire door assemblies except as to size.
 - C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
 - D. Manufacturer: Obtain doors from a single manufacturer.
- 1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING
- A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration.
 - 1. Comply with requirements of referenced standards and recommendations of WDMA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer's instructions.
 - B. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames and hardware, using temporary, removable or concealed markings.
- 1.06 PROJECT CONDITIONS
- A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity stabilized and maintained in storage and installation areas during remainder of construction period to comply with following requirements applicable to project's geographical location:
 - 1. Referenced AWI quality standard including Section 100-S-3 "Moisture Content".
- 1.07 WARRANTY
- A. General: Warranties in addition to, and not limitation of, other rights Owner may have under Contract Documents.
 - B. Door Manufacturer's Warranty:
 - 1. Submit written agreement on door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.
 - 2. Warranty also include reinstallation required due to repair or replacement of defective doors where defect not apparent to hanging.
 - 3. Warranty in effect during following period of time after date of Final Acceptance.
 - a. Solid Core Interior Doors: Life of installation.
 - C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following.
 - 1. Solid Core Doors with Wood Veneer Faces:
 - a. Algoma Hardwoods, Inc.
 - b. Eggers Industries, Architectural Door Division.
 - c. Graham Manufacturing
 - d. Southwood Door Company
 - e. Oshkosh Architectural Door Company
 - f. VT Industries, Inc.
 - g. Marshfield Door Systems (Weyerhaeuser Company)

2.02 INTERIOR FLUSH WOOD DOORS

- A. Solid Core Doors for Transparent Finish: Comply with following requirements:
 - 1. Faces: White Birch; rotary sliced; 'A' Grade; 1/50" Minimum thick before sanding.
 - 2. Matching: Book and running match
 - 3. AWI Grade: Custom.
 - 4. Construction: PC-5 (Particleboard core, LD-2, 5-ply) or SLC-5 (Glued block core, 5-ply); or SCLC-5 (Structural Composite Lumber Core, 5 ply), hot press
 - a. Wood staved only at doors with full lites.
 - 5. Exposed Edges:
 - a. Solid hardwood of same species as face veneers.
 - 6. Top and Bottom Edges:
 - a. Solid hardwood of species recommended by manufacturers.
 - b. Use of exposed particle board, veneer core, or engineered wood not acceptable.
 - 7. Thickness: 1-3/4" thick unless noted otherwise.
 - 8. Application: All wood doors unless door indicated to be plastic laminate or required to be fire rated.
- B. Fire-Rated Solid Core Doors: Comply with following requirements:
 - 1. Faces and AWI Grade: Provide faces and grade to match non-rated doors in same area of building, unless otherwise indicated.
 - 2. Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.
 - 3. Exposed Edges: Maple or match face veneer.
 - 4. Edge Construction: Provide manufacturer's standard laminated edge construction for improved screw-holding capability and split resistance as compared to edges composed of single layer of treated lumber.
 - 5. Pairs: Furnish formed steel edges and astragals for pairs of fire rated doors, unless otherwise indicated.
 - 6. Hardware Reinforcement: Provide reinforcement blocks at lock edge for installation of locksets and at top of door for installation of closer.
 - 7. Application: Wood doors located in fire rated walls where rating greater than 20 minutes.

2.03 LIGHT FRAMES

- A. Metal Frames for Light Openings in Fire Rated and Non-Fire Rated Doors: Manufacturer's custom frame formed of 18-gage cold-rolled steel of beveled channel shape, with mitered corners, and factory-primed.
 - 1. Unit to be approved for use in door of fire-rating indicated.
- B. Shape and configuration to:
 - 1. Match light frame utilized on hollow metal doors.
 - 2. Match light frame detailed on drawings.
- C. Metal light opening frame shall be anchored through door with cadmium or zinc coated, counter sunk tamperproof posts and screws.

2.04 FABRICATION

- A. Fabricate flush wood doors to produce doors complying with following requirements:
 - 1. In sizes indicated for job-site fitting.
 - 2. Face veneer gluing: Secure face veneer to core using hot press with type I glue.
 - 3. Stiles and Rails: Secure stiles and rails to core with type I glue; dry set slabs not acceptable.
 - a. Stiles and rails and core assembly shall be abrasively planed to a common thickness.
- B. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces and finish as specified for associated doors.
- C. Fixed Transom Panels: Fabricate fixed panels with solid lumber transom bottom rail and door top rail, both rebated as indicated, and factory- installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Louvers: Factory install louvers in prepared openings.

2.05 FINISHING

- A. General: The contractor has the option either factory-finishing or field-finishing doors furnished as part of this section.
 - 1. Finishing method selected, field or factory, to be utilized throughout the project.
- B. Factory Finished-Door: Comply with referenced AWI quality standard including Section 1500 "Factory Finishing".
 - 1. Prefinished wood doors at factory.
- C. Factory-Applied Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect and sheen.
 - 1. AWI Grade: Custom.
 - 2. Finish: AWI System TR-6conversion varnish.
 - a. Staining: Match approved sample for color.
 - b. Effect: Open grain finish.
 - c. Sheen: Semi-gloss.
 - 3. Apply specified finish to each face, edge and top and bottom of doors,
 - a. Where doors field cut, sanded or modified provide additional finish on areas affected by modifications.
- D. Field-Finished Doors: Refer to following for finishing requirements:
 - 1. Division-9 section "Painting".

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine installed door frames prior to hanging door:
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
- B. Do not proceed with installation until unsatisfactory conditions corrected.

3.02 INSTALLATION

- A. Hardware: For installation see Division-8 "Finish Hardware" section of these specifications.

- B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and of referenced AWI standard and as indicated.
 - C. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA No. 80.
 - D. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors.
 - 1. Machine doors for hardware; seal cut surfaces after fitting and machining.
 - 2. Fitting Clearances for Non-Rated Doors:
 - a. Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of decorative floor finish or covering.
 - b. Where threshold shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.
 - c. Bevel non-rated doors 1/8" in 2" at lock and hinge edges.
 - 3. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
 - a. Bevel fire-rated doors 1/8" in 2" in lock edge; trim stiles and rails only to extent permitted by labeling agency.
 - E. Field-Finished Option: Refer to following for finishing requirements:
 - 1. Division-9 section "Painting".
 - 2. Unless specifically noted otherwise wood doors to receive field applied transparent finish (stain).
 - F. Factory-Finished Option:
 - 1. Restore finish before installation, if fitting or machining required at jobsite.
- 3.03 ADJUSTING AND PROTECTION
- A. Operation: Rehang or replace doors which do not swing or operate freely.
 - B. Finished Doors: Refinish or replace doors damaged during installation.
 - C. Protect doors as recommended by door manufacturer to assure that wood doors without damage or deterioration at time of Final Approval.

END OF SECTION 08211

**SECTION 08305
ACCESS DOORS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-I Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent, location, and size of each type of access door required indicated on drawings and herein.
- B. Building in of anchors and grouting of frames set in masonry construction specified in Division 4.
- C. Roof hatches specified in Division 7.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions and directions for installation of anchorage devices.
 - 1. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.
 - 2. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.
 - 3. Special Sizes Access Doors: Use where required or requested; indicate on schedule.
- B. Shop Drawings: Submit shop drawings for fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage and accessory items.
- C. Samples: 3" x 5" min. size, of each panel face material showing factory- finished color and texture.

1.04 QUALITY ASSURANCE

- A. Fire-Resistance Ratings: Wherever fire-resistance classification indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturers listed in Underwriters Laboratories, Inc.; "Building Materials Directory" for rating shown.
 - 1. Provide UL label on each fire-rated access door.
- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes indicated.
- C. Coordination:
 - 1. Furnish inserts and anchoring devices built into other work for installation of access doors.
 - 2. Coordinate delivery with other work to avoid delay.
- D. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

- E. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 2. Statement also state that proposed application of product on project is suitable and proper.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide access doors by one of following:
1. Bar-Co., Inc.
 2. J.L. Industries
 3. Karp Associates, Inc.
 4. Milcor Div.; Inryco, Inc.
 5. Nystrom, Inc.

2.02 MATERIALS AND FABRICATION

- A. General: Furnish each access door assembly manufactured as integral unit, complete with all parts and ready for installation.
- B. Steel Access Doors and Frames:
1. Fabricate units of continuous welded steel construction, unless otherwise indicated.
 2. Grind welds smooth and flush with adjacent surfaces.
 3. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.
 4. Steel Frames: Unless noted otherwise, fabricate from 16-gage steel.
 5. Stainless Steel Frames: Where indicated fabricate 16-gage, #4 satin finished stainless steel, as indicated.
 6. Fabricate frame with exposed flange nominal 1" wide around perimeter of frame for units installed in following construction:
 - a. Exposed masonry.
 - b. Exposed concrete.
 - c. Drywall finish.
 - d. Ceramic tile finish.
 7. For gypsum drywall or gypsum plaster, furnish perforated frames with drywall bead.
 8. For installation in masonry construction, furnish frames with adjustable metal masonry anchors.
 9. For full-bed plaster applications, furnish frames with galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
- C. "Steel" Flush Panel Doors:
1. Unless noted otherwise fabricate from min. 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175°.
 2. Finish with manufacturer's factory-applied prime paint.
- D. "Stainless Steel" Flush Panel Doors:
1. Where indicated fabricate from min. 14-gage stainless steel sheet, with concealed spring hinges or concealed piano hinge set to open 175°.
 2. Buff exposed surfaces to #4 satin finish.
- E. Fire-Rated Flush Panel Doors:
1. For fire-rated units, provide manufacturer's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.
- F. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.
1. Provide one mortised cylinder lock per access door.
 - a. Furnish 2 keys per lock.
 - b. Key all locks alike, unless otherwise scheduled.

- G. Door Release:
 - 1. Each door access door 24" and larger in size, shall be equipped with an interior latch release system so arranged to prevent entrapment of individual(s) behind door.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's instructions for installation of access doors.
- B. Coordinate installation with work of other trades.
- C. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.
- D. Where access doors are scheduled to be installed in fire or smoke rated walls, ceilings or assemblies, access door shall be self-closing, self latching and have a rating equal to or greater than wall, ceiling, or assembly in which door is being placed.

3.02 ADJUST AND CLEAN

- A. Adjust hardware and panels after installation for proper operation.
- B. Remove and replace panels or frames which are warped, bowed or otherwise damaged.

3.03 SCHEDULE

- A. Provide and install access doors for each condition and location indicated on drawings and as listed below:

Application	Quantity	Size	Fire Rating	Material
Wall (Chase) Applications				
Access to mechanical system gate valves	1 per valve	12"X12"	See Plan	Stainless
Access to pulper clean outs	1 per cleanout	16"X16"	See Plan	Primed Steel
Access to roof drain leader cleanouts	1 per cleanout	16"X16"	See Plan	Stainless
Ceiling Applications:				
Access through gypsum board ceiling	2 per room	24"X24"	See Plan	Primed Steel
Miscellaneous Areas:				
Where shown or indicated on drawings	as indicated	as indicated	See Plan	Primed Steel

B. In addition to units listed above, provide and install the following in locations to be designated by the Architect and as required for access to systems components:

Application	Quantity	Size	Fire Rating	Material
As required	5 each	12"X12"	Yes	Stainless
As required	5 each	12"X12"	No	Stainless
As required	5 each	24"X24"	Yes	Primed Steel
As required	5 each	24"X24"	No	Primed Steel

END OF SECTION 08305

**SECTION 08332
COILING SHUTTERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of coiling shutters shown on drawings.
- B. Provide complete operating shutter assemblies including curtains, guides, counterbalance mechanisms, hardware, operators and installation accessories, as shown on drawings and herein specified.
- C. Types of coiling shutters specified in this section include following:
 - 1. Pre-finished steel non-fire rated coiling shutters.
- D. Application: Provide and install "coiling shutters" in locations indicated on drawings and as follows:
 - 1. New Serving Line

1.03 QUALITY ASSURANCE

- A. Provide each coiling shutter as complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.
- B. Manufacturer: Rolling fire doors shall be manufactured by a firm with a minimum of five years experience in the fabrication and installation of rolling fire doors. Manufacturers proposed for use, which are not named in these specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past five years. Unless otherwise acceptable to Architect, furnish all coiling shutter units by one manufacturer for entire Project.
- C. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- D. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 - 1. Obtain operators and controls from overhead coiling door manufacturer.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- F. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- G. Inserts and Anchorages: Furnish inserts and anchoring devices to be set in concrete or built into masonry for installation of rolling shutter units.
 - 1. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices.
 - 2. Coordinate delivery with other work to avoid delay.
 - 3. See concrete and masonry sections for installation of inserts and anchorage devices.
- H. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

- I. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.
- 1.04 REFERENCED STANDARDS
 - A. ASTM A653/A653M-03; 2003 - Standard Specification for Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - B. National Fire Protection Association NFPA 80, 1999 Edition - Standard for Fire Doors and Fire Windows.
 - C. Underwriters Laboratories (UL) 10B, 1997 Edition - Standard for Fire Tests of Door Assemblies.
- 1.05 SUBMITTALS
 - A. Manufacturer's Data: Submit manufacturer's product data, roughing-in diagrams, and installation instructions for each type and size of coiling shutter.
 - 1. Include operating instructions and maintenance data.
 - 2. Transmit copy of diagrams and installation instructions to Installer.
 - B. Shop Drawings: Submit shop drawings for special components and installations not fully dimensioned or detailed on manufacturers data sheets.
 - 1. Provide wiring diagram.
 - C. Samples: Submit samples of each of the following:
 - 1. Curtain slat, indicative of shape, size and finish.
 - 2. Provide 3" X 3" prefinished metal color chips showing the full range of available colors from which the Architect may select.
- 1.06 DELIVERY, STORAGE, AND HANDLING
 - A. Store products in manufacturer's unopened packaging until ready for installation.
 - B. Store and dispose of all materials in accordance with federal, state and local laws.
- 1.07 PROJECT CONDITIONS
 - A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- 1.08 WARRANTY
 - A. Provide an original of the manufacturer's limited warranty against manufacturing defects and product workmanship.
 - 1. Duration: One (1) year.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with technical provisions, provide coiling shutters manufactured by one of following:
 - 1. The Cookson Company.
 - 2. Cornell Iron Works, Inc.
 - 3. Kinnear Div., Harsco Corp.
 - 4. Mahon Rolling Door Div., RCM Corp.
 - 5. Overhead Door Corp.
 - 6. J. C. Wilson Corp.
 - 7. Windsor Door Co., Div. of Ceco Corp.

2.02 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Fabricate coiling shutter curtain of interlocking slats, of continuous length for width of opening. Unless otherwise indicated, provide slats of material gage recommended by shutter manufacturer for size and type unit required and as follows:
 - 1. Gage: Minimum slat gage; 20 gage
 - 2. Steel Door Curtain Slats: Structural quality, cold-rolled galvanized steel sheets complying with ASTM A 446, Grade A, with G90 zinc coating, complying with ASTM A 525, and phosphate treated before fabrication.
 - 3. Profile of Slats: Profile: Flat, non-insulated, 2 1/2 inches high by 3/4 inch deep.
- B. Endlocks: Provide locks on alternate curtain slats for curtain alignment and resistance against lateral movement, of same material and finish as slats or as otherwise recommended by manufacturer.
- C. Bottom Bar: Continuous box shape of a minimum 14 gage, with replaceable flexible vinyl or neoprene astragal.
 - 1. Bottom bar of same material and finish as curtain slats.
- D. Curtain Jamb Guides: Boxed type section of same material and finish as curtain slats.
 - 1. Provide interlocking pile stripping on both sides of guides to prevent metal-to-metal contact.
- E. Head Plate: Rectangular steel plate, with precision sealed ball bearings supporting drive side axle
- F. Barrel Assembly: Steel pipe, sized for minimum deflection, with threaded rings or lugs welded to barrel assembly for curtain attachment.

2.03 COUNTERBALANCING MECHANISM

- A. Counterbalance doors by means of steel helical torsion spring, mounted around steel shaft and contained in spring barrel, connected to curtain.
 - 1. Use grease-sealed ball bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance: Hot-formed structural quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support roll-up curtain without distortion of slats and limit barrel deflection to max. 0.03" per ft. of span under full load.
 - 1. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs.
 - 2. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel.
 - 3. Provide cast steel barrel plugs to secure ends of springs to barrel and shaft.
 - 4. Fabricate torsion rod for counterbalance shaft of case-hardened steel, sized to hold fixed spring ends and carry torsional load.
- C. Brackets: Manufacturer's standard design, either cast iron on cold-rolled steel plate with bell-mouth guide groove for curtain.

- D. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head.
 - 1. Contour to suit end brackets to which hood attached.
 - 2. Roll and reinforce top and bottom edges for stiffness.
 - 3. Provide closed ends for surface-mounted hoods, and any portion of between-jamb mounting projecting beyond wall face.
 - 4. Provide intermediate support brackets as required to prevent sag.

2.04 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: Provide cylinders specified in Section 08710 "Door Hardware" and keyed to building keying system.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.05 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
 - 1. Wall Mounted: Operator is mounted to the inside front wall above door and connected to door drive shaft with drive chain and sprockets. Motor to be fully concealed above suspended ceiling.
- D. Motor Operated Re-Set:
 - 1. Furnish door with an 'Auto-Reset' motor operator.
- E. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 11005 "Common Motor Requirements for Equipment" unless otherwise indicated.
 - 1. Electrical Characteristics: Refer to electrical drawings
 - 2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
 - 3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
 - 4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 - 5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- F. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

- G. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
 - 1. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using wireless connections and controls.
- H. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
 - 1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- I. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).
- J. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- K. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- L. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.06 METAL FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated.
 - 1. For components assembled or welded in factory, apply finish after fabrication completed.
- B. Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.
- C. Powder Coated Finishes: For components assembled and welded at factory apply powdered coated finishes to all surfaces.
 - 1. Finish after manufacturer and prior to installation
 - a. Electrostatic applied polyester coating. 2 coat system. Total finished thickness 4 to 5 mill cured.
 - b. First coat 2 to 2.5 mills. Cure 5 minutes at 395°F and 10 minutes at 356°F.
 - c. Second coat: Cure at 392°F for 22 minutes and 356°F for 35 minutes.
 - 2. Color and Sheen: As selected by Architect from manufacturer's standard colors and sheens.
 - a. Submit a minimum of 15 standard colors from which the architect may select.
 - 3. Manufacturers: provide products from one of the listed manufacturers:
 - a. Alvarado.
 - b. Tiger.
 - c. DSM Powder Coating Resins
 - d. KMI Systems Inc
 - e. Porter Corporation

PART 3 - EXECUTION

3.01 INSPECTION

- A. Installer examine substrates and conditions under which coiling shutter units installed and notify Contractor in writing of conditions detrimental to proper and timely completion of Work.
- B. Do not proceed with work until unsatisfactory conditions corrected in manner acceptable to Installer.

3.02 INSTALLATION

- A. Install shutter and operating equipment complete with necessary hardware, in accordance with final shop drawings, manufacturer's instructions, and as specified herein.
 - 1. Install assembly in accordance with manufacturer's instructions
 - 2. Anchor to adjacent construction without distortion or stress
 - 3. Fit and align assembly including hardware, plumb, level and square to ensure smooth operation.
 - 4. Position head and jamb weatherstripping to contact door when closed; secure in position
 - 5. Make wiring connections between power supply and operator and between operator and controls
- B. Where shutters are installed in fire/smoke rated walls, shutter shall have Class "A" fire rated classification.
- C. Install fire-rated shutters in accordance with NFPA Bulletin No. 80.
- D. Connect shutter with smoke detectors and building fire alarm system. Provide relays, smoke detectors, contactors and other materials and equipment to interconnect with building fire alarm system and render system operation.

3.03 ADJUSTING

- A. Upon completion of installation including work by other trades, test and adjust shutters to operate easily, free from warp, twist or distortion.
 - 1. Adjust closures to operate smoothly throughout full operating range.

3.04 DEMONSTRATION

- A. Demonstrate proper operation to Owner.
- B. Perform fire door and shutter drop tests in presence of Owner or owner's representative.
 - 1. Require signature for manufacturer supplied drop test form.

END OF SECTION 08332

SECTION 08410
ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of aluminum entrances and storefronts is indicated on drawings and schedules.
- B. Aluminum entrances and storefront types required for Project include:
 - 1. Exterior entrance doors.
 - 2. Frames for exterior entrances.
 - 3. Storefront type framing system.
- C. Glazing: Refer to "Glass and Glazing" section of Division 8 for glazing requirements for aluminum entrances and storefronts, including doors specified factory-paned.
- D. Lock cylinders are specified in the Division-8 hardware section.

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide aluminum entrance and storefront assemblies that comply with specified performance characteristics.
 - 1. Test each system utilizing a recognized testing laboratory or agency in accordance with specified test methods.
 - 2. Provide certified test results.
 - 3. Thermal Movement: Capable of withstanding thermal movements resulting from ambient temperature range of 120°F. (67°C.), that could cause metal surface temperature range of 180°F. (100°C.) within framing system.
 - 4. Wind Loading: Capable of withstanding uniform test pressure of 26.4 psf inward and 26.4 psf outward per ASTM E 330.
 - 5. Fixed Framing Transmission Characteristics: Comply with requirements indicated for transmission characteristics.
 - a. Air Infiltration: Max. rate of 0.06 cfm/s.f of fixed area (excluding operable door edges) per ASTM E 283 at inward test pressure differential of 6.24 psf.
 - b. Water Penetration: No penetration (excluding operable door edges) as defined in ASTM E 331 at inward test pressure differential of 6.24 lbf/s.f.
- B. Aluminum Entrance Transmission Characteristics: Provide entrance doors with jamb and head frames that comply with requirements indicated for transmission characteristics.
 - 1. Air Infiltration: Max. air infiltration rate of 0.50 cfm for single doors and 1.0 for pairs of doors per ASTM E 283 at inward test pressure differential of 1.567 psf.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's product specifications, technical product data, standard details, and installation recommendations for each type entrance and storefront product required.
 - 2. Include following information:
 - a. Fabrication methods.
 - b. Finishing.
 - c. Hardware.
 - d. Accessories.

- B. Shop Drawings: Submit shop drawings for fabrication and installation of entrances and storefronts, including following:
 - 1. Elevations.
 - 2. Detail sections of typical composite members.
 - 3. Hardware, mounting heights.
 - 4. Anchorages and reinforcements.
 - 5. Expansion provisions.
 - 6. Glazing details.
 - C. Samples:
 - 1. Submit pairs of samples of each type and color of aluminum finish, on 12" long sections of extrusions or formed shapes and on 6" square sheets.
 - 2. Where color or texture variations are anticipated, include 2 or more units in each set of samples indicating extreme limits of variations.
 - D. Certification: Provide certified test results showing that entrance and storefront systems tested by recognized testing laboratory or agency and comply with specified performance characteristics.
- 1.05 QUALITY ASSURANCE
- A. Manufacturer's Qualifications: Provide entrances and storefront produced by single manufacturer with min. 5 years successful experience in fabrication of assemblies of type and quality required.
 - B. Installer's Qualifications: Firm with min. 5-years successful experience in installation of systems similar to those required.
 - C. Design Criteria:
 - 1. Drawings indicate sizes, spacing of members, profiles and dimensional requirements of entrance and storefront work.
 - 2. Minor deviations accepted in order to utilize manufacturer's standard products when, in Architect's sole judgment, such deviations do not materially detract from design concept or intended performances.
 - D. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
 - E. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.
- 1.06 PROJECT CONDITIONS
- A. Field Measurements:
 - 1. Check openings by field measurement before fabrication to ensure proper fitting of work; show measurements on final shop drawings.
 - 2. Coordinate fabrication schedule with construction progress to avoid delay in work.
 - 3. Where necessary, proceed with fabrication without field measurement, and coordinate fabrication tolerances to ensure proper fit.

1.07 WARRANTY

- A. Special Product Warranty:
1. Submit written warranty, executed by Contractor, Installer and Manufacturer, agreeing to repair or replace units (including reglazing) which fail in materials or workmanship within specified warranty period.
 2. Failures include, but not necessarily limited to structural failures including excessive deflection, excessive leakage or air infiltration, faulty operation, and deterioration of metals, metal finishes and other materials beyond normal weathering.
 3. Warranty in addition to and not limitation of other rights Owner may have against Contractor under Contract Documents.
 4. Warranty period for aluminum entrances and storefront is 3 years after date of Final Acceptance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following:
1. Amarlite/Arco Metals Co.
 2. Kawneer Company, Inc.
 3. PPG Industries, Inc.
 4. Vistawall Architectural Products.
 5. YKK AP America, Inc.

2.02 MATERIALS

- A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for extrusions and ASTM B 209 for sheet or plate.
1. Unless noted otherwise the minimum thickness of extrusions to be 0.90" .
- B. Fasteners: Aluminum, nonmagnetic stainless steel, or other materials warranted by manufacturer as noncorrosive and compatible with aluminum components, hardware, anchors and other components.
- C. Reinforcement: Where fasteners screw-anchor into aluminum, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
- D. Exposed Fasteners:
1. Except where unavoidable for application for hardware, do not use exposed fasteners.
 2. For application of hardware, use fasteners that match finish of member or hardware being fastened.
 3. Provide Phillips flat-head machine screws for exposed fasteners.
- E. Concealed Flashing: 26-ga. min. dead-soft stainless steel, or 0.026" min. extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.
- F. Brackets and Reinforcements: Where feasible, high-strength aluminum brackets and reinforcements; otherwise nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.
- G. Concrete/Masonry Inserts: Fabricate from cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.
- H. Compression Weatherstripping: Manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.
- I. Sliding Weatherstripping: Manufacturer's standard replaceable weatherstripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.
- J. Glass and Glazing Materials: Glass and glazing materials to comply with requirements of "Glass and Glazing" section of these specifications.

- K. Glazing Panels: Manufacturer's flush-laminated panels of thickness indicated, fabricated with resin-impregnated Kraft paper honeycomb or rigid closed-cell urethane core, laminated with waterproof glue between two sheets of aluminum.

2.03 COMPONENTS

- A. Storefront Framing System:
 - 1. Inside-outside matched resilient flush-glazed storefront framing system with provisions for glass replacement.
 - 2. Shop-fabricate and preassemble frame components where possible.
- B. Aluminum Door Frames: Fabricate tubular and channel frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturer's standards; reinforce as necessary to support required loads.
- C. Stile-and-Rail Type Aluminum Doors:
 - 1. Frame: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts.
 - 2. Design to be base on a "modified" medium style door in compliance with the following:
 - a. Minimum thickness of metal: 0.90".
 - b. Minimum thickness of door: 1-3/4".
 - c. Min. height of top (head) rail: 8".
 - d. Min. height of bottom rail: 6-3/4".
 - e. Min. height of center rail: 8-1/4".
 - 3. Glazing: Fabricate doors to permit replacement of glazing without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.
- D. Aluminum Sub-sill: Aluminum sub-sill shall be a single piece extruded aluminum component designed to prevent water from entering building. Sub-sill shall be of material and finish to match aluminum doors and frames and not less than 0.125" in thickness.

2.04 HARDWARE

- A. General: Refer to hardware section in Division-8 for requirements for hardware items other than those indicated as provided by aluminum entrance manufacturer.

2.05 FABRICATION

- A. General:
 - 1. Sizes of door and frame units, and profile requirements, described herein and indicated on drawings. Unless noted or detailed otherwise the following shall apply:
 - a. Doors shall be: 3'-0" X 7'-0".
 - b. Jamb and head members shall be: 2" X 4-1/2" X 1/8"
 - c. Sill at door side lites shall be: 4" X 4-1/2" X 1/8"
 - d. Cross Rail (Equal to Kawaneer #200-059): 8-1/4" high
 - 2. Variable dimensions indicated, with max. and min. dimensions required to achieve design requirements and coordination with other work.
 - 3. Centerline of cross rail to match center line of panic device.
- B. Prefabrication:
 - 1. Before shipment to project site, complete fabrication, assembly, finishing, hardware application, and other work to greatest extent possible.
 - 2. Disassemble components only as necessary for shipment and installation.
 - 3. Preglaze door and frame units to greatest extent possible.
 - 4. Do not drill and tap for surface-mounted hardware items until time of installation of project site.
- C. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces.
 - 1. For hardware, perform these operations prior to application of finishes.

- D. Welding: Comply with AWS recommendations; grind exposed welds smooth and restore mechanical finish.
 - E. Hardware Reinforcing: Install reinforcing as required for hardware and necessary for performance requirements, sag resistance and rigidity.
 - 1. Provide continuous 0.125" aluminum angle at back side of frame for attachment of hinges.
 - 2. Provide 0.125" backer plate on door head for attachment of closer.
 - F. Frame Reinforcing: Install reinforcing as required and necessary for performance requirements, sag resistance and rigidity and as detailed or specified.
 - 1. Steel Reinforcing Channel: Install steel reinforcing channel at each mullion, both vertically and horizontally. Vertical mullion to extend from finished floor to head of opening.
 - G. Dissimilar Metals: Separate dissimilar metals with zinc chromate primer, bituminous paint, or other separator preventing corrosion.
 - H. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.
 - I. Uniformity of Finish: No integral color or texture variation permitted in abutting extruded members greater than half range indicated in sample pair submittal.
 - J. Fasteners: Conceal fasteners wherever possible.
 - K. Weatherstripping:
 - 1. For exterior doors, compression type against fixed stops; at other edges, sliding weatherstripping retained in adjustable strip mortised into door edge.
 - 2. EPDM or vinyl blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.
 - 3. At interior doors and other locations without weatherstripping, provide neoprene silencers on stops to prevent metal-to-metal contact.
- 2.06 FINISHES
- A. High Performance Organic Coating:
 - 1. NAAMM AA-C12C42R1x coating (cleaned with inhibited chemicals, conversion coated with acid-chromate-fluoride- phosphate treatment, and painted with organic coating specified below).
 - 2. Prepare, pretreat and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' instructions.
 - 3. Fluorocarbon Coating: Provide manufacturer's standard multicoat thermo-cured system, composed of specially formulated primer and fluorocarbon topcoats, complying with AAMA 605.2.
 - a. Color: Provide color selected by Architect from standard choices available from coating manufacturer.
 - 4. Warranty: 20 year finish warranty

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation.
- B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels.
 - 1. Provide proper support and anchor securely in place.
 - 2. Separate aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials; comply with requirements specified under paragraph "Dissimilar Materials" in Appendix to AAMA 101-85.
- C. Drill and tap frames and doors and apply surface-mounted hardware items.
 - 1. Comply with hardware manufacturer's instructions and template requirements.
 - 2. Use concealed fasteners wherever possible.

- D. Install extruded aluminum sub sill below each section of store front serving as a sill member and elsewhere where detailed.
 - 1. Set each sill members on continuous, single piece extruded aluminum subsill.
 - 2. Set sub sill and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealant, fillers, and gaskets.
 - E. Refer to "Glass and Glazing" section of Division 8 for installation of glass and other panels indicated glazed into doors and framing, and not preglazed by manufacturer.
- 3.02 ADJUSTING
- A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.
- 3.03 CLEANING
- A. Clean completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.
 - B. Clean glass surfaces after installation, complying with requirements contained in "Glass and Glazing" section for cleaning and maintenance.
 - 1. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.
- 3.04 PROTECTION
- A. Institute protective measures required throughout remainder of construction period to ensure that aluminum entrances and storefronts without damage or deterioration, other than normal weathering, at time of Final Acceptance.

END OF SECTION 08410

**SECTION 08520
ALUMINUM WINDOWS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of each type, grade and performance class of aluminum window units required indicated on drawings.
- B. Aluminum window units required are heavy commercial grade of performance class indicated.
- C. Types of aluminum window units required include the following:
 - 1. Fixed windows.
- D. Applications include individual units set in conventional wall construction and units in continuous horizontal runs with mullions.
- E. Glass and Glazing specified in another Division 8 Section..

1.03 DEFINITIONS

- A. Dual windows: Units having both prime and secondary window combined into single composite unit.
 - 1. Prime element used to protect building from climatic elements.
 - 2. Secondary component used in conjunction with primary element for energy conservation.
- B. Performance class number included as part of window designation system is actual design pressure in lbs./s.f. used to determine structural test pressure and water test pressure.
 - 1. Structural test pressure, windload test: 150% of design pressure.
 - 2. Water leakage resistance test pressure: 15% of design pressure with 2.86 psf min.

1.04 SYSTEM DESCRIPTION

- A. Design Requirements: Air infiltration, water penetration and structural performance requirements per AAMA 101-88 for type, grade and performance class required.
 - 1. Heights of window units above grade at window centerline, indicated or determined from drawings; consult Architect for clarification to confirm required loading and test pressures.
 - 2. Design wind velocity at project site: 110 mph.
- B. Optional Performance Class Requirements: Where design pressure exceeds min. for specified window grade, comply with AAMA 101-88, Section 3, "Optional Performance Classes" for higher than min. performance class.
- C. Testing: Test each type and size of required window unit through recognized testing laboratory or agency:
 - 1. Structural Performance: ASTM E 330
 - 2. Air Infiltration: ASTM E 283
 - 3. Water Penetration: ASTM E 331 and ASTM E 547
 - 4. Provide certified test results.
- D. Structural Performance: Provide units with no failure or permanent deflection for positive (inward) and negative (outward) test pressure of 82 lbf/s.f.
- E. Air Infiltration: Provide units with max. air infiltration rate of 0.11 cfm/ft. of operable sash joint for inward test at 50 mph wind load.

- F. Water Penetration: Provide units with no water penetration per test method at inward test pressure of 15 lbf/s.f.

1.05 SUBMITTALS

- A. Shop Drawings: Submit for each type window including information not fully detailed in manufacturer's standard product data and following:
 - 1. Elevations of continuous work at 1/4" = 1'-0" scale.
 - 2. Typical unit elevations at 3/4" = 1'-0" scale.
 - 3. Full size section details of every typical composite member.
 - 4. Anchors.
 - 5. Hardware.
 - 6. Operators.
 - 7. Accessories.
- B. Product Data: Submit manufacturer's product specifications, technical product data, recommendations and standard details for each type window unit required; include following information:
 - 1. Fabrication methods.
 - 2. Finishing.
 - 3. Hardware.
 - 4. Accessories.
- C. Samples: Submit samples of specified finish on 12" lengths of window members.
 - 1. Architect reserves right to require additional samples, which show fabrication techniques and workmanship, and design of hardware and accessories.
 - 2. Submit samples of assembled corner sections of window and sash.
 - 3. Submit samples of window hardware.
 - 4. The Architect reserves right to require additional samples indicative of fabrication techniques and workmanship.
- D. Certification: Provide certification by manufacturer showing each type, grade and size of window unit complies with requirements where manufacturer's standard window units tested in accordance with specified tests and meet performance requirements specified.
 - 1. Where testing not accomplished, perform required tests through recognized testing laboratory or agency and provide certified test results.

1.06 QUALITY ASSURANCE

- A. Standards: Requirements for aluminum windows, terminology and standards of performance, and fabrication workmanship are specified and recommended in AAMA 101-88 and applicable general recommendation published by AAMA and AA.
- B. Single Source Responsibility: Provide units produced by single manufacturer capable of showing prior production of units similar to those required.
- C. Design Criteria: Drawings indicate sizes, profiles and dimensional requirements of windows; units having minor deviations from indicated dimensions and profiles accepted, subject to Architect's approval, provided deviations do not materially detract from design concept or intended performance.
- D. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Where possible, check actual window openings in construction work by accurate field measurement before fabrication; show recorded measurements on final shop drawings.
 - 1. Coordinate fabrication schedule with construction progress as directed by Contractor to avoid delay of work.
 - 2. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit of window units.

1.08 WARRANTY

- A. Special Project Warranty: Submit written warranty, executed by Contractor, Installer and Manufacturer, agreeing to repair or replace aluminum window units which fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but not limited to, structural failures including excessive deflection, excessive leakage or air infiltration, faulty operation of sash and hardware, and deterioration of metals, metal finishes and other materials beyond normal weathering.
 - 2. Warranty in addition to and not limitation of other rights Owner may have against Contractor under Contract Documents.
- B. Warranty Period: 5 years after date of Final Acceptance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Aluminum Window Manufacturers: Subject to compliance with requirements, provide products of one of following:
 - 1. Projected and Fixed Windows:
 - a. Custom Window Company
 - b. Desco Architectural Incorporated
 - c. YKK Corporation of America;
 - d. Milco Division, Wausau Metals Corporation: Series 2000
 - e. Peerless Products, Inc.: Series 1800
 - f. Traco Three Rivers Aluminum Co.: Series 2500.
 - g. Winco: Series 1100.

2.02 MATERIALS

- A. Aluminum Extrusions: Alloy and temper recommended by window manufacturer for strength, corrosion-resistance, and application of required finish, but min. 22,000 psi ultimate tensile strength and min. 0.125" thickness at any location for main frame and sash members.
- B. Fasteners: Provide aluminum, non-magnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer as non-corrosive and compatible with aluminum window members, trim, hardware, anchors and other components of units.
 - 1. Provide stainless steel fasteners where fastening to metal substrates.
- C. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125" thick, reinforce interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.
- D. Exposed Fasteners: Except where unavoidable for application of hardware, do not use exposed fasteners; for application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- E. Anchors, Clips and Window Accessories: Fabricate anchors, clips and window accessories of aluminum, non-magnetic stainless steel or hot-dip zinc coated steel or iron complying with ASTM A 386; provide sufficient strength to withstand design pressure indicated.

- F. Compression Type Glazing Strips and Weatherstripping: Unless otherwise indicated, and at manufacturer's option, provide compressible stripping for glazing and weatherstripping of one of following molded types:
 - 1. EPDM or neoprene gaskets: AAMA SG-1 or ASTM D 2000 Designation 2BC415 to 3BC620.
 - 2. PVC gaskets: ASTM D 2287.
 - 3. Expanded EPDM or neoprene gaskets: ASTM C 509, Grade 4.
 - G. Sealant: For sealants required within fabricated window units, provide type recommended by manufacturer for joint size and movement.
 - 1. Permanently elastic, non-shrinking, and non-migrating.
 - 2. Comply with Section 07900 - Sealants for selection and installation of sealants.
- 2.03 WINDOW GRADES AND PERFORMANCE CLASSIFICATION
- A. Heavy Commercial Windows: AAMA Grade and Performance Class HC60.
- 2.04 WINDOW TYPES
- A. General: Following paragraphs define operating arrangement for types of sash required in units and specify minimum provisions for each type; drawings indicate which panels of each unit are operable and which are fixed.
 - B. Fixed windows: Units consisting of glazed frame installed into one inoperable opening.
- 2.05 HARDWARE
- A. General: Except to extent that more specific or stringent requirements indicated, provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform function intended.
 - B. Fixed windows: Inoperable units; except for special provisions indicated for maintenance, cleaning and removal, no operating hardware or equipment required.
- 2.06 ACCESSORIES
- A. General: Except to extent that more specific or stringent requirements indicated, provide manufacturer's standard accessories that comply with indicated standards.
- 2.07 FABRICATION
- A. General: Except to extent that more specific or stringent requirements indicated, provide manufacturer's standard fabrication complying with indicated standards and producing units reglazable without dismantling sash framing.
 - 1. Include complete system for assembly of components and anchorage of window units
 - 2. Prepare sash for glazing except where preglazing at factory indicated.
 - B. Sizes and Profiles: Required sizes for window units and profile requirements indicated.
 - 1. Variable dimensions indicated along with max. and min. dimensions required to achieve design requirements and coordination with other work.
 - 2. Details based on standard details by one or more manufacturers; similar details by other manufacturers acceptable, provided they comply with size requirements, min./max. profile requirements, and performance standards indicated or specified.
 - 3. Frame Requirements:
 - a. Min. wall thickness: .125"
 - b. Min. depth: 2"
 - c. Construction: Corners and intersections reinforced, mittered, welded and sealed continuously.

4. Sash Requirements:
 - a. Min. wall thickness: .125"
 - b. Min. depth: 2"
 - c. Construction: Tubular extrusions, mitered corners with corner block reinforcing, hydraulically crimped connections "cold welded" with epoxy adhesive.
 - C. Provide weepholes and internal water passages to conduct infiltrating water to exterior.
 1. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.
 - D. Provide sub-frames with anchors for window units where shown, of profile and dimensions indicated but min. 0.125" tk. extruded aluminum.
 1. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners.
 2. Finish to match window units.
 - E. Provide angle trim with anchors for head and jamb of each window units and elsewhere where shown or required, of profile and dimensions indicated but min. 0.125" thick, and minimum 3/4" X 1-1/2", extruded aluminum.
 1. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners.
 2. Finish to match window units.
 - F. Provide mullions and cover plates shown, matching window units, complete with anchors for support to structure and installation of window units.
 1. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, in manner indicated.
 - G. Glazing Stops: Provide screw-applied or snap-on glazing stops, coordinated with glass selection and glazing system indicated.
 1. Finish glazing stops to match window units.
 - H. Preglazing Fabrication: Preglaze window units at factory where possible and practical for applications indicated:
 1. Comply with glass and glazing requirements of "Glazing" sections of these specifications and AAMA 101-88.
- 2.08 FINISHES
- A. Sealing of Finish: Specified finish to be sealed in a manner required to prevent 'weathering', loss of coating or staining of finish due to exposure to weather or normal construction materials.
 - B. High Performance Organic Coating: Shop Applied, NAAMM AA-C12C42R1x coating (cleaned with inhibited chemicals, conversion coated with acid-chromate-fluoride- phosphate treatment, and painted with organic coating specified below).
 1. Prepare, pretreat and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' instructions.
 2. Fluorocarbon Coating: Provide manufacturer's standard multicoat thermo-cured system, composed of specially formulated primer and fluorocarbon topcoats, complying with AAMA 605.2.
 3. Color: To be selected from manufacturers standard color range; minimum of 20 colors.
 4. Provide 20 Year finish warranty.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect openings before beginning installation; verify that rough or masonry opening square, plumb and correct and sill plate level. Installation of window(s) shall be construed as acceptance of masonry opening as being acceptable for installation of windows herein specified.
- B. Inspect physical condition of opening and verify it is acceptable for installation of window(s). Openings shall be:
 - 1. Masonry surfaces: Visibly dry and free of excess mortar, sand and other construction debris.
 - 2. Wood frame walls: Dry, clean, sound and well-nailed, free of voids and without offsets at joints; ensure that nail heads driven flush with surfaces in opening and within 3 inches of opening.
 - 3. Metal surfaces: Dry, clean, free of grease, oil, dirt, rust and corrosion, and welding slag, without sharp edges or offsets at joints.

3.02 INSTALLATION

- A. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of Work.
- B. Set units plumb, level, and true to line, without warp or rack of frames or sash; provide proper support and anchor securely in place.
 - 1. Attach window securely to back up using mechanical fasteners as detailed, specified and recommended by manufacturer. Fasteners to be aluminum or stainless steel, minimum 3/8" in diameter.
 - 2. Fasteners to be spaced at a maximum of 24" on center along entire perimeter of window **AND** at each location of hinge. Minimum number of anchors per frame leg to be three.
- C. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified under paragraph "Dissimilar Materials" in the Appendix to AAMA 101-88.
- D. Aluminum Sub-Frame: Install sub-frame (sub-sill) where indicated, where recommended by window manufacturer and at each window where brick or stone sill not specified to be installed.
 - 1. Sub-frame to extend from window jamb to window jamb, single piece (no joints), with back turned up min. 1/4" behind front leg of window and sides turned up min. 1/4" behind jamb face brick.
 - 2. Joints to be mitered and welded continuously to obtain a water tight installation.
- E. Aluminum Angle Trim: Install angle trim at window head, jamb and sills, where indicated on drawings, where required by field conditions, or as required by window manufacturer. In addition provide angle trim as required to cover wall cavity or nailers where joints are in excess of 1/2" in width.
 - 1. Install without joints and interruptions except at corners. Corners to be mitered and sealed with sealant of color to match the window and window trim.
 - 2. If necessary install both on interior and exterior of window.
 - 3. Apply sealant tape between the trim and the window.
 - 4. Secure angle trim to window through sealant tape using non-corrosive pop rivets of color to match window and trim.
 - 5. Edges of trim to smooth, clean and neat and free from roughness or sharp edges.
 - 6. Exposed edges of trim to have anodized finish to match face of trim.
- F. Aluminum Mullion Covers: Install mullion covers where ever two or more windows are combined. Through bolt as necessary to secure and align windows and as recommended by manufacturer.
- G. Set sill members and other members in bed of compound or with joint fillers or gaskets, as shown, to provide weathertight construction.
 - 1. Refer to Section 07900 - Sealants, for compounds, fillers, and gaskets installed concurrently with units.
 - 2. Coordinate installation with wall flashings and other components of Work.

- H. Compounds, joint fillers and gaskets installed after installation of window units are specified as work in another section in Division-7.

3.03 PROTECTION

- A. Installed windows to be protected from damage for duration of project.

3.04 FIELD QUALITY CONTROL

- A. Contractor bear cost, arrange for and conduct on-site tests for air and water infiltration with window manufacturer's representative present.
 - 1. Architect select units to be tested.
 - 2. After testing, correct units not meeting specified requirements and units having similar deficiencies, at no cost to Owner.
 - 3. Accredited testing agency selected by Architect to perform testing.
- B. Air Infiltration Tests: ASTM E 783; allowable infiltration not in excess of 1.5 times amount indicated.
- C. Water Resistance Tests: AAMA 501.3; no water leakage permitted.

3.05 ADJUSTING

- A. Adjust operating sash and hardware to provide tight fit at contact points and weatherstripping, for smooth operation and weathertight closure.

3.06 CLEANING

- A. Clean aluminum surfaces promptly after installation of windows.
 - 1. Exercise care to avoid damage to protective coatings and finishes.
 - 2. Remove excess glazing and sealant compounds, dirt and other substances.
 - 3. Lubricate hardware and other moving parts.

3.07 PROTECTION

- A. Initiate and maintain protection and other precautions required through remainder of construction period, to ensure that, except for normal weathering, window units free of damage or deterioration at time of Final Acceptance.
- B. Apply coating of clear non-staining or discoloring "grease" or similar product for duration of project in order to keep frames free from damage as result of mortar droppage and other construction materials.
 - 1. Prior to final inspection remove all grease and clean windows and frame.

END OF SECTION 08520

**SECTION 08710
FINISH HARDWARE**

PART 1 - GENERAL

1.01 SUMMARY

- A. Finish Hardware: Commercially known as finish hardware for swing, sliding and folding doors.
 - 1. Exception: Special types of unique and non-matching hardware specified in same section as door and door frame.
- B. Extent of finish hardware required indicated on drawings and in schedules.
 - 1. In addition to the specified hardware the supplier shall include, as part of the base bid proposal, a sum of \$7,500 for changes to be made to the hardware schedule during the shop drawing phase of the project.
- C. Types of finish hardware required include following:
 - 1. Hinges
 - 2. Lock cylinders and keys
 - 3. Lock and latch sets
 - 4. Bolts
 - 5. Exit devices
 - 6. Push/pull units
 - 7. Closers
 - 8. Overhead holders
 - 9. Door trim units
 - 10. Protection plates
 - 11. Weatherstripping for exterior doors
 - 12. Sound stripping for interior doors.
 - 13. Automatic drop seals (door bottoms).
 - 14. Astragals or meeting seals on pairs of doors
 - 15. Thresholds
 - 16. Silencers
- D. Related Documents Specified Elsewhere:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
 - 2. Section 08110 - Steel Doors and Frames.
 - 3. Section 06400 - Architectural Woodwork.
 - 4. Section 08332 - Coiling Shutter
- E. Coiling shutter hardware, except cylinders, specified in another Division 8 section; Cylinders specified herein.

1.02 OWNER PREFERRED HARDWARE

- A. Under contractor's base bid proposal the contractor may bid products by any of the listed manufacturers. If 'Additive Alternate' for 'Owner-preferred' hardware is accepted the contractor shall provide hardware by manufacturer noted herein:
 - 1. Locksets and Deadlocks: Schlage
 - 2. Cylinders: Schlage; Everest Key System
 - 3. Door Closers: LCN;
 - 4. Panic Devices: Von Duprin

1.03 QUALITY ASSURANCE

- A. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.

- B. Supplier:
 - 1. Recognized architectural finish hardware supplier.
 - 2. Warehousing facilities in project's vicinity min. of 2 years.
 - 3. Employs experienced architectural consultant available during course of work, for consultation with to Owner, Architect and Contractor.

- C. Fire-Rated Openings:
 - 1. Hardware on fire rated doors (Smoke, 20 Minute, "C" Labeled, "B" Labeled and "A" labeled) to be fire rated (tested) whether specifically noted as such on schedule or not.
 - 2. Additions and Revisions necessary to scheduled hardware to accommodate this requirement shall be at no cost to the contract.
 - 3. Provide additional hardware necessary, including astragals, coordinators, ect. required to obtain specified rating without added cost to the contract.

- D. Fire-Rated Hardware:
 - 1. Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements.
 - 2. Provide only hardware tested and listed by UL or FM for types and sizes of doors required and complying with requirements of door and door frame labels.
 - 3. Where emergency exit devices required on fire-rated doors (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".

- E. Certificate of Compliance:
 - 1. Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 2. Any and all deviations from technical provisions of specifications shall be specifically noted.

- F. Producer's Statement of Applicability:
 - 1. Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 2. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 3. Statement also state that proposed application of product on project is suitable and proper.

- G. Accessibility Code Compliance:
 - 1. Door hardware provided under this section to fully comply with applicable provisions of the Georgia Accessibility Code 120-3-20, ANSI A117.1, and Americans with Disabilities Act (ADA).
 - 2. Submit as part of shop drawings supplier's certification that hardware furnished comply with above referenced codes.

- H. International Building Code:
 - 1. Work of this section to comply with the requirements of the current edition of the International Building Code (IBC).
 - 2. Hardware supplier/hardware manufacturer to certify to the architect that hardware furnished complies with the requirements of the code.

- I. Certification of Proper Installation and Operation of Finished Hardware:
 - 1. Upon completion of installation of finished hardware the contractor to arrange to have the manufacturer's technical representative of each item of finished hardware visit the project site and inspect hardware installation.
 - 2. Manufacturer of hardware to submit certification to architect, as part of close out documents, that hardware has been installed in accordance with manufacturers recommendations and is operating properly.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturers technical product data for each item of hardware in accordance with Division-1 section "Submittals".
 - 2. Include whatever information necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.
 - 3. If product submitted differs, in make and/or model, from product specified, submit catalog data on both originally specified product and the proposed unit to allow for comparison.
- B. Hardware Schedule:
 - 1. Submit final hardware schedule in manner indicated below.
 - 2. Shop drawings shall have hardware organized into sets of grouping, arrangement, and style identical to those found in this specification. Alternate grouping of sets or format of schedule not acceptable and will subject submittal to rejection.
 - 3. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.
 - 4. Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening.
 - 5. Hardware Schedule Content; Include following information:
 - a. Type, style, function, size and finish of each hardware item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of hardware set cross-referenced to indications on Drawings both on floor plans and door and frame schedule.
 - e. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
 - f. Mounting locations for hardware.
 - g. Door and frame sizes and materials.
 - 6. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) critical in project construction schedule.
 - a. Include with schedule product data, samples, shop drawings of other work affected by finish hardware, and other information essential to coordinated review of hardware schedule.
- C. Keying Schedule: Submit separate detailed schedule indicating clearly how Owner's final instructions on keying of locks fulfilled.
 - 1. Contractor shall arrange a meeting between the Hardware supplier, contractor, Construction Manager, Owner and Architect to review keying schedule proposed by Hardware supplier.
- D. Samples: Prior to submittal of final hardware schedule and prior to final ordering of finish hardware, submit one sample of each type exposed hardware unit, finished as required, and tagged with full description for coordination with schedule.
 - 1. Samples will be returned to supplier; units found acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in work, within limitations of keying coordination requirements.
- E. Templates: Furnish hardware templates to each fabricator of doors, frames and other work factory-prepared for installation of hardware.
 - 1. Upon request, check shop drawings of such other work, to confirm that adequate provisions made for proper location and installation of hardware.

1.05 WARRANTY

- A. Guarantee all items except overhead closers against failure due to defective materials and workmanship for two (2) years after date of Final Acceptance and in event of such failure, promptly repair or replace with no additional cost to Owner.
- B. Guarantee overhead closers against failure due to defective materials and workmanship for five (5) years after date of Final Acceptance and in event of such failure, promptly repair or replace with no additional cost to Owner.

1.05 PRODUCT HANDLING

- A. Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of hardware, responsibility of supplier.
 - 1. As material received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule.
 - 2. Two or more identical sets may be packed in same container.
- C. Inventory hardware jointly with representatives of hardware supplier and hardware installer until each satisfied that count correct.
- D. Deliver individually packaged hardware items at proper times to proper locations (shop or project site) for installation.
- E. Security: Control handling and installation of hardware items not immediately replaceable, so completion of Work not delayed by hardware losses, both before and after installation.
 - 1. Provide secure lock-up for hardware delivered to Project, but not yet installed.

PART 2 - PRODUCTS

2.01 SCHEDULED HARDWARE

- A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type finish hardware indicated in Finish Hardware Data Sheet and Hardware Schedule at end of this Section.
- B. Products identified by using hardware designation numbers. Where manufacturer product designations used the following shall apply:
 - 1. One or more manufacturers listed for each hardware type required.
 - 2. First named manufacturer name indicates that whose product designation used in Hardware Schedule for purposes of establishing min. requirements.
 - 3. Provide either product designated, or, where more than one manufacturer listed, comparable product of one of other manufacturers which comply with requirements including those specified elsewhere in this Section.

2.02 MATERIALS AND FABRICATION

- A. General; Hand of door:
 - 1. Drawings show direction of slide, swing or hand of each door leaf.
 - 2. Furnish each item of hardware for proper installation and operation of door movement shown.
- B. Manufacturer's Name Plate:
 - 1. Do not use manufacturer's products which have manufacturer's name or trade name displayed in visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to Architect.
 - 2. Manufacturer's identification permitted on rim of lock cylinders only.
- C. Base Metals:
 - 1. Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated.
 - 2. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
- D. Fasteners:
 - 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 - 2. Do not provide hardware prepared for self-tapping sheet metal screws, except as specifically indicated.
 - 3. Furnish screws for installation, with each hardware item.
 - 4. Provide Phillips flat-head screws except as otherwise indicated.

5. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
 6. Provide concealed fasteners for hardware units exposed when door closed, except to extent no standard units of type specified available with concealed fasteners.
 7. Where indicated attach hardware with through bolts. Where thru bolting utilized, use sex-nut type screw fasteners; bolt and nut configuration not acceptable.
- E. Tools and Maintenance Instructions for Maintenance: Furnish complete set of specialized tools and maintenance instructions needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

2.03 HINGES, BUTTS

- A. Templates: Except for hinges installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- B. Bearing:
1. Generally plain bearing.
 2. Provide ball-bearing hinges on each door wider than 3'-0", on each door containing a closer, and each fire rated door where rating is twenty minutes or greater, and elsewhere where indicated.
- C. Screws:
1. Furnish Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head or wood screws for installation of units into wood.
 2. Finish screw heads to match surface of hinges.
- D. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
1. Steel Hinges: Steel pins.
 2. Non-ferrous Hinges: Stainless steel pins.
 3. Exterior Doors: Non-removable stainless steel pins.
 4. Out-swing Corridor Doors: Non-removable pins.
 5. Interior Doors: Non-rising pins.
 6. Tips: Flat button and matching plug, finished to match leaves.
- E. Number of hinges:
1. Butts: Provide number of hinges indicated but min. 3 hinges per door leaf for doors 90" or less in height.
 - a. Add one additional hinge for each 30" of additional height.
 2. Continuous Hinges: Provide one continuous hinge per leaf of door, full height of door where scheduled.
- F. Products: Specifications based on products manufactured by first named manufacturer with following manufacturers acceptable if their products meet the criteria of first named manufacturer:
1. Hager Hinge Co.
 2. Markar Products, Inc. (Continuous Hinges only)
 3. McKinney Manufacturing Co.
 4. Stanley Hardware Div., The Stanley Works.

2.04 LOCK CYLINDERS AND KEYING

- A. General: Supplier's Architectural Hardware Consultant meet with Contractor, Architect and Owner to finalize keying requirements and obtain final instructions in writing.
- B. Existing System: Grandmasterkey locks to Owner's existing system, with new masterkey(s) for Project. The Owner's existing system is **Schlage Everest Primus**.

- C. Equip locks with manufacturer's special 7-pin tumbler cylinder, with construction master key feature, which permits voiding of construction keys without cylinder removal. Furnish temporary inserts for construction period, and remove when directed.
 - 1. Where interchangeable-cores provided, supplier to provide final inserts; mailed directly to owner; contractor to install.
- D. Locks Cylinder Parts Metals:
 - 1. Brass/Bronze
 - 2. Stainless steel.
 - 3. Nickle silver.
- E. Keys and Keying System:
 - 1. Masterkey per Owner's instructions, unless otherwise indicated.
 - a. All cylinders to be keyed by the cylinder manufacturer at the cylinder manufacturers plant or factory.
 - b. Keying of cylinders by distributor, supplier, installer or party other than cylinder manufacturer, prohibited.
 - 2. Provide individual change key for each lockset.
 - 3. Permanently inscribe each key:
 - a. Number that identifies cylinder manufacturer, key symbol
 - b. Notation "DO NOT DUPLICATE".
 - 4. Key Material: Nickel silver only.
 - 5. Bow Type:
 - a. Manufacturer's standard access bow:
 - 1) One for each change of keys.
All master keys, grandmaster keys, except one.
 - b. Manufacturer's access/large bow.
 - 1) One each change key, master key and grandmaster key.
 - 6. Key Quantity:
 - a. Two (2) change keys for each lock.
 - b. Six (6) master keys for each master system.
 - c. Six (6) grandmaster keys for each grandmaster system.
 - d. Twenty (20) construction master keys.
 - 7. Supplier to deliver keys to key control system manufacturer.
 - 8. Hardware Supplier deliver master and grandmaster keys directly to Owner and obtain receipt for same; deliver change keys to Owner's representative and obtain receipt for same.
 - 9. Products: Specifications for cylinders and keys based on products manufactured by manufacturer holding Owners present masterkeying system indicated above.
 - 10. Key Control: Provide key control system as recommended by the manufacturer and as follows:
 - a. Envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers.
 - b. Standard metal cabinet:
 - 1) Hinged-panel type cabinet, wall mounted.
 - c. Capacity: 150% of number of locks required for project.
 - d. Set up complete cross index system and place keys on markers and hooks in cabinet as determined by final key schedule.
 - e. Acceptable manufacturers:
 - 1) P. O. Moore
 - 2) American Device
 - 3) Lund Equipment Co., Inc.
 - 4) Telkee, Inc.

2.05 LOCKS, LATCHES AND BOLTS

- A. Strikes:
 - 1. Manufacturer's standard wrought box strike for each latch or lock bolt.
 - 2. Curved lip extended to protect frame.
 - 3. Finished to match hardware set.
 - 4. Dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.

- B. Special Lever Surface: Tactile surface on levers to warn of hazardous areas. For the purposes of this section hazardous areas shall be defined to include Boiler rooms, Mechanical Rooms, Air Handler rooms, Electrical rooms, equipment rooms, other like spaces and as noted on schedule.
 - 1. Tactile surface shall meet requirements of ANSI A117.1 and ADA by use of one of following surface treatments:
 - a. Abrasive material permanently ingrained in surface treatment.
 - b. Grooves incised in back of lever.
 - c. Knurled grip surface.
- C. Lock Throw:
 - 1. Provide 5/8" min. throw of latch and deadbolt used on pairs of doors.
 - 2. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
 - 3. Provide 1/2" min. throw on other latch and deadlock bolts.
- D. Flush Bolts:
 - 1. Heads: Minimum of 1/2" diameter rods of brass, bronze or stainless steel, with min. 12" long rod for doors up to 7'-0" in height.
 - 2. Provide longer rods as necessary for doors exceeding 7'-0" in height.
 - 3. Provide automatic flush bolts on all fire rated pairs of doors unless otherwise indicated.
 - 4. Provide UL listed and labeled bolts on fire rated doors.
- E. Rabbeted Doors: Where rabbeted door stiles indicated, provide special rabbeted front on lock and latch units and bolts.
- F. Coordinators: On pair of doors:
 - 1. Where overlapping astragals and closers occur.
 - 2. Where automatic flush bolts and closers.
- G. Products: Specifications based on products manufactured by first named manufacturer with following manufacturers acceptable if their products meet the criteria of first named manufacturer:
 - 1. Locksets, Latchsets and Deadlocks:
 - a. **Schlage Lock Co.; Design 06. (Owner Preferred)**
 - b. Best Lock Corp.; Design 15H.
 - c. Sargent Manufacturing Co., Div. of Essex Industries, Inc.; Design LNL
 - d. Yale Lock Co.; Design Augusta AUR
 - 2. Flush Bolts, Surface Bolts:
 - a. Hager Hinge Co.
 - b. Glynn Johnson.
 - c. H. B. Ives.
 - d. Quality Hardware Manufacturing Co.
 - e. Rockwood Manufacturing Co.
 - 3. Coordinators:
 - a. Hager Hinge Co.
 - b. Glynn Johnson.
 - c. H. B. Ives.

2.06 EXIT DEVICES

- A. **ALL** exit devices manufactured by one manufacturer.
- B. UL Rating: Each exit device on doors in a fire and/or smoke rated opening to bear a factory installed UL markings indicating 3-hour rating and listed for Accident Hazard.
- C. Strike: Furnish each exit device with appropriate adjustable strike; surface applied for rim devices; recessed (flush) for vertical rod devices; and mortised for mortised devices.
- D. Provide exit devices with following features:
 - 1. Non-handed.

2. Device width: Min. width equal to width of door less 6".
 3. Touchpad:
 - a. Design: Surface of push pad to be larger than 'receiver' and designed to prevent 'pinching'
 - b. Width: Min. of 1/2 width of door.
 4. Fluid damper to decelerate touchpad on return stroke for sound control.
 5. Deadlocking latchbolts.
 6. Self-lubricating, non-handed latchbolts; plated or coated latchbolts not permitted.
- E. Except on fire-rated doors, wherever closers provided on doors equipped with exit devices, equip units with keyed dogging device to hold push bar down and latch bolt in open position.
- F. Products: Specifications based on products manufactured by first named manufacturer with following manufacturers acceptable if their products meet the criteria of first named manufacturer:
1. Manufacturers standard design for exterior applications:
 2. Interior applications:
 - a. **Von Duprin, Inc.; #03 lever design (Owner Preferred)**
 - b. Precision Hardware, Inc., 9LC lever design.
 - c. Sargent Manufacturing Co., Div. of Essex Industries, Inc.; LNJ lever design.
- 2.07 REMOVABLE MULLIONS
- A. Removable mullions shall be installed in locations indicated. Mullions unless specifically noted otherwise, shall comply with the following:
1. Length to be as required.
 2. Mullion to be factory primed steel.
 3. Furnish each mullion with stabilizers.
 4. Mullions in fire rated openings to be bear U.L. Label appropriate for opening.
- 2.08 PUSH/PULL UNITS
- A. Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation; through-bolted for matched pairs, but not for single units.
- B. Products: Specifications based on products manufactured by first named manufacturer with following manufacturers acceptable if their products meet the criteria of first named manufacturer:
1. Quality Hardware Manufacturing Co.
 2. Hager Hinge Co.
 3. Rockwood Manufacturing Co.
- 2.10 CLOSERS AND DOOR CONTROL DEVICES
- A. Size of Units: Except as otherwise specifically indicated, comply with manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.
1. Closers to comply with ADA's 5 lbs. max. resistance to opening for interior, non-rated doors and 8 lbs. resistance for fire rated and exterior openings.
- B. Access-Free Manual Closers: Where manual closers indicated for doors required as accessible to physically handicapped, provide adjustable units complying with ANSI A 117.1 provisions for door opening force and delayed action closing.
1. For the purposes of this section, all doors within an accessible route or means of egress shall be considered handicapped accessible.
- C. Manual door closers shall be certified to exceed ten million (10,000,000) full load operating cycles by recognized independent testing laboratory. Closers to be fully hydraulic, rack and pinion action with high strength cast cylinders and one piece forged steel pistons. Hydraulic fluid to be of a type that requires no seasonal adjustments for temperatures for 120 to -30 degrees F. Hydraulic regulation to be controlled by tamper-proof non-critical screw valves. Separate adjustments for backcheck, general speed, and latch speed to be provided. Closers to be fabricated of cast iron bodies and malleable forged arms.

- D. Provide parallel arms for all overhead closers, except as otherwise indicated.
- E. Products: Specifications based on products manufactured by first named manufacturer with following manufacturers acceptable if their products meet the criteria of first named manufacturer:
 - 1. **LCN Closers (Owner Preferred)**
 - 2. Rixon-Firemark, Inc.
 - 3. Norton Door Controls.

2.11 DOOR TRIM UNITS

- A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops and similar units); either machine screws or self-tapping screw.
- B. Edge Trim: Stainless steel, max. 1/2", min. 1/16" smaller in length than door dimension.
- C. Protection plates (armor, kick or mop) max. 2" less than door width on stop side and max. 2" less than door width on pull side, x the height indicated.
 - 1. Metal Plates: Stainless steel, .050" (U.S. 18 ga.).
 - 2. Plastic Plates: Plastic laminate (polyester), 1/8" thick (0.125") thick.
- D. Stops: Generally provide wall bumpers of type scheduled, but where wall bumpers not applicable, provide floor stops or roller bumpers as required unless otherwise indicated; provide stops on for all doors whether scheduled or not.
 - 1. Stops required on **ALL** doors whether scheduled or not, including doors with closers and overhead holders containing stop feature.
 - 2. Stops which do not effectively stop door, when installed, shall be replaced with a stop with functions properly, without causing a hazard. Removal and replacement of stops which do not perform properly shall be at no added cost to the contract.
 - 3. Use roller bumpers where doors back to back.
- E. Products: Specifications based on products manufactured by first named manufacturer with following manufacturers acceptable if their products meet the criteria of first named manufacturer:
 - 1. Door Trim, Protection Plates:
 - a. Hager Hinge Co.
 - b. Quality Hardware Manufacturing Co.
 - c. Rockwood Manufacturing Co.
 - 2. Stops:
 - a. Hager Hinge Co.
 - b. Glynn Johnson.
 - c. H. B. Ives.
 - d. Quality Hardware Manufacturing Co.
 - e. Rockwood Manufacturing Co.

2.12 WEATHERSTRIPPING

- A. General:
 - 1. Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf.
 - 2. Provide type, sizes and profiles shown or scheduled.
 - 3. Provide non-corrosive fasteners recommended by manufacturer for application indicated.
- B. Replaceable Seal Strips: Provide only units where resilient or flexible seal strip easily replaceable and readily available from stocks maintained by manufacturer.
- C. Weatherstripping at Jambs and Heads:
 - 1. Provide bumper-type resilient insert and metal retainer strips, surface-applied unless shown mortised or semi-mortised, of following metal, finish and resilient bumper material:
 - a. Extruded aluminum with natural anodized finish; 0.062" min. thickness of main walls and flanges.
 - b. Flexible, hollow neoprene bulb or loop insert, conforming to MIL R 6055, Class II, Grade 40.

- D. Weatherstripping at Door Bottoms:
 - 1. Provide threshold consisting of contact type resilient insert and metal housing of design and size shown; of following metal, finish, and resilient seal strip:
 - a. Extruded aluminum with natural anodized finish; 0.062" min. thickness of main walls and flanges.
 - b. Solid neoprene wiper or sweep seal complying with MIL R 6055, Class II, Grade 40.
- E. Products: Specifications based on products manufactured by first named manufacturer with following manufacturers acceptable if their products meet the criteria of first named manufacturer:
 - 1. National Guard Products, Inc.
 - 2. Hager Hinge Co.
 - 3. Pemko
 - 4. Reese Enterprises, Inc.
 - 5. Zero International, Inc.

2.13 THRESHOLDS

- A. General: Except as otherwise indicated provide standard metal threshold unit of type, size and profile as shown or scheduled.
- B. Exterior Hinged/Pivoted Doors: Provide units min. 4" wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames, and as follows:
 - 1. For in-swinging doors provide units with interlocking lip and interior drain channel; include hook on bottom edge of door and drain pan.
 - 2. For out-swinging doors provide rabbeted type units with replaceable weatherstrip insert in stop.
- C. Products: Specifications based on products manufactured by first named manufacturer with following manufacturers acceptable if their products meet the criteria of first named manufacturer:
 - 1. National Guard Products, Inc.
 - 2. Hager Hinge Co.
 - 3. Pemko
 - 4. Reese Enterprises, Inc.
 - 5. Zero International, Inc.

2.14 HARDWARE FINISHES

- A. Provide matching finishes for hardware units at each door or opening, to greatest extent possible, and except as otherwise indicated.
 - 1. Reduce differences in color and textures much as commercially possible where base metal or metal forming process different for individual units of hardware exposed at same door or opening.
 - 2. In general, match items to manufacturer's standard finish for latch and lock set (or push-pull units if no latch-lock sets) for color and texture.
- B. Provide finishes which match those established by BHMA or, if none established, match Architect's sample.
- C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for applicable units of hardware by referenced standards.
- D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze and aluminum, except as otherwise indicated.
 - 1. The suffix "-NL" used with standard finish designations to indicate "no lacquer".
- E. Designations used in schedules and elsewhere to indicate hardware finishes are industry-recognized standard commercial finishes, except as otherwise noted.
- F. Rust-Resistant Finish: For iron and steel base metal, required for exterior work and in areas shown as "High Humidity" areas (and also when designed with suffix -RR), provide 0.2 mil thick copper coating on base metal before applying brass, bronze, nickel or chromium plated finishes.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
 - 1. Coordinate location of hardware with glass lights to ensure that no portion of the hardware extends over the glass light frame or glass.
- B. Install each hardware item in compliance with manufacturer's instructions and recommendations.
 - 1. Wherever cutting and fitting required to install hardware onto or into surfaces later painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in Division-9 sections.
 - 2. Do not install surface-mounted items until finishes completed on substrate.
- C. Set units level, plumb and true to line and location.
 - 1. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
 - 2. Drill and countersink units not factory-prepared for anchorage fasteners.
 - 3. Space fasteners and anchors in accordance with industry standards.
- D. Panic Devices: Attach to door with sex nut bolts (through bolts).
- E. Weatherstripping: Install door head and jamb weatherstripping continuous along length of door frame. Cutting or omission of sections of weatherstripping for installation of closer arm not acceptable.
- F. Closer: Unless otherwise noted, install closer on door inside of room in a manner to permit full 180 degree opening of door.
 - 1. Attach closer arm to door frame through weatherstripping. Provided 'extra' length machine screws for attachment of closer to frame through weatherstripping.
 - 2. Attach door closer to door using sex-nut type through bolts.
- G. Thresholds: Attach thresholds to concrete slab using min. 2" stainless steel screws spaced 12" on center and 6" from each end.
 - 1. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.
- H. Removable Mullions: Attach bottom bracket at removable mullion to concrete slab using min. 2" long stainless steel screws.

3.02 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit.
 - 1. Replace units which cannot be adjusted to operate freely and smoothly as intended for application made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Final Adjustment: Inspect work during week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area.
 - 1. Installer, accompanied by representative of latch and lock manufacturer, inspect Project and re-adjust every item of hardware to restore proper function of doors and hardware.
 - 2. Provide written report of visit to Architect stating adjustments made and corrections required and made in manner of original installation.
 - 3. Clean operating items as necessary to restore proper function and finish of hardware and doors.
 - 4. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

- D. A Representative of the Hardware Manufacturer and supplier shall visit the project site, inspect hardware installation and operation and certify to the Architect in writing that hardware has been installed and is operating correctly.
- E. Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during final adjustment of hardware.
- F. Continued Maintenance Service: Approximately six months after acceptance of hardware in each area, Installer, accompanied by representative of latch and lock manufacturer, return to Project and re-adjust every item of hardware to restore proper function of doors and hardware.
 - 1. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
 - 2. Replace hardware items deteriorated or failed due to faulty design, materials or installation of hardware units.
 - 3. Prepare written report of current and predictable problems (of substantial nature) in performance of hardware.

3.03 FINISH HARDWARE DATA

- A. Finishes:
 - 1. Generally, provide Satin Chrome (US26D) throughout.
- B. Exterior Finishes:
 - 1. Continuous Hinges (Aluminum Doors) Bronze Anodized Aluminum.
 - 2. Continuous Hinges (Hollow Metal Doors) Clear Anodized Aluminum.
 - 3. Continuous Hinges (Wood Doors) Clear Anodized Aluminum
 - 4. Hinges (Wood Doors) Satin Chrome (US26D).
 - 5. Hinges (Hollow Metal Doors) Primed (USP)
 - 6. Pivots Satin Chrome (US26D).
 - 7. Locksets Satin Chrome (US26D).
 - a. Exit Devices Stainless Steel Pushbar (US32D); Satin Chrome (US26D) case and trim.
 - 8. Closers Aluminum (AL).
 - 9. Stops, Holders, Bolts, Misc. Satin Chrome (US26D) or Satin Stainless Steel (US32D) (Supplier's Option).
- C. Interior Finishes:
 - 1. Continuous Hinges Clear Anodized Aluminum.
 - 2. Hinges (Wood Doors) Satin Chrome (US26D).
 - 3. Hinges (Hollow Metal Doors) Primed (USP)
 - 4. Pivots Satin Chrome (US26D).
 - 5. Locksets Satin Chrome (US26D).
 - a. Exit Devices Stainless Steel (US32D) Pushbar; Satin Chrome (US26D) Case and Trim.
 - 6. Closers Aluminum (AL)
 - 7. Push/Pulls Satin Stainless Steel (US32D).
 - 8. Kick and Mop Plates High Impact Plastic, black, unless otherwise indicated.
 - 9. Armor Plates and Edgings Stainless Steel (US32D) unless otherwise indicated.
 - 10. Stops, Holders, Bolts, Misc. Satin Chrome (US26D) or Satin Stainless Steel (US32D)

3.04 HARDWARE SCHEDULE

HW-1.

EXTERIOR - PAIR - CORRIDOR, DINING, FOYER, LOBBY, VESTIBULE - ALUMINUM STOREFRONT - EXIT - ALD X ALF

Doors: **300C, 300E, 300F, 303A, 303B, 305, 502A, 502,B, 502C, 502D, 502E**

Each Pair of Doors:

2 Cont. Hinges	Hager Roton	780-224-HD
1 Exit Device	Von Duprin	CD33NL x SNB
1 Exit Device	Von Duprin	CD33DT x SNB
1 Rim Cylinder	Best	1E72-S2-RP
3 Mortise Cylinders	Best	1E74-C4
2 Closers	LCN	4110-CUSH x TBGN
2 Keyed Removable Mullions	Von Duprin	KR4954 X 154 Stabilizer Set
2 Door Sweep	National Guard	200N
1 Threshold	National Guard	425N
2 Door Stops	Glynn Johnson	FB18S

Hardware Set Notes:

1. Balance of Hardware by Aluminum Door Manufacturer.
2. Cylinders for KR Mullion is to be keyed to the building system master key.
3. Closers to be parallel arm type.
4. Closers to be mounted 1/4" lower than normal to work with 700N weatherstrip

HW-2.

EXTERIOR - PAIR - LOBBY, VESTIBULE ; CARD ACCESS- ALUMINUM STOREFRONT - EXIT - ALD X ALF

Doors: **234, 234A, 502**

Each Pair of Doors:

2 Cont. Hinges	Hager Roton	780-224-HD
1 Exit Device	Von Duprin	CD33NL x SNB
1 Exit Device	Von Duprin	CD33DT x SNB
1 Electric Strike	Von Duprin	6111 x PS 861-B, FSE x 24V (*)
1 Rim Cylinder	Best	1E72-S2-RP
3 Mortise Cylinders	Best	1E74-C4
2 Closers	LCN	4110-CUSH x TBGN
2 Keyed Removable Mullions	Von Duprin	KR4954 X 154 Stabilizer Set
2 Door Sweep	National Guard	200N
1 Threshold	National Guard	425N
2 Door Stops	Glynn Johnson	FB18S

Hardware Set Notes:

1. Balance of Hardware by Aluminum Door Manufacturer.
2. Cylinders for KR Mullion is to be keyed to the building system master key.
3. Closers to be parallel arm type.
4. Closers to be mounted 1/4" lower than normal to work with 700N weatherstrip
5. Equip with power supply (and battery back up) PS 861-B, FSE (Fail Secure), 24 volt DC for use with card access system. Owner to provide card access system. Contractor to coordinate equipment requirements with Owner prior to ordering electric strike and related components.

HW-3.

EXTERIOR - PAIR - CORRIDOR, GYMNASIUM, FOYER, , LOBBY, VESTIBULE - HMD x HMF

Doors: **210, 224, 500**

Each Pair of Doors:

2 Cont. Hinges	Hager Roton	780-224-HD
1 Exit Device	Von Duprin	CD99NL x SNB
1 Exit Device	Von Duprin	CD99DT x SNB
1 Rim Cylinder	Best	1E72-S2-RP
3 Mortise Cylinders	Best	1E74-C4
1 Keyed Removable Mull	Von Duprin	KR4954 X 154 Stabilizer Set
2 Closers	LCN	4111-CUSH x TBGN
2 Kickplates	Hager	8" x 2" LDW; US32D
4 Silencers	Hager	307D
2 Door Sweeps	National Guard	200N
1 set Weatherstripping	National Guard	700N
1 set Astragals	National Guard	115NG
1 Threshold	National Guard	425N
2 Door Stops	Glynn Johnson	FB18S

Hardware Set Notes:

1. Cylinders for KR Mullion is to be keyed to the building system master key.
2. Closers to be parallel arm type.
3. Closers to be mounted 1/4" lower than normal to work with 700N weatherstrip

HW-4.

EXTERIOR - PAIR - CORRIDOR, LOBBY, VESTIBULE; CARD ACCESS - HMD x HMF

Doors: **213, 221, 501**

Each Pair of Doors:

2 Cont. Hinges	Hager Roton	780-224-HD
1 Exit Device	Von Duprin	CD99NL x SNB
1 Exit Device	Von Duprin	CD99DT x SNB
1 Electric Strike	Von Duprin	6111 x PS 861-B, FSE x 24V (*)
1 Rim Cylinder	Best	1E72-S2-RP
3 Mortise Cylinders	Best	1E74-C4
1 Keyed Removable Mull	Von Duprin	KR4954 X 154 Stabilizer Set
2 Closers	LCN	4110-CUSH x TBGN
2 Kickplates	Hager	8" x 2" LDW; US32D
4 Silencers	Hager	307D
2 Door Sweeps	National Guard	200N
1 set Weatherstripping	National Guard	700N
1 set Astragals	National Guard	115NG
1 Threshold	National Guard	425N
2 Door Stops	Glynn Johnson	FB18S

Hardware Set Notes:

1. Cylinders for KR Mullion is to be keyed to the building system master key.
2. Closers to be parallel arm type.
3. Closers to be mounted 1/4" lower than normal to work with 700N weatherstrip
4. Equip with power supply (and battery back up) PS 861-B, FSE (Fail Secure), 24 volt DC for use with card access system. Owner to provide card access system. Contractor to coordinate equipment requirements with Owner prior to ordering electric strike and related components.

HW-5.

EXTERIOR - SINGLE - STAIRS- HMD X HMF

Doors: **515**
Each Door:

1 Cont. Hinges	Hager Roton	780-224-HD
1 Exit Device	Von Duprin	99NL x SNB
1 Closers	LCN	4111-CUSH x TBGN
1 Kickplates	Hager	8" x 2" LDW; US32D
3 Silencers	Hager	307D
1 Door Sweeps	National Guard	200N
1 Set Weatherstripping	National Guard	700N
1 Threshold	National Guard	425N
1 Door Stop	Glynn Johnson	FB18S

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-6.

INTERIOR - PAIR - COMMONS, CORRIDOR, FOYER OR LOBBY TO CORRIDOR - CORRIDOR TO CORRIDOR - PAIR - NON-RATED MAX. - HMD X HMF OR WD X HMF

Doors: **228, 232**
Each Pair of Doors:

2 Cont. Hinges	Hager Roton	780-224 HD
2 Concealed Rod Exit Device	Von Duprin	9547L-F-LBR-US26D; 'X' InPact
2 Rim Cylinders	Best	1E72
2 Closers	LCN	4111 x 72MX x TBGN
2 Kickplates	Hager	8" x 2" LDW; US32D
1 Threshold	Hager	410S
2 Stop/holders	Hager	326F
3 Silencers	Hager	307D

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-7.

INTERIOR - PAIR - COMMONS, STAIRS, CORRIDOR, FOYER OR LOBBY TO CORRIDOR - PAIR - FIRE-RATED MAX. 1½-HR. - HMD X HMF

Doors: **303, 312, 502F**
Each Pair of Doors:

2 Cont. Hinges	Hager Roton	780-224 HD
2 Concealed Rod Exit Device	Von Duprin	9547L-F-LBR-US26D; 'X' InPact
2 Rim Cylinders	Best	1E72-S2-RP
2 Closers	LCN	4111 x TBGN
1 Coordinator	Hager	297D
1 Astragal	National Guard	139SP
1 Threshold	National Guard	425N
2 Kickplates	Hager	8" x 2" LDW; US32D
4 Silencers	Hager	307D
2 Magnetic Hold Opens	Rixson	998
1 Set Smoke Seals	National Guard	5020 (Heads and Jambs)

Hardware Set Notes:

1. Closers to be parallel arm type.
2. Coordinate electrical voltage for magnetic holder with electrical drawings. Wiring for magnetic holders to be furnished and installed as part of Division 16 work.
3. Smoke detectors for fire doors furnished and installed under Division 16 work.
4. Install Magnetic Hold-open and Back Box in Locations Shown on Details

HW-8.

INTERIOR - PAIR - COMMONS, STAIRS, CORRIDOR, FOYER OR LOBBY TO CORRIDOR - PAIR - FIRE-RATED MAX. 4 HR. - HMD X HMF

Doors: **410**

Each Pair of Doors:

2 Closers	LCN	4111 x TBGN
2 Magnetic Hold Opens	Rixson	998

Hardware Set Notes:

1. Existing doors and frame to remain.
2. Existing hardware, other than closer to remain. Remove and replace closer.
3. Provide new electromagnetic holders.
4. Coordinate electrical voltage for magnetic holder with electrical drawings. Wiring for magnetic holders to be furnished and installed as part of Division 16 work.
5. Smoke detectors for fire doors furnished and installed under Division 16 work.
6. Install Magnetic Hold-open and Back Box in Locations Shown on Details

HW-9.

INTERIOR - PAIR - LUNCHROOM, GYMNASIUM, OR MULTIPURPOSE TO CORRIDOR - FIRE-RATED 1½-HR. MAX. - HMD X HMF

Doors: **300, 300A, 300B, 500C**

Each Pair of Doors:

2 Cont. Hinges	Hager Roton	780-224 HD
2 Exit Devices	Von Duprin	9927L-F x SNB
2 Vertical Rod Guard	Von Duprin	RG-27
2 Rim Cylinders	Best	1E72-S2-RP
2 Closers	LCN	4111 x TBGN
2 Kickplates	Hager	8" x 2" LDW; US32D
2 Silencers	Hager	307D
1 Threshold	National Guard	425N
2 Magnetic Hold Opens	Rixson	998
1 Set Smoke Seals	National Guard	5020 (Heads and Jambs)

Hardware Set Notes:

1. Closers to be parallel arm type.
2. Coordinate electrical voltage for magnetic holder with electrical drawings. Wiring for magnetic holders to be furnished and installed as part of Division 16 work.
3. Smoke detectors for fire doors furnished and installed under Division 16 work.
4. Install Magnetic Hold-open and Back Box in Locations Shown on Details.
5. At Doors 300A, 300B and 500C: Provide, in addition to the above hardware (1)Rixson Armature extension base 900, (2) Rixson 90 degree bend armature extension 900-Z and (3) Rixson extension arm 900-xxx (length required).
6. As part of the shop drawing process the supplier shall provided detailed drawings showing layout, location, dimensions of magnetic holder components.

HW-1.

INTERIOR - PAIR - LUNCHROOM, GYMNASIUM, OR MULTIPURPOSE TO CORRIDOR - FIRE-RATED
1½-HR. MAX. - HMD X HMF

Doors: **500A, 500B**

Each Pair of Doors:

2 Cont. Hinges	Hager Roton	780-224 HD
2 Exit Devices	Von Duprin	9927L-F x SNB
2 Vertical Rod Guard	Von Duprin	RG-27
2 Rim Cylinders	Best	1E72-S2-RP
2 Closers	LCN	4111 x TBGN
2 Kickplates	Hager	8" x 2" LDW; US32D
2 Silencers	Hager	307D
1 Threshold	National Guard	425N
2 Door Stops	Glynn Johnson	FB18S

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-2.

INTERIOR - SINGLE - COMMONS, CORRIDOR, FOYER OR LOBBY TO CORRIDOR; BATTERY TOILET,
KITCHEN EMPLOYEE'S LOUNGE - NON-RATED - WD X HMF

Doors: **215, 216, 226, 227, 507, 508, 511, 512**

Each Door:

1½ Pair Hinges	Hager	BB1279 4½ x 4½
1 Deadlock	Best	48H7R
1 Flush Cup Pull & Plate	Quality	1458 - 4" X 16"
1 Door Pull & Plate	Quality	1610A - 8" x 16"
1 Closer	LCN	4111H x TBGN
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Mop Plate	Hager	8" X 1" LDW, Black Plastic
1 Stop	Hager	234W or 240F as applicable.
3 Silencers	Hager	307D

Hardware Set Notes:

1. Place 'Door Pull and Plate' on pull side of door.
2. Place 'Flush Cup Pull & Plate on push side of door.
3. Closers to be parallel arm type.

HW-3.

INTERIOR - SINGLE - STAIRS TO CORRIDOR- FIRE-RATED MAX. 1½-HR. - HMD X HMF

Doors: **503**

Each Door:

1 Cont. Hinges	Hager Roton	780-224 HD
1 Exit Device	Von Duprin	99L-F x SNB
1 Rim Cylinders	Best	1E72-S2-RP
1 Closer	LCN	4111 x 72MC x TBGN
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Set Smoke Seals	National Guard	5020 (Heads and Jambs)
3 Silencers	Hager	307D

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-4.

INTERIOR - SINGLE - SERVING TO DINING - FIRE-RATED - HMD X HMF AND NON-RATED- WD X HMF

Doors: **302A, 302B**

Each Door:

2 Pair Hinges	Hager	BB1168 5 x 4½
1 Lockset	Best	35H7E
1 Closer	LCN	4111 x TBGN
1 Kickplates	Hager	8" x 2" LDW; US32D
3 Silencers	Hager	307D

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-5.

INTERIOR - PAIR - CLASSROOM (OVER 20 MIN.) TO CORRIDOR; MECHANICAL, ELECTRICAL, STORAGE - FIRE-RATED - HMD X HMF

Doors: **402, 603**

Each Pair of Doors:

3 Pairs Hinges	Hager	BB1168 4½ x 4½
1 Lockset	Best	35H7J
1 Dummy Lockset	Best	35H2DT with Open Back Strike
2 Closers	LCN	4111 x TBGN
2 Flush Bolts	Hager	282D
1 Dustproof Strike	Hager	280X
2 Kickplates	Hager	8" x 2" LDW; US32D
2 Stops	Hager	234W or 240F as applicable.
2 Silencers	Hager	307D

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-6.

INTERIOR - SINGLE - CLASSROOM (20 MIN. MAX.) TO CORRIDOR; CLOSET; NON-RATED - WD X HMF

Doors: **202, 204, 208, 211, 212, 217, 218, 219, 220, 222, 223,**

Each Door:

1½ Pair Hinges	Hager	BB1279 4½ x 4½
1 Lockset	Best	45H7 INL-Intruder
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Stop	Hager	234W or 240F as applicable.
3 Silencers	Hager	307D

HW-7.

INTERIOR - SINGLE -CLASSROOM OR MULTIPURPOSE TO CORRIDOR - NON-RATED AND FIRE-RATED MAX. 1½-HR. - HMD X HMF AND WD X HMF

Doors: **200, 201, 203, 205, 501A**
Each Door:

1 Cont. Hinges	Hager Roton	780-224 HD
1 Exit Device	Von Duprin	99L-F x SNB
1 Rim Cylinder	Best	1E72-S2-RP
1 Closer	LCN	4111 x TBGN
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Stop	Hager	230W
3 Silencers	Hager	307D

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-8.

INTERIOR - SINGLE - CHORAL TO CORRIDOR - NON-RATED OR FIRE-RATED MAX. 1-1/2 HR. - HMD X HMF AND WD X HMF

Doors: **229, 229A**
Each Door:

1 Cont. Hinge	Hager Roton	780-224 HD
1 Exit Device	Von Duprin	99L-F x 299 x SNB
1 Rim Cylinder	Best	1E72-S2-RP
1 Closer	LCN	4111 x TBGN
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Set Sound Seals	National Guard	106N
1 Door Bottom	National Guard	220SN

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-9.

INTERIOR - SINGLE - STORAGE, JANITORS, PULPER ROOMS - NON-RATED - WD X HMF AND HMD X HMF

Doors: **214, 225, 301, 401**
Each Door:

1½ Pair Hinges	Hager	BB1168 4½ x 4½
1 Lockset	Best	45H7R
1 Closer	LCN	4111 x TBGN
1 Armor Plates	Hager	34" x 2" LDW; US32D
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Stop	Hager	234W or 240F as applicable.
3 Silencers	Hager	307D

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-10.

INTERIOR - SINGLE - STORAGE LARGE DOOR- NON-RATED - WD X HMF AND HMD X HMF

Doors: **504, 506, 513, 514**

Each Door:

2 Pair Hinges	Hager	BB1279 5 x 4½
1 Lockset	Best	45H7R
1 Closer	LCN	4111 x TBGN
1 Armor Plates	Hager	34" x 2" LDW; US32D
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Stop	Hager	234W or 240F as applicable.
3 Silencers	Hager	307D

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-11.

INTERIOR - SINGLE - CONFERENCE, OFFICE OR WORKROOM TO CORRIDOR - FIRE-RATED OR NON-RATED - A/V STORAGE, MEDIA PRODUCTION - FIRE-RATED - HMD X HMF

Doors: **501B**

Each Door:

1½ Pair Hinges	Hager	BB1279 4½ x 4½
1 Lockset	Best	45H7A
1 Closer	LCN	4111 x TBGN
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Stop	Hager	234W or 240F as applicable.
3 Silencers	Hager	307D

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-12.

INTERIOR - SINGLE - CONFERENCE, OFFICE OR WORKROOM NON-RATED - WD X HMF

Doors: **206, 207, 209**

Each Door:

1½ Pair Hinges	Hager	BB1279 4½ x 4½
1 Lockset	Best	45H7A
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Stop	Hager	234W or 240F as applicable.
3 Silencers	Hager	307D

HW-13.

INTERIOR - SINGLE - MECHANICAL, AND ELECTRICAL DATA- FIRE-RATED - HMD X HMF AND WD X HMF

Doors: **230, 231, 505,**
Each Door:

1½ Pair Hinges	Hager	BB1168 4½ x 4½
1 Lockset	Best	45H7R X TL
1 Closers	LCN	4111 x TBGN
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Stop	Hager	234W or 240F as applicable.
1 Set Sound Seals	National Guard	106N
1 Door Bottom	National Guard	220SN

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-14.

INTERIOR - SINGLE - MECHANICAL EQUIPMENT ROOMS AND ELEVATOR EQUIPMENT ROOM;
LARGE DOOR - NON RATED AND FIRE-RATED - HMD X HMF

Doors: **510, 601, 604, 608**
Each Door:

2 Pair Hinges	Hager	BB1279 5 x 4½
1 Lockset	Best	45H7R X TL
1 Closers	LCN	4111 x TBGN
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Stop	Hager	234W or 240F as applicable.
1 Set Sound Seals	National Guard	106N
1 Door Bottom	National Guard	220SN

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-15.

INTERIOR - SINGLE - MEZZANINE TO STAIRS; NON-RATED AND FIRE-RATED MAX. 1½-HR. - HMD X HMF AND WD X HMF

Doors: **602**
Each Door:

1 Cont. Hinges	Hager Roton	780-224 HD
1 Exit Device	Von Duprin	99L-F x SNB
1 Rim Cylinder	Best	1E72-S2-RP
1 Closer	LCN	4111 x TBGN
1 Kickplates	Hager	8" x 2" LDW; US32D
1 Stop	Hager	230W
3 Silencers	Hager	307D

Hardware Set Notes:

1. Closers to be parallel arm type.

HW-16.

INTERIOR - TEACHERS AND STORAGE CABINETS - WD X WD; 1-3/8" THICK SOLID CORE DOOR

Doors: **Teachers and Storage Cabinets**

Each Door:

1 Deadlock	Best	83T7L X STK
1 Lever Lockset	Best	93K7Z

Note:

- (1) Master key to building master key system.
- (2) Coordinate lockset type with teachers and storage cabinets door type and thickness. If necessary modify lockset type to work with doors furnished and to allow for keying with building master key system. Provide adapter ring where required to accommodate the thickness of the door.
- (3) Hinges, silencers and door stops provided and installed as Part of Section 06400 Architectural Wood Work. Cylinders.
- (4) Deadlock and lever lock sets furnished and installed under this section.

HW-17.

INTERIOR - OVERHEAD DOORS OR SHUTTERS, WIRE MESH PARTITIONS - CYLINDER ONLY - WD X HMF

Doors: **302C**

Each Door:

1 Mortise Cylinder	Best	1E74-C4
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Balance of Hardware by Door Manufacturer.

END OF SECTION 08710

**SECTION 08800
GLASS AND GLAZING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of glass and glazing work indicated on drawings and schedules.
- B. Types of work in this Section includes glass and glazing for:
 - 1. Window units, not indicated as "preglazed".
 - 2. Storefront construction.
 - 3. Entrances and other doors, not indicated as "preglazed".
 - 4. Fixed glazing in hollow metal frames.
 - 5. Curved plastic glazing
- C. Structural and weatherseal sealants for structural curtain wall specified in Division-8 section.
- D. Mirror glass specified in a Division-10 section.

1.03 SYSTEM DESCRIPTION

- A. Provide glass and glazing produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in work.
 - 1. Normal thermal movement defined as that resulting from ambient temperature range of 120°F. (67°C.) and from consequent temperature range within glass and glass framing members of 180°F. (100°C.).
 - 2. Deterioration of insulating glass defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.
 - 3. Deterioration of laminated glass defined as development of manufacturing defects including edge separation, or delamination which materially obstructs vision through glass.
 - 4. Deterioration of coated glass defined as development of manufacturing defects including peeling, cracking or other indications of deterioration in metallic coating due to normal conditions of use.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each glazing material and fabrication glass product required, including installation and maintenance instructions.
- B. Samples: Submit, for verification purposes, 12" square samples of each type glass indicated except for clear single pane units, and 12" long samples of each color required (except black) for each type sealant or gasket exposed to view.
- C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

- D. Compatibility and Adhesion Test Report: Submit statement for sealant manufacturer indicating that glass and glazing materials tested for compatibility and adhesion with glazing sealants and interpreting test results relative to materials performance, including recommendations for primers and substrate preparation needed to obtain adhesion.

1.05 QUALITY ASSURANCE

- A. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FMGA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements indicated.
 - 1. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this Section or other referenced standards.
- B. Safety Glazing Standard: Where safety glass indicated or required by authorities having jurisdiction, provide type products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.
 - 1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.
- C. Fire Resistant Glass: Provide glass units marked and tested per ASTM and UL. Glass— As applicable, meet the following standards.
 - 1. Federal Specifications: DD-G-451c; TT-S-00230e
 - 2. ASTM: D-635
 - 3. ANSI: Z 97.1; A 26.1 AS1 through AS0
 - 4. Underwriters Laboratories: 952; 972
 - 5. Corps of Engineers: CSPC 16 CFR 1201, Category II
 - 6. Federal Bureau of Prisons approved products listing
- D. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of one of inspecting and testing organization indicated below:
 - 1. Insulating Glass Certification Council (IGCC).
 - 2. Associated Laboratories, Inc. (ALI)
- E. Single Source Responsibility: To ensure consistent quality of appearance and performance, provide materials produced by single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from single source for each type and class required.
- F. Preconstruction Compatibility and Adhesion Testing: Submit samples of all glass, gaskets, glazing accessories, and glass framing members proposed for use in contact with, or proximity of, glazing sealants, to sealant manufacturer for compatibility and adhesion testing in accordance with sealant manufacturer's standard testing methods and following requirements.
 - 1. Submit min. 9 pieces of each type and finish of glass framing member and of each type, class, kind, condition, and form (monolithic, laminated, insulating units) of glass for adhesion testing and one sample of substrates (gaskets, setting blocks and spacers) for compatibility testing.
 - 2. Schedule sufficient time for testing and analysis of results to prevent delay in progress of Work.
 - 3. Investigate materials failing compatibility or adhesion tests and obtain sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

- B. Where insulating glass units will be exposed to substantial altitude changes, avoid hermetic seal ruptures by complying with insulating glass fabricator's recommendations for venting and sealing.
- C. Where insulating glass units will be exposed to substantial altitude changes, avoid hermetic seal ruptures by complying with insulating glass fabricator's recommendations for venting and sealing.

1.07 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing if ambient and substrate temperature conditions outside limits permitted by glazing material manufacturer or when joint substrates wet due to rain, frost, condensation or other causes.
 - 1. Install liquid sealant at ambient and substrate temperatures above 40°F. (4.4°C.).

1.08 WARRANTY

- A. General: Warranties in addition to, and not limitation of, other rights Owner may have under Contract Documents.
- B. Manufacturer's Special Project Warranty on Laminated Glass:
 - 1. Provide written warranty signed by manufacturer of laminated glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those laminated glass units which develop manufacturing defects.
 - 2. Manufacturing defects defined as edge separation or delamination which materially obstructs vision through glass.
 - 3. Warranty Period: Manufacturer's standard but min. 4 years after date of Final Acceptance.
- C. Manufacturer's Special Project Warranty on Coated Glass Products:
 - 1. Provide written warranty signed by manufacturer of coated glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those coated glass units which develop manufacturing defects.
 - 2. Manufacturing defects defined as peeling, cracking or deterioration in metallic coating due to normal conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.
 - 3. Warranty Period: Manufacturer's standard but min. 5 years after date of Final Acceptance.
- D. Manufacturer's Special Project Warranty on Insulating Glass:
 - 1. Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units which develop manufacturing defects.
 - 2. Manufacturing defects defined as failure of hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided manufacturer's instructions for handling, installing, protecting and maintaining units complied with during warranty period.
 - 3. Warranty Period: Manufacturer's standard but min. 10 years after date of Final Acceptance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of one of following:

1. Manufacturers of Clear and Tinted Float Glass:
 - a. AFG Industries, Inc.
 - b. Ford Glass Division.
 - c. Guardian Industries Corp.
 - d. LOF Glass, Inc.
 - e. PPG Industries, Inc.
 - f. Saint-Gobain/Euroglass.
2. Manufacturers of Heat-Treated (Tempered) Glass:
 - a. AFG Industries, Inc.
 - b. Cardinal IG.
 - c. Environmental Glass Products.
 - d. Falconer Glass Industries.
 - e. Ford Glass Division.
 - f. Guardian Industries Corp.
 - g. Hordis Brothers, Inc.
 - h. LOF Glass, Inc.
 - i. PPG Industries, Inc.
 - j. Saint-Gobain/Euroglass.
 - k. Spectrum Glass Prod. Div., H.H. Robertson Co.
 - l. Viracon, Inc.
3. Manufacturers of Wire-less Fire Rated Glass:
 - a. Nippon Electric Glass Co., Ltd. "FireLite" premium.
 - b. Pilkington-Pyrostop
 - c. Safety and Fire Technology, Inc (SAFTI); San Francisco, Ca.
 - d. Safti First; San Francisco, Ca.
 - e. Technical Glass Products
4. Manufacturers of Impact Resistant Glass:
 - a. Vircaon-Viraguard
 - b. Sully North America
 - c. Armorpane
 - d. Armour World
 - e. Globe-Amerada
 - f. Sierragin/Sylmar
5. Manufacturers of Coated Glass:
 - a. Advanced Coating Technology.
 - b. Cardinal IG.
 - c. Environmental Glass Products.
 - d. Falconer Glass Industries.
 - e. Ford Glass Division.
 - f. Guardian Industries Corp.
 - g. Hordis Brothers, Inc.
 - h. Independent Insulating Glass.
 - i. Interpane Coatings, Inc.
 - j. LOF Glass, Inc.
 - k. PPG Industries, Inc.
 - l. Saint-Gobain/Euroglass.
 - m. Spectrum Glass Prod. Div., H.H. Robertson Co.
 - n. Viracon, Inc.
6. Manufacturers of Laminated Glass:
 - a. Advanced Coating Technology.
 - b. Environmental Glass Products.
 - c. Falconer Glass Industries.
 - d. Ford Glass Division.

- e. Guardian Industries Corp.
- f. Hordis Brothers, Inc.
- g. PPG Industries, Inc.
- h. Saint-Gobain/Euroglass.
- i. Viracon, Inc.
- 7. Manufacturers of Insulating Glass:
 - a. Advanced Coating Technology.
 - b. AFG Industries, Inc.
 - c. Cardinal IG.
 - d. Environmental Glass Products.
 - e. Falconer Glass Industries.
 - f. Ford Glass Division.
 - g. Guardian Industries Corp.
 - h. Hordis Brothers, Inc.
 - i. Independent Insulating Glass.
 - j. PPG Industries, Inc.
 - k. Spectrum Glass Prod. Div., H.H. Robertson Co.
 - l. Viracon, Inc.
- 8. Manufacturers of Polycarbonate Glazing:
 - a. CPI International
 - b. CYRO Industries
 - c. General Electric Co.

2.02 GLASS PRODUCTS, GENERAL

- A. Primary Glass Standard: Comply with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and if applicable, form, finish, mesh and pattern.
- B. Heat-Treated Glass Standard: Comply with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.
- C. Sizes:
 - 1. Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer.
 - 2. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

2.03 PRIMARY GLASS PRODUCTS

- A. Clear Float Glass: Type I, (transparent glass, flat), Class 1, Quality q3 (glazing select).
- B. Tinted Float Glass: Type I, (transparent glass, flat) Class 2 (tint heated absorbing and light reducing), Quality q3 (glazing select), and as follows:
 - 1. Gray: Manufacturer's standard tint, with visible light transmittance of 41%-43% and shading coefficient of 0.67-0.69 for 1/4" thick glass.
 - 2. Refer to coated glass product requirements for tint and performance characteristics of coated tinted glass for single glazing relative to visible light transmittance, U-values, shading coefficient and visible reflectance.
 - 3. Refer to requirements for sealed insulating glass units for performance characteristics of assembled units composed of tinted glass, coated or uncoated, relative to visible light transmittance, U-values, shading coefficient and visible reflectance.
- C. Clear (Wire-less) Fire Rated Glass: Proprietary clear fire rated glass consisting of two outer lites of tempered glass separated by a stainless steel spacer. Cavity between lites to be filled with 'special' clear, colorless, odorless, ultraviolet stable, non-yellowing gel polymer of thickness necessary to provide fire rating listed.
 - 1. Application: For use in fire rated walls.

2.04 HEAT-TREATED GLASS PRODUCTS

- A. Manufacturing Process: Manufacture heat-treated glass as follows:
 - 1. By vertical (tong-held) or horizontal (roller hearth) process, at manufacturer's option, except provide horizontal process where indicated as "tongless" or "free of tong marks".
- B. Uncoated Clear Heat-Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below:
 - 1. Kind FT (fully tempered) where indicated.
- C. Uncoated Tinted Heat-Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 2 (tinted heat absorbing and light reducing), Quality q3 (glazing select), with tint color and performance characteristics for 1/4" thick glass matching those for non-heat-treated tinted float glass; kind as indicated below:
 - 1. Kind FT (fully tempered) where indicated.
- D. Coated Clear Heat-Treated Float Glass: Condition C (other coated glass), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), with coating type and performance characteristics complying with requirements specified under coated glass products; kind as indicated below:
 - 1. Kind FT (fully tempered) where indicated.
- E. Coated Tinted Heat-Treated Float Glass: Condition C (other coated glass), Type I (transparent glass, flat), Class 2 (tinted heat absorbing and light reducing), Quality q3 (glazing select), with coating type and performance characteristics complying with requirements specified under coated glass products; kind as indicated below:
 - 1. Kind FT (fully tempered) where indicated.
- F. Ceramic-Coated Heat-Treated Spandrel Glass: Condition B (spandrel glass, one surface ceramic coated), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), with ceramic coating applied to second surface and complying with following requirements:
 - 1. Kind FT (fully tempered).
 - 2. Color: As indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

2.05 COATED GLASS PRODUCTS FOR SINGLE GLAZING APPLICATIONS

- A. General: Performance characteristics designated for coated glass products: Nominal values based on manufacturer's published test data for 1/4" thick glass products, unless otherwise indicated.
 - 1. Refer to primary and heat-treated glass product requirements relating to properties of glass products to which coating applied.
- B. U-values indicated are expressed in Btu's/hr./s.f./°F. difference.
- C. Provide heat-treated coated float glass of grade and where indicated or, if not otherwise indicated, provide heat-strengthened units where recommended by manufacturer for application indicated and tempered where coated safety glass designated or required.
- D. Pyrolitic-Coated Glass: Provide float glass of class indicated impregnated with metallic oxide coating, on glass surface indicated, by manufacturer's standard pyrolitic deposition process, either at time of initial manufacturer or during heat treatment, and which complies with following requirements:
 - 1. Tinted Float Glass Coated on First Surface: Of tint and with performance characteristics indicated below:
 - a. Gray: Manufacturer's standard tint, with visible light transmittance of 17%-20%, summer daylight U-value of 1.08-1.10, winter nighttime U-value of 1.11-1.13, shading coefficient of 0.44-0.48, and outdoor visible reflectance of 35%-45%.

2. Tinted Float Glass Coated on Second Surface: Of tint and with nominal performance characteristics indicated below:
 - a. Gray: Manufacturer's standard tint, with visible light transmittance of 17%-23%, summer daylight U-value of 1.10-1.13, winter nighttime U-value of 1.10-1.13, shading coefficient of 0.48-0.53, and outdoor visible reflectance of 10%-13%.
3. Application: Mirrored "one-way" glass.

2.06 LAMINATED GLASS PRODUCTS

- A. General: Refer to primary glass requirements relating to properties of uncoated glasses making up laminated glass products.
- B. Plastic Interlayer: Provide glass fabricator's standard polyvinyl butyral interlayer for laminating panes of glass, with proved record of showing no tendency to bubble, discolor or lose physical or mechanical properties after laminating and installation, in clear or colors and of thickness indicated.
- C. Laminating Process: Fabricate laminated glass using laminator's standard heat-plus-pressure process to produce glass free from foreign substances and air/glass pockets.
- D. Laminated Safety Glass: Two panes of glass of equal thickness, laminated together with min. 0.030" thick plastic interlayer and complying with requirements indicated below:
 1. Glass Characteristics: Float glass, complying with requirements for class, tint, kind and thickness of each pane (ply) indicated below:
 - a. Class 1 - clear both panes.
 - b. Kind FT (fully tempered).
 - c. Thickness: 7/16"; unless noted.
 2. Color of Plastic Interlayer: Gray; Visible light transmittance of 44%.

2.07 IMPACT RESISTANT LAMINATED GLASS:

- A. Two panes of glass of equal thickness, laminated together with a 3/8" thick plastic polycarbonate interlayer and complying with requirements indicated below:
 1. Glass Characteristics: Float glass complying with requirements for class, tint, kind and thickness of each pane (ply) indicated below:
 - a. Class 1 - clear for both panes.
 - b. Kind HS (heat strengthened).
 - c. Thickness: 11/16".
 2. Color of Plastic Interlayer:
 - a. Clear

2.08 SEALED INSULATING GLASS UNITS

- A. General: Provide preassembled units consisting of organically sealed panes of glass enclosing hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and desiccant.
- B. For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this section applicable to types, classes, kinds and conditions of glass products indicated.
- C. Provide heat-treated panes of kind and at locations indicated or, if not indicated, provide heat-strengthened panes where recommended by manufacturer for application indicated and tempered where indicated or where safety glass designated or required.
- D. Performance characteristics designated for coated insulating glass: Nominal values based on manufacturer's published test data for units with 1/4" thick panes and 1/2" thick air space.

- E. U-values indicated expressed in Btu's/hr./s.f./°F. difference.
- F. Performance Classification per ASTM E 774: Class A.
- G. Thickness: 1" overall
 - 1. Each Pane: 1/4"; 3/16" where laminated indicated.
 - 2. Air Space: 1/2"
- H. Sealing System: Dual seal; primary sealant; polyisobutylene, secondary sealant: silicone.
- I. Spacer Material: Aluminum.
- J. Desiccant: Manufacturer's standard; either molecular sieve or silica gel or blend of both.
- K. Corner Construction: Manufacturer's standard corner construction.
- L. Uncoated Insulating Glass Units: Manufacturer's standard units complying with following requirements:
 - 1. Type "A" Insulating, Tinted Glass Unit; 1" Total Thickness:
 - a. Exterior Pane: Tinted Grey float glass, 1/4" thick.
 - b. Interior Pane: Clear float glass, 1/4" thick.
 - c. Performance Characteristics: Visible light transmittance of 37%-38%, summer daylight U-value of 0.56-0.57, winter nighttime U-value of 0.49, shading coefficient of 0.56-0.58, and outdoor reflectance of 8% to 9%.
 - d. Application: Where insulated glass indicated.
 - 2. Type "B" Insulating, Heat Strengthened, Tinted Glass Unit; 1" Total Thickness:
 - a. Exterior Pane: Tinted Grey float glass, 1/4" thick, FT (fully tempered).
 - b. Interior Pane: Clear float glass, 1/4" thick, FT (fully tempered).
 - c. Performance Characteristics: Visible light transmittance of 37%-38%, summer daylight U-value of 0.56-0.57, winter nighttime U-value of 0.49, shading coefficient of 0.56-0.58, and outdoor reflectance of 36%.
 - d. Application: Where insulated glass indicated to be tempered.
 - 3. Type "C" Insulating, Safety Glass, Tinted Glass Unit; 1-3/16" Total Thickness:
 - a. Exterior Pane: Tinted Grey float glass, 1/4" thick, FT (fully tempered).
 - b. Interior Pane: Laminated safety glass with grey tinted interlayer, 7/16" thick, FT (fully tempered).
 - c. Performance Characteristics: Visible light transmittance of 37%-38%, summer daylight U-value of 0.56-0.57, winter nighttime U-value of 0.49, shading coefficient of 0.56-0.58, and outdoor reflectance of 36%.
 - d. Application: Clear story windows.
- M. Low Emissivity-Coated Insulating Glass Units: Manufacturer's standard units with one pane of glass coated with durable, neutral-colored, low-emissivity metallic coating, of type and on surface indicated, and complying with following requirements:
 - 1. Total Thickness: 1".
 - 2. Exterior Pane:
 - a. Tinted float glass, uncoated; Green.
 - b. Kind: FT (fully tempered).
 - c. Thickness: 1/4".
 - 3. Interior Pane: Clear float glass, third surface coated.
 - a. Kind: FT (fully tempered).
 - b. Coating Type: Pyrolytic deposited.
 - c. Thickness: 1/4"
 - 4. Performance Characteristics: Visible light transmittance of 63%, summer daylight U-value of 0.34, winter nighttime U-value of 0.31, shading coefficient of 0.47, and outdoor reflectance of 11%.
 - 5. Application: Glass used for glazing of storefront, curtain wall, exterior windows and exterior hollow metal doors and sidelights and transoms.

- N. Insulating Spandrel Glass: Manufacturer's standard units with Kind HS (heat strengthened) exterior pane and location of reflective coating matching that of coated insulating glass of that type, class and coating characteristics, and with interior pane complying with following additional requirements:
 - 1. Ceramic-Coated Heat-Treated Spandrel Glass: Condition B (spandrel glass, one face ceramic coated), Kind HS (heat strengthened), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), and complying with following requirements:
 - a. Color: As indicated or, if not indicated, selected by Architect from manufacturer's standard color.
 - b. Location of Ceramic Coating: Third surface of insulating spandrel unit.
 - 2. Insulated spandrel glass to match appearance of adjacent glass.

2.09 FIRE-RATED GLAZING PRODUCTS

- A. Monolithic Ceramic Glazing Material: Proprietary product in the form of clear flat sheets of 3/16-inch (5-mm) nominal thickness weighing 2.5 lb/sq. ft. (12.2 kg/sq. m), and as follows:
 - 1. Fire-Protection Rating: As indicated for the fire window in which the glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Surfaces:
 - a. Polished on both surfaces, transparent.
 - 3. Product: Subject to compliance with requirements, provide the following product manufactured by Nippon Electric Glass Co., Ltd. and distributed by Technical Glass Products:
 - a. "Premium FireLite" (polished on both surfaces).
 - 4. Application: For use in openings in fire rated walls.

2.10 POLYCARBONATE GLAZING

- A. Tinted polycarbonate sheet: UV resistant cold-formable monolithic polycarbonate sheet.
 - 1. Color:
 - a. Interior: Clear
 - b. Exterior: Grey, 50% light transmission
 - 2. Thickness: 0.236" (6mm)
- B. Form to radii indicated.
- C. Warranty: 5 year against breakage, yellowing and light transmission loss.

2.11 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES

- A. General: Provide products of type indicated and complying with following requirements:
 - 1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they come in contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 - 2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes having performance characteristics suitable for applications indicated and conditions at time of installation.
 - 3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for type, Grade, Class and Uses.
 - 4. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, selected by Architect from manufacturer's standard colors.

- B. One-Part Non-Acid-Curing Silicone Glazing Sealant: Type S; Grade NS; Class 25; Uses NT, G, A and, as applicable to uses indicated, O; and complying with the following requirements for modulus and additional joint movement capability.
 - 1. Low Modulus: Max. tensile strength of 45 psi at 100% elongation when tested per ASTM D 412 after 14 days at 77°F. (20°C.) and 50% relative humidity.
 - 2. Additional capability, when tested per ASTM C 719 for adhesion and cohesion under maximum cyclic movement, to withstand following percentage increase and decrease of joint width, measured at time of application, and remain in compliance with other requirements of ASTM C 920.
 - a. 50 percent.
- C. Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free butyl-polyisobutylene formulation with solids content of 100%; complying with AAMA A 804.1; in extruded tape form; non-staining and non-migrating in contact with porous surfaces; packaged on rolls with release paper on one side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.
- D. Products: Subject to compliance with requirements, provide one of the following:
 - 1. One-Part Non-Acid Curing Low-Modulus Silicone Glazing Sealant:
 - a. "Chem-Calk 1000"; Bostic Construction Products Div.
 - b. "Dow Corning 790"; Dow Corning Corp.
 - c. "864"; Pecora Corp.
 - d. "Omniseal"; Sonneborn Building Products Div.; Rexnord Chemical Products Inc.
 - e. "Spectrum 1"; Trimco, Inc.
 - 2. Preformed Butyl-Polyisobutylene Glazing Tape Without Spacer Rod:
 - a. "Chem-Tape 40"; Bostic Construction Products Div.
 - b. "Extru-Seal"; Pecora Corp.
 - c. "PTI 303"; Glazing Tape; Protective Treatments, Inc.
 - d. "Tremco 440 Tape"; Trimco, Inc.
 - 3. Preformed Butyl-Polyisobutylene Glazing Tape With Spacer Rod:
 - a. "Chem-Tape 60"; Bostic Construction Products Div.
 - b. "Shim-Seal"; Pecora Corp.
 - c. "PTI 303"; Shim Tape; Protective Treatments, Inc.
 - d. "Pre-shimmed Tremco 440 Tape"; Trimco, Inc.

2.12 GLAZING GASKETS

- A. Dense Elastomeric Compression Seal Gaskets: Molded or extruded gaskets of material indicated below, complying with ASTM C 864, of profile and hardness required to maintain watertight seal:
 - 1. Neoprene.
 - 2. EPDM.
 - 3. Thermoplastic polyolefin rubber.
 - 4. Any material indicated above.
- B. Manufacturer: Subject to compliance with requirements, provide products of one of following:
 - 1. Manufacturers of Preformed Gaskets:
 - a. D. S. Brown Co.
 - b. Maloney Precision Products Co.
 - c. Tremco, Inc.

2.13 MISCELLANEOUS GLAZING MATERIALS

- A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Neoprene, EPDM or silicone blocks required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.

- D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.
- E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.
- F. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets and corners; for presence and functioning of weep system; for existence of min. required face or edge clearances; and for effective sealing of joinery.
 - 1. Obtain Glazier's written report listing conditions detrimental to performance of glazing work.
 - 2. Do not allow glazing work to proceed until unsatisfactory conditions corrected.

3.02 PREPARATION

- A. Pre-installation Meeting: At Contractor's direction, Glazier, sealant and gasket manufacturer's technical representatives, glass framing erector and other trades whose work affects glass and glazing meet at project site to review procedures and time schedule proposed for glazing and coordination with other work.
- B. Clean glazing channels and other framing members to receive glass, immediately before glazing.
 - 1. Remove coatings not firmly bonded to substrates.
 - 2. Remove lacquer from metal surfaces where elastomeric sealants indicated for use.

3.03 GLAZING, GENERAL

- A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements indicated, including those of referenced glazing standards.
- B. Glazing channel dimensions indicated in details intended to provide for necessary bite on glass, min. edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
 - 1. Adjust as required by job conditions at time of installation.
- C. Protect glass from edge damage during handling and installation; use rolling block in rotating glass units to prevent damage to glass corners.
 - 1. Do not impact glass with metal framing.
 - 2. Use suction cups to shift glass units within openings; do not raise or drift glass with pry bar.
 - 3. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so to locate these at top of opening.
 - 4. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

3.04 GLAZING

- A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner max. 6" from corner unless otherwise required; set in thin course of sealant acceptable for heel bead use.
- B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods used for glazing.
 - 1. Provide 1/8" min. bite of spacers on glass.
 - 2. Use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
- D. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
- E. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.
- F. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
- G. Tool exposed surfaces of sealants to provide substantial "wash" away from glass.
 - 1. Install pressurized tapes and gaskets to protrude slightly out of channel, to eliminate dirt and moisture pockets.
- H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket not "walk" out when installation subjected to movement.
- I. Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and but joints with sealant recommended by gasket manufacturer.
- J. Lock-Strip Gasket Glazing:
 - 1. Comply with ASTM C 716 and gasket manufacturer's printed recommendations.
 - 2. Provide supplementary wet seal and weep system unless otherwise indicated.

3.05 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass.
 - 1. Do not apply markers to surfaces of glass.
 - 2. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but min. once a month, for build-up of dirt, scum, alkali deposits or staining.
 - 1. When examination reveals presence of such residue, remove by method recommended by glass manufacturer.

- D. Remove and replace broken, chipped, cracked, abraded glass or glass damaged in other ways during construction period, including natural causes, accidents and vandalism.
- E. Wash glass on both faces min. 4 days prior to date scheduled for inspections intended to establish date of Final Acceptance in each area of Project.
 - 1. Wash glass by method recommended by glass manufacturer.

END OF SECTION 08800

**SECTION 09250
GYPSUM DRYWALL**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of each type of gypsum drywall construction required indicated on Drawings.
- B. This Section includes following types of gypsum board construction:
 - 1. Steel studs framing for exterior and interior load bearing and non-load bearing walls.
 - 2. Steel stud framing for exterior non-load-bearing curtain wall framing.
 - 3. Gypsum board screw-attached to steel framing and furring members.
 - 4. Fiber-Reinforced-Cement Panels.
 - 5. Reinforced drywall screw-attached to steel framing and furring members.
 - 6. Acoustical Insulation specified to be installed in metal stud partitions.
 - 7. Glass mesh mortar units for application of tile.
- C. Wood framing and furring specified in following Division 6 sections:
 - 1. "Rough Carpentry."
- D. Glass Mesh Mortar Units as base for ceramic wall tile specified in Division-9 Section "Tile"; steel framing for glass mesh mortar units included in this Section 09250.
- E. Glass mesh sheathing as base for Exterior Insulation and Finish Systems specified in Division-7 Section "Exterior Insulation and Finish System"; steel framing for E.I.F.S included in this Section 09250.
- F. Access panels occurring in gypsum board walls or ceilings are specified in Division 8 Section "Access Doors".

1.03 PERFORMANCE REQUIREMENTS:

- A. General: The contractor/supplier shall be responsible for the design of light gage metal stud framing system, components and methods of attachment of framing to building structure.
- B. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated:
 - 1. Design Loads: Design member for following loads:
 - a. Wind Loads: 110 MPH
 - b. Earthquake: Zone #2; unless more stringent required by code.
 - c. Dead Load: Actual weights of materials and construction.
 - 2. Deflection Limits:
 - a. Comply with code requirements unless more stringent requirements listed herein.
 - b. Exterior Load-bearing and Non-loadbearing (Masonry): 1/720.
 - c. Exterior Load-bearing and Non-loadbearing Synthetic Plaster (EFIS): 1/360.
 - d. Interior Non-Bearing Wall Synthetic Plaster/Drywall: 1/240.
 - 3. Design framing system to provide for movement of framing members without damage or over stressing sheathing, failure, connection failure, undue strain on fasteners and anchors, or other detrimental effect when subjected to maximum a ambient temperature change of 120 degrees F.
- C. Design exterior non-loadbearing curtain wall framing to accommodate horizontal deflection with regard for contribution of sheathing materials.

1.04 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this Section or other referenced standards.

1.05 SUBMITTALS

- A. Product data from manufacturers for each type of product specified.
- B. Submit samples of each product specified herein.
- C. Submit, as part of shop drawing review phase of the project, structural engineer design narrative and structural engineering calculations for light gage metal framing system proposed to be used for exterior framing, interior structural framing and interior suspended (furred) framing. Calculations not required for interior, non-structural wall framing where height of studs is less than 12'-0".
 - 1. Indicated size, gages, and spacing of framing materials to be used.
 - 2. Indicate method of attachment of framing to building structure.
 - 3. Indicate methods by which suspended and furred walls and ceilings are to be supported from the structure.

1.06 QUALITY ASSURANCE

- A. Work included in this Section to comply with United States Gypsum Company, " Gypsum Construction Handbook", Third Edition, 1987, and "Recommended Specifications for Application and Finishing Gypsum Board", 6A-216-82, as prepared by the Gypsum Association.
 - 1. If there are ambiguities or options between these requirements and/or ambiguities and options between these and the requirements herein specified, the more stringent requirement shall govern.
- B. Engineering Responsibility: Engage qualified, Georgia licensed professional engineer to prepare design calculations, shop drawings and other required structural data.
- C. Professional Engineer Qualifications: Professional engineer to be legally qualified to practice in Jurisdiction where project is located and who is experienced in providing engineering services of the type required.
 - 1. Engineering services are defined as those performed for installation of cold formed metal framing that are similar to those indicated for this project in material design and extent.
- D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance rating determined per ASTM E 119 by testing and inspecting organization acceptable to authorities having jurisdiction.
 - 1. Provide fire-resistance-rated assemblies, identical to those indicated by reference to GA File Nos. in GA-600 "Fire Resistance Design Manual" or to design designations in U.L. "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having jurisdiction.
- E. Single-Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from single manufacturer.
- F. Welding: Quality producers over personnel according to AWS D1.1 " Structural Welding Code-Steel" and AWS D1.3 Structural Welding Code - Structural Steel".
- G. Metal Stud manufacturer: Manufacturer of metal studs to be a member of the 'Steel Stud Manufacturer's Association (SSMA)':
 - 1. Products to be identified using SSMA four part identification code.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

- B. Store materials inside under cover and keep dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes; neatly stack gypsum boards flat to prevent sagging.
- C. Handle gypsum boards to prevent damage to edges, ends and surfaces; do not bend or otherwise damage metal corner beads and trim.

1.08 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.
- B. Minimum Room Temperatures:
 - 1. For nonadhesive attachment of gypsum board to framing, maintain not less than 40°F (4°C).
 - 2. For adhesive attachment and finishing of gypsum board maintain not less than 50°F (10°C) for 48 hours prior to application and continuously thereafter until drying complete.
- C. Ventilate building spaces to remove water not required for drying joint treatment materials.
 - 1. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

1.09 ASBESTOS

- A. Products specified herein to be 100% free of Asbestos.
 - 1. Submit Manufacturer certification that all products contained herein do not contain asbestos.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements provide products of one of following:
 - 1. Steel Framing and Furring:
 - a. Dale/Incore Industries, Inc.
 - b. Dietrich Industries, Inc.
 - c. Formetal Co. Inc;
 - d. Incor, Inc.
 - e. Marino Industries Corp.
 - 2. Gypsum Boards and Related Products:
 - a. Centex American Gypsum Co.
 - b. Domtar Gypsum Co.
 - c. Genstar Building Materials Company.
 - d. Georgia-Pacific Corp.
 - e. Gold Bond Building Products Div., National Gypsum Co.
 - f. United States Gypsum Co.

2.02 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS AND WALLS

- A. Definition: For the purposes of this section suspended and furred ceiling and walls shall be defined as any wall which is not floor supported.
- B. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.
 - 1. Sizes (Depth, thickness and gage) of members indicated are minimums.
 - 2. Members to be designed by supplier's structural engineer to comply with performance standards listed above.
- C. Components listed herein shall be used for applications noted, including:
 - 1. Suspended and furred ceilings, soffits and walls.
 - 2. Fire rated assembled; suspended and attached to underside of structure.

- D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating soft temper.
- E. Channels: Cold-rolled steel, 0.0598" min. thickness of base (uncoated) metal and 7/16" wide flanges, protected with rust-inhibitive paint, and as follows:
 - 1. Carrying Channels: 1½" deep, 475 lbs per 1000 ft., unless otherwise indicated.
 - 2. Furring Channels: ¾" deep, 300 lbs per 1000 ft., unless otherwise indicated.
- F. Steel Studs: ASTM C 645, with flange edges bent back 90° and doubles over to form 3/16" min. lip (return), min. thickness of base (uncoated) metal and min. depth as follows:
 - 1. Thickness: 20 ga. (0.0359"), unless otherwise indicated.
 - 2. Depth: 3⅝", unless otherwise indicated.
- G. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, 7/8" depth, and min. thickness of base (uncoated) metal as follows:
 - 1. Thickness: 20 ga. (0.0359"), unless otherwise indicated.
- H. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, complying with ASTM C 645 for material, finish and widths of face and fastening flange, fabricated to form ½" deep channel of following configuration:
 - 1. Single-Leg Configuration: Asymmetric-shaped channel with face connected to single flange by single slotted leg (web).

2.03 STEEL FRAMING FOR WALLS AND PARTITIONS

- A. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.
 - 1. Sizes (Depth, thickness and gage) of members indicated are minimums.
 - 2. Members to be designed by licensed structural engineer to comply with performance standards listed above
- B. Steel Studs, Runners, and Kickers: ASTM C 645, with flange edges of studs bent back 90° and doubled over to form lip (return) and sizes required as determined through structural engineering by manufacturer. However sizes shall comply the following requirements for **minimum** thickness of base (uncoated) metal and for depth.
 - 1. Interior Non-Loadbearing Walls and Partitions: Min. 1-1/4" face width with 3/16" lip:
 - a. Depth: 3⅝", unless otherwise indicated.
 - b. Thickness (based on 16" o.c. spacings):
 - 1) Thickness: 25-ga. (0.0209") in walls up to and including 13'-0" high.
 - 2) Thickness: 22-ga. (0.0269") in walls 13'-1" to 15'-1" high.
 - 3) Thickness: 20-ga. (0.0329") in walls 15'-2" to 16'-1".
 - 4) Thickness: 16-ga (0.0538") in walls 16'-2" to 18'-1".
 - 2. Exterior Non-Loadbearing Walls: Min. 1-3/8" face width with 3/8" lip:
 - a. Depth: 6", unless otherwise indicated.
 - b. Thickness (based on 16" o.c. spacings):
 - 1) Thickness: 20 ga. (0.0329") in walls up to and including 12'-9".
 - 2) Thickness: 18 ga. (0.0428") in walls 12'-10" to 13'-11".
 - 3) Thickness: 16 ga. (0.0538") in walls 14'-0" to 14'-11".
 - 4) Thickness: 14 ga. (0.0677") in walls 15'-0" to 15'-11".
 - 5) Thickness: 12 ga. (0.0966") in walls 16'-0" to 18'-6".
- C. Channel Bridging (Braces): ASTM C 645, Channel Shaped, depth and minimum thickness of base (uncoated) metal as follows:
 - 1. Depth: 1½" deep.
 - 2. Thickness: 16 Gauge.
- D. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth and min. thickness of base (uncoated) metal as follows:
 - 1. Depth: 7/8".
 - 2. Thickness: 20 ga. (0.0359"), unless otherwise indicated.

- E. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, complying with ASTM C 645 for base metal, finish and widths of face and fastening flange, fabricated to form ½" deep channel of following configuration:
 - 1. Single-Leg Configuration: Asymmetric-shaped channel with face connected to single flange by single slotted leg (web).
 - F. Z-Furring Members: Manufacturer's standard zee-shaped furring members with slotted or nonslotted web, fabricated from hot-dip galvanized steel sheet complying with ASTM A 525, Coating Designation G60; with min. base metal (uncoated) thickness of 25 ga. (0.0209"), face flange of 1¼", wall attachment flange of ⅞", and of depth required to fit insulation thickness indicated.
 - G. Fasteners: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring members securely to substrates involved; complying with recommendations of gypsum drywall manufacturers for applications indicated.
 - H. Furring Brackets: Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, min. thickness of base (uncoated) metal of 20 ga. (0.0359"), designed for screw attachment to steel studs and steel rigid furring channels used for furring.
- 2.04 GYPSUM BOARD
- A. General: Provide gypsum board of types indicated in max. lengths available to minimize end-to-end joints.
 - B. Thickness: Provide gypsum board in thicknesses indicated, or if not otherwise indicated, in either ½" or ⅝" thicknesses to comply with ASTM C 840 for application system and support spacing indicated.
 - C. Gypsum Wallboard: ASTM C 36, and as follows:
 - 1. Types:
 - a. Regular, unless otherwise indicated.
 - b. Foil-backed where indicated.
 - c. Type X for fire-resistance-rated assemblies.
 - 2. Edges: Tapered and featured (rounded or beveled) for prefilling.
 - 3. Thickness: ⅝", unless otherwise indicated.
 - D. Products: Subject to compliance with requirements, provide one of following products where Type X gypsum wallboard indicated:
 - 1. "Gyprock Fireguard 'C' Gypsum Board"; Domtar Gypsum Co.
 - 2. "Fire-Shield G"; Gold Bond Building Prod. Div., National Gypsum Co.
 - 3. "SHEETROCK Brand FIRECODE 'C' Gypsum Panels"; U. S. Gypsum Co.
- 2.05 FIBER-REINFORCED-CEMENT PANELS
- A. Proprietary fiber-reinforced-cement interior liner panels, complying with following requirements:
 - 1. Fiber-Reinforced-Cement Panels: High density fiber reinforce portland cement ; 7/16" thick x 48" wide x 36", 48", 60", 64", or 72" long; 3.3 lbs./s.f; with tapered edges.
 - a. "Hardiboard"; James Hardie Building Products.
- 2.06 REINFORCED DRYWALL BOARDS
- A. Proprietary drywall boards reinforced for improved impact resistance, fire rated where indicated, with feathered edges. Boards, when tested in accordance with ASTM E 695 (modified) shall have no failure after 17 impacts with a 50 pound, 9" diameter leather ball, 28" in length, when board is installed on 2 x 4's at 16" o.c.. Approved manufacturers subject to conformance with requirements contained herein:

1. Fiber-reinforced gypsum wall board complying with ASTM C 1278-94; 5/8" thick; Louisiana-Pacific Fiberbond Wallboard.
 2. Hi-impact wallboard panels consisting of gypsum core encased in a heavy natural-finish paper on the face side and a strong liner paper and "lexan" film laminated on back side; 5/8" thick; National Gypsum, "Hi-Impact Wallboard".
 3. High density fiber-reinforced-portland-cement interior liner panels, 7/16" thick, 3.3 pounds per square foot; James Hardie Building Products; "Hardiboard".
- B. Application: Reinforced drywall to be utilized on interior partitions located between classrooms and other instructional areas where gypsum wall board indicated to be installed. Extend from finished floor to top of partition.

2.07 GLASS MESH REINFORCED SHEATHING

- A. Proprietary backing units with glass mesh fiber mesh reinforcing and water resistant coating on both faces, complying with one of the following:
1. Coated Gypsum Panels: Water resistant, silicone-treated gypsum core with glass fiber mesh surface mats and manufacturer's proprietary water/vapor retarding, alkali resistant coating on both faces, 1/2" thick x 48" wide x 96", 108" or 120" long, weighing 2.0 lbs./s.f.
 2. Cement-Coated Portland Cement Panels: High density portland cement surface coating on both faces, lightweight concrete core composed of portland cement and expanded ceramic aggregate; 7/16" thick x 36" wide x 36", 48", 60", 64", or 72" long; 3.2 - 3.8 lbs./s.f.
 3. Vinyl-Coated Portland Cement Panels: Core formed in continuous process from aggregated portland cement slurry and reinforced with vinyl-coated woven glass fiber mesh embedded in both surfaces, with one face smooth and other textured; 1/2" thick and x 36" wide x 48", 60", and 72" long; 3 lbs./s.f.
 4. Products: Subject to compliance with requirements, provide one of following products:
 - a. "Dens-Glass Gold"; Georgia Pacific Corp.
 - b. "Wonder-Board"; Modulars Inc.
 - c. "Durock Tile Backer Board"; Durabond Div., USG Industries, Inc.

2.08 TRIM ACCESSORIES

- A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below:
1. Material: Formed metal, plastic or metal combined with paper, with metal complying with following requirements:
 - a. Sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum.
 2. Profile: All Corner and Edge trim to have raised lip for tape and mud application unless specifically noted as being non-taped.
- B. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047:
1. "LC Bead"; mud-on type, unless otherwise indicated.
 2. "L" Bead; mud-on type where indicated.
 3. "U" Bead; mud-on type where indicated.
- C. One-Piece Control Joints: Formed with vee-shaped slot per Fig. 1 in ASTM C 1047, with slot opening covered with removable strip.
- D. Metal Cornerbead and Edge Trim for Exterior Ceilings: Comply with following requirements:
1. Edge trim complying with ASTM C 1047, formed from rolled zinc, shape "LC" Bead per Fig. 1 unless otherwise indicated.
- E. Column Collar: Where Gypsum board abut round or partially round concrete columns provide preformed Column Trim of inside dimension to match column diameter.
1. Column Collar to be Single piece extruded aluminum of finish to match ceiling grid.
 2. Size: Provide edge moldings fabricated to diameter required to fit penetration exactly.
 2. Style: 3/4" Reveal Edge; of type to accommodate ceiling specified.

3. Approved Manufacturers; Subject to conformance with specification:
 - a. Alabama Metal Industries
 - a. Fry Reglet Corporation.
 - b. MM Systems Corporation.

2.09 GYPSUM BOARD JOINT TREATMENT MATERIALS

- A. General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for application indicated.
- B. Joint Tape: Paper reinforcing tape, unless otherwise indicated.
 1. Use pressure sensitive or staple-attached open-weave glass fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
- C. Drying-Type Joint Compounds: Factory-prepackaged vinyl-based products complying with following requirements for formulation and intended use.
 1. Ready-Mix Formulation: Factory-premixed product.
 2. Taping compound formulated for embedding tape and for first coat over fasteners and flanges of corner beads and edge trim.
 3. Topping compound formulated for fill (second) and finish (third) coats.
 4. All-purpose compound formulated for use as both taping and topping compound.

2.10 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and recommendations of manufacturer of gypsum board.
- B. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum boards.
- C. Spot Grout: ASTM C 475, setting-type joint compound of type recommended for spot grouting hollow metal door frames.
- D. Fastening Systems:
 1. Gypsum Board Adhesive; For metal: Special adhesive recommended for laminating gypsum boards to steel framing.
 2. Gypsum Board Screws: ASTM C 1002.
- E. Asphalt Felt: ASTM D 226, Type I (No. 15).
- F. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant complying with requirement specified in Division-7 section "Joint Sealers."
- G. Sound Attenuation Blankets: Unfaced mineral fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:
 1. Mineral Fiber Type: Fibers manufactured from glass or slag.
 2. Thickness: Thickness as indicated on drawings. If not indicated, as follows:
 - a. In Stud Partitions: Full Thickness of wall or partition.
 - b. Above Ceilings: 3" minimum.
- H. Reinforced Drywall Boards Finishing Materials: Tape and joint compounds recommended by reinforced drywall manufacturer.
- I. Glass Mesh Mortar Unit Finishing Materials: Tape and joint compounds recommended by glass mesh mortar unit manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction; do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Ceiling Anchorages: Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure inserts and other structural anchorage provisions installed to receive ceiling anchors in manner to develop their full strength and at spacing required to support ceiling.
- B. Metal stud framing and furring for partitions, walls, fur down areas, soffits, ceilings and fire rated assemblies shall be attached to roof structure at the **UNDERSIDE** of the roof structure in accordance with the following:
 - 1. Provide double 6" 18 gage horizontal metal stud, long leg vertical, at underside of structure, spanning a minimum of three structural members. Horizontal studs to be at 16" on center.
 - 2. Attach vertical studs to horizontal stud, using screws; min five per connection point.

3.03 NON-RATED PARTITION CONSTRUCTION

- A. Where indicated and specified herein the contractor shall construct partitions, walls, ceilings and assemblies in accordance with applicable requirements of contract documents
 - 1. Unless detailed or noted otherwise extend partitions to no less than 8" above the 'upper' adjacent ceiling. If no ceiling exists on one or both sides of wall, extend partition to deck.
 - 2. Extend walls to roof deck where walls are noted on drawings as being extending to deck ('D').

3.04 FIRE RATED, SMOKE RATED AND SMOKE TIGHT CONSTRUCTION

- A. Where indicated and specified herein the contractor shall construct partitions, walls, ceilings and rated assemblies in accordance with applicable U.L. Design Numbers.
 - 1. All Materials utilized shall be in accordance with applicable U.L. Design Number.
 - 2. Installation methods shall comply with applicable U.L. Design Number.
 - 3. Partitions, walls and ceilings, where designated to be fire and/or smoke rated, shall be installed in a manner to maintain the continuity of the rating, whether specifically shown on drawings or not.
 - 4. Walls and ceilings shall be continuous without interruptions.
 - a. Gypsum board shall extend around columns or beams or other obstructions occurring in wall in order that the specified rating may be retained.
 - b. Do not recess equipment, devices or specialties in fire rated walls or ceilings unless provisions are made to maintain rating behind recessed item.
 - 5. Walls shall, unless noted or detailed otherwise, extend from:
 - a. Floor to roof deck, where shown or required to maintain continuity of smoke barrier.
 - b. Floor to fire rated ceiling assembly where fire rated assembly occurs, unless noted to extend to deck.
 - c. Top of Masonry wall to roof deck where masonry wall is terminated at or near ceiling level.
 - 6. Where fire rated wall or partition abuts a fire rated ceiling assembly or roof deck, seal in accordance with applicable details, provisions of specifications, **AND** as required by Local Fire Marshall to maintain specified fire rating and resist the passage of smoke.
 - a. Gap between top of wall and roof shall be sealed (both sides) with fire rated sealant.
 - b. Gap between wall and ceiling shall be sealed (both sides) with fire rated sealant.
 - 7. Penetrations in smoke and fire rated partitions shall be sealed to maintain specified fire rating and to resist the passage of smoke. Methods utilized **SHALL** comply with applicable details, provisions of specifications, **AND** the requirements of the Local Fire Marshall.

- B. Applicable U.L. Design Numbers:
1. Unless noted or detailed otherwise fire rated walls and partitions shall comply with the following:
 - a. Smoke, .5, 1 hour partitions: U.L. Design U465
 - b. 1.5 Hour partitions: U.L. Design U452
 - c. 2.0 Hour Partitions: U.L. Design U454
 - d. 3.0 Hour Partitions: U.L. Design U455
 - e. 4.0 Hour Partitions: U.L. Design U463
 2. Unless noted or detailed otherwise fire rated ceilings and assemblies shall have the same U.L. Design numbers as equivalent rating on walls, except that ceiling is turned horizontally.

3.05 INSTALLATION OF STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking and bracing at terminations in work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar construction to comply with details indicated and with recommendations of gypsum board manufacturer, or if none available, with United States Gypsum Co., "Gypsum Construction Handbook".
1. Solid back blocking required behind all permanent wall mounted fixtures, including but not limited to: overhead cabinets (top & bottom), base cabinets (top), miscellaneous shelving, door stops, plumbing fixtures, toilet accessories (all), mechanical equipment and controls, and electrical equipment and controls.
- C. Size, space, brace and attach metal framing in accordance with framing manufacturer's recommendations.
1. Do not exceed limitations for unbraced stud lengths for manufacturer's published structural characteristics for each depth and thickness.
 2. Do not exceed limitations for spacing and span furring members of manufacturer's published structural characteristics for each profile, depth and thickness.
 3. Provide internal stiffeners and external bracing as specified herein, detailed and as required by framing manufacturer.
 4. If drawings conflict with manufacturer's recommendations or limitations, request decision of Architect for resolution.
 5. Unless otherwise instructed by Architect, the contractor shall assume the most stringent of the requirements governs.
- D. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement, at locations indicated below to comply with details shown on Drawings:
1. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements.
 2. Where partitions and wall framing abuts overhead structure.
 3. Provide slip or cushioned type joints as detailed or required to attain lateral support and avoid axial loading.
- E. Do not bridge building expansion and control joints with steel framing or furring members; independently frame both sides of joints with framing or furring members or as indicated.

3.06 INSTALLATION OF STEEL FRAMING FOR SUSPENDED CEILINGS

- A. Install Steel Framing for Suspended and Furred Ceilings in the following locations:
1. Where fire rated or smoke tight ceilings are specified.
 2. Where Suspended Gypsum Board Ceilings are specified.
 3. Where Suspended Gypsum board and plywood ceilings are specified.
 4. Where furred areas of ceilings and walls are indicated.
 5. Elsewhere where shown on drawings or specified herein.
- B. Secure hangers to structural support by attaching to bottom chord of pre-fabricated metal trusses.
1. Do not attach hangers to metal deck tabs.
 2. Do not attach hangers to metal roof deck.
 3. Do not attach hangers to metal roofing.
 4. Do not connect or suspend steel framing from ducts, pipes or conduit.

- C. Keep hangers and braces 2" clear of ducts, pipes and conduits.
 - D. Sway-brace suspended steel framing with hangers used for support.
 - E. Install suspended steel framing components in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.
 - 1. Wire Hangers: 0.1620" dia. (8 gage), 4' o.c. and 6" from each end.
 - 2. Carrying Channels (Main Runners): 1-½", 4' o.c. and 6" from each end.
 - a. Install carrying channels perpendicular to building structural members.
 - 3. Rigid Furring Channels (Furring Members): 16" o.c. and 6" from each end.
 - a. Install furring channels perpendicular to carrying channels.
 - F. Installation Tolerances: Install steel framing components for suspended ceilings so that cross furring members or grid suspension members are level to within ⅛" in 12' measured both lengthwise on each member and transversely between parallel members.
 - G. Saddle Wire-tie using double strand 18 gauge tie wire or clip furring members to main runners (carrying channels) and to other structural supports.
 - H. At fire rated and smoke tight assemblies comply with requirements of applicable U.L. Design numbers.
- 3.07 INSTALLATION OF STEEL FRAMING FOR WALLS AND PARTITIONS
- A. Install steel framing for walls and partitions in accordance with:
 - 1. Manufacturer's recommendations and requirements.
 - 2. Provisions of these specifications.
 - 3. Applicable details.
 - B. Install runners (tracks) at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other construction.
 - 1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.
 - 2. Attach tracks to structure (floor, walls, columns, roof structure / deck) at a maximum of 24" on center using concrete stub nails, power driven fasteners or 1/2" bolts and nuts.
 - C. Installation Tolerances: Install each steel framing and furring member so that fastening surface do not vary more than ⅛" from plane of faces of adjacent framing.
 - 1. Studs to be installed plumb and true.
 - D. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings.
 - 1. Where walls terminate below floor or roof structure, provide stud braces (kickers) from top of partition to structural components above.
 - a. Stud braces (kickers) to be set with a minimum angle from horizontal of 30 degrees and a maximum of 60 degrees.
 - b. Stud braces (kickers) to be at 48" on center staggered.
 - 2. Where walls extend to structure above, provide 4" stud brace at top of partition to allow anchoring of top of partition.
 - a. Brace to extend across a minimum of two structural members (purlins, joists, beams, top chord of pre-fabricated trusses) when partition is perpendicular to structural members; across three structural members when partition is parallel to structural member. Secure to structural member. Secure stud to brace.
 - b. Do Not attach stud to metal roofing.
 - E. Install steel studs and furring in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.
 - 1. For single or double layer construction: 16" o.c.
 - 2. Install steel studs so that flanges point in same direction and gypsum boards installed in direction opposite that of flange.
 - 3. Place studs in direct contact with door and window jambs, abutting partitions, and partitions corners.
 - 4. Provide metal channel bridging at center line of stud partitions at 5'-0" on center vertically.

- F. Frame door openings to comply with details indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer.
 - 1. Studs at door jambs to be minimum 20 gage.
 - 2. Provide double studs and jambs and heads of doors and window.
 - 3. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames
 - 4. Install runner track section (for cripple studs) at head and secure to jamb studs.
 - 5. Install cripple studs over openings at same spacing as primary studs.
 - 6. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
 - 7. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - G. Frame openings other than door openings to comply with details indicated or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.
 - H. Provide solid back blocking behind all permanent wall mounted fixtures, including but not limited to: overhead cabinets (top & bottom), base cabinets (top), miscellaneous shelving, door stops, plumbing fixtures, toilet accessories (all), mechanical equipment and controls, and electrical equipment and controls.
- 3.08 INSTALLATION METAL STUDS FOR EXTERIOR WALLS
- A. Metal Studs and Tracks: Install metals studs and tracks in accordance with manufacturers requirements, requirements for 'Installation of Steel Framing for Walls and Partitions' as described above and the following:
 - 1. Attach bottom and top runners 16" o.c. to steel structure with power driven anchors, or 1/2" bolts and nuts.
 - 2. Install continuous horizontal channel bridging in stud openings.
 - a. Bridging to be at a maximum of 4'-0" on center vertically.
 - b. Secure bridging to studs as recommended by Manufacturer.
 - 3. Install studs plumb; do not vary fastening surface of any framing or furring member max. 1/16" from plane of faces of adjacent framing or furring members.
 - 4. Refer to drawings for special framing details.
- 3.09 INSTALLATION METAL STUDS - FURRED PARTITIONS AND SOFFITS
- A. Metal Studs and Tracks: Install metals studs and tracks in accordance with manufacturers requirements, requirements for 'Installation of Steel Framing for Walls and Partitions' as described above and the following:
 - 1. Provide 45 degree kickers (braces) from partition to structure at 48" on center.
 - 2. Provide a 6" 18 gauge horizontal stud, with long dimension vertical, attached to structure and vertical leg of studs to serve as a stiffener. Span a minimum of 3 structural members.
 - a. Screw attach vertical studs to 6" stud; min five screws per connection.
 - 3. Provide continuous channel bridging between studs at mid point of height.
 - a. Wire-tie, using 8 Gauge wire, horizontal bridging to structure above to provide added support for furred framing.
 - 4. Install studs plumb; do not vary fastening surface of any framing or furring member max. 1/8" from plane of faces of adjacent framing or furring members.
 - 5. Provide back-blocking and framing for the support of wall mounted equipment.
 - 6. Refer to drawings for special framing details.
- 3.10 INSTALLATION OF TILE BACKER BOARD
- A. Tile Backer Board: Provide and install Water Resistant Tile Backer Board in areas scheduled to receive ceramic wall tile where partitions are constructed of metal studs and gypsum board.
 - 1. Install in accordance with the manufacturers instructions.
 - 2. Seal "Raw" edges in a manner acceptable to manufacturer.
 - 3. Do not use tile backer board for ceiling applications.

3.11 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840.
- B. Fire and Smoke Rated Partitions, Walls and Ceiling Assemblies: Where fire rated installation is indicated, installation shall comply with the following requirements:
- C. Install sound attenuation blankets where indicated, prior to gypsum board unless readily installed after board installed.
- D. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24" in alternate courses of board.
- E. Install ceiling boards across framing in manner which minimizes number of end-butt joints, and which avoids end joints in central area of each ceiling; stagger end joints at least 24".
- F. Install wall/partition boards in manner which minimizes number of end-butt joints or avoids them entirely where possible.
 - 1. At stairwells and similar high walls, install board horizontally with end joints staggered over studs.
- G. Install exposed gypsum board with face side out.
 - 1. Do not install imperfect, damaged or damp boards.
 - 2. Butt boards together for light contact at edges and ends with max. 1/16" open space between boards.
 - 3. Do not force into place.
- H. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking provided behind end joints.
 - 1. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends.
 - 2. Do not place tapered edges against cut edges or ends.
 - 3. Stagger vertical joints over different studs on opposite sides of partitions.
- I. Attach gypsum board to steel studs so that leading edge or end of each board attached to open (unsupported) edge of stud flange first.
- J. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
- K. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32" wide.
 - 1. Apply spot grout at each jamb anchor clip just before inserting board into frame.
- L. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories. Unless noted otherwise control joints in gypsum board to be spaced in accordance with the following criteria:
 - 1. Maximum area between control joints: 100 Square feet.
 - 2. Maximum Dimension of area: 12 feet.
 - 3. Joints to be equally spaced.
 - 4. Locate at each wall offset.
 - 5. Layout of joints to be approved by Architect prior to installation.
- M. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls properly braced internally.
 - 1. Except where concealed application required for sound, fire, air or smoke ratings, accomplish coverage with scraps of min. 8 sq. ft. area, and limited min. 75% of full coverage.
 - 2. Fit gypsum board around ducts, pipes, and conduits.
 - 3. Where partitions intersect fluted metal deck or panel, cut gypsum board to fit profile of flute and allow ¼" to ½" wide joint for sealant.

- N. Isolate perimeter of non-load-bearing drywall partitions at structural abutments.
 - 1. Provide ¼" to ½" space and trim edge with "U" bead edge trim.
 - 2. Seal joints with acoustical sealant.
- O. Where sound-rated work indicated, seal construction at perimeters, control and expansion joints, openings and penetrations with continuous bead of acoustical sealant including bead at both faces of partitions.
 - 1. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim, and close off sound-flanking paths around or through construction including sealing of partitions above acoustical ceilings.
- P. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.12 METHODS OF GYPSUM BOARD APPLICATION

- A. Single-Layer Application: Install gypsum wallboard as follows:
 - 1. On ceilings apply gypsum board prior to wall/partition board application to greatest extent possible.
 - 2. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated, and provide sheet lengths which minimize end joints.
 - a. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.
 - b. On Z-furring members apply gypsum board vertically (parallel to framing) with no end joints; locate edge joints over furring members.
 - c. Wall Tile Base: Where drywall is base for thin-set ceramic tile and similar rigid applied wall finishes, install gypsum backing board.
 - 3. In "dry" areas install gypsum backing board or wallboard with tapered edges taped and finished to produce flat surface.
 - 4. At showers, tubs, electric water coolers and similar "wet areas" install glass mesh mortar units and treat joints to comply with manufacturer's recommendations for type of application indicated.
- B. Double-Layer Application: Install gypsum backing board for base layer and gypsum wallboard for face layer.
 - 1. On ceilings apply base layer prior to application of base layer on walls/partitions; apply face layers in same sequence.
 - a. Offset joints between layers at least 10".
 - b. Apply base layers at right angles to supports unless otherwise indicated.
 - 2. On partitions/walls apply base layer and face layers vertically (parallel to framing) with joints of base layer over supports and face layer joints offset at least 10" with base layer joints.
 - 3. On Z-furring members apply base layer vertically (parallel to framing) and face layers either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member; locate edge joints of base layer over furring members.
- C. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:
 - 1. Fasten with screws.
 - 2. Fasten to wood supports with single nailing.
- D. Double-Layer Fastening Methods: Apply base layer of gypsum board and face layer to base layer as follows:
 - 1. Fasten both base layers and face layers separately to supports with screws.

3.13 INSTALLATION OF DRYWALL TRIM ACCESSORIES

- A. General: Where feasible, use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports; otherwise, fasten flanges to comply with manufacturer's recommendations.
- B. Install corner beads at external corners.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim indicated.
 - 1. Provide type with face flange to receive joint compound except where "U-bead" (semi-finishing type) indicated.

2. Install "LC" bead where drywall construction tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 3. Install U-bead where indicated, and where exterior gypsum board edges not covered by applied moldings or indicated to receive edge trim with face flanges covered with joint compound.
- D. Install control joints at locations indicated, or if not indicated at spacings and locations required by referenced gypsum board application and finish standard, and approved by Architect for visual effect.
- E. Install access panels where indicated in accordance with manufacturer's directions.
1. Anchor panels securely to auxiliary framing.
 2. Set panel flush with face of gypsum board.
- 3.14 FINISHING OF DRYWALL
- A. General:
1. Apply joint treatment at gypsum board joints (both directions), flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration. based on levels defined in GA -214.
 - a. Level 1: Unexposed surfaces (duct shafts, above ceilings, etc.)
 - b. Level 2: Surfaces to receive ceramic tile or similar materials.
 - c. Level 3: Surfaces to receive heavy textured coatings.
 - d. Level 4: Surfaces to receive wall covering or flat, minimum sheen paints and coatings.
 - e. Level 5: Surfaces to receive semi-gloss or gloss paints and coatings and surfaces receiving natural or strong artificial light if finish not heavily textured.
 2. Re-treat to next level any surfaces showing joint or fastener treatment imperfections
- B. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.
- C. Apply joint tape at joints between gypsum boards, except where trim accessories indicated.
- D. Finish interior gypsum wallboard by applying following joint compounds in 3 coats (not including prefill of openings in base), sand between coats and after last coat:
1. Compounds:
 - a. Embedding and First Coat: Ready-mix drying-type all-purpose or taping compound.
 - b. Fill (Second) Coat: Ready-mix drying-type all-purpose or topping compound.
 - c. Finish (Third) Coat: Ready-mix drying-type all-purpose or topping compound.
- E. Finish exterior gypsum soffit board by using setting-type joint compounds to prefill joints, embed tape, and to apply first, fill (second) and finish (third) coats; smooth each coat before joint compound hardens to minimize need for sanding; sand between coats and after finish coat.
1. Painting of exterior gypsum soffit board after finish coat dried is specified in Division-9 Section "Painting."
- F. Base for Acoustical Tile: Where gypsum board indicated as base for adhesively-applied acoustical tile, install tape and 2-coat compound treatment, without sanding.
- G. Water-Resistant Gypsum Backing Board Base for Ceramic Tile: Comply with ASTM C 840 and manufacturer's recommendations for treatment of joints behind tile.
- H. Water-Resistant Backing Board Base for Ceramic Tile: Finish joints between water-resistant backing board with tape and setting-type joint compound to comply with gypsum board manufacturer's recommendations and installation standards referenced in Division-9 Section "Tile."
- I. Partial Finishing: Omit third coat and sanding on concealed drywall work indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

3.15 PROTECTION

- A. Provide final protection and maintain conditions, in manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of Final Acceptance.

END OF SECTION 09250

SECTION 09270
GYPSUM BOARD SHAFT WALL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes following applications for gypsum board shaft wall systems:
 - 1. Elevator shaft enclosures.
 - 2. Service shaft enclosures (for piping, ductwork, air plenums, electrical, and similar services).
 - 3. Fire rated wall construction where indicated.
- B. Gypsum drywall construction for applications other than shaft walls specified in Division 9 Section "Gypsum Drywall."
- C. Application and finishing of gypsum wallboard specified by reference to Division 9 Section "Gypsum Drywall."

1.03 DEFINITIONS

- A. Gypsum board shaft wall systems pretested assemblies of gypsum boards and metal components designed for erection from room-side of shaft.
- B. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this Section or other referenced standards.

1.04 SYSTEM DESCRIPTION

- A. Performance Requirements, General: Provide gypsum board shaft wall systems complying with performance requirements specified, as demonstrated by pretesting manufacturer's corresponding stock systems.
- B. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies, including those incorporating elevator door and other framing, whose fire resistance determined per ASTM E 119 by testing and inspecting organization acceptable to authorities having jurisdiction.
 - 1. Provide fire-resistance rated assemblies identical to those indicated by reference to GA File No.'s in GA 600 "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in listings of other testing and inspecting agencies acceptable to authorities having jurisdiction.
- C. Structural Performance Characteristics: Provide gypsum board shaft wall systems engineered to withstand following lateral design loadings (air pressures), applied transiently and cyclically, for max. heights of partitions required, within following deflection limits, verified by pretesting for deflection characteristics:
 - 1. Lateral Loading: 15 psf.
 - 2. Deflection Limit: 1/240 of partition height.
- D. Sound Attenuation Performance: Provide gypsum board shaft wall systems designed and pretested to achieve following min. ratings for sound transmission class (STC) per ASTM E 90.
 - 1. STC Rating: 39.

1.05 SUBMITTALS

- A. Product data from manufacturers for each type of gypsum board shaft wall system specified.
- B. Product test reports indicating and interpreting test results relative to compliance of gypsum board shaft wall systems with fire resistance, structural performance and acoustical performance requirements.
- C. Research reports or evaluation reports of model code organization acceptable to authorities having jurisdiction which evidence system's compliance with requirements and with building code in effect for Project.

1.06 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain products for gypsum board shaft wall systems from single manufacturer for each type system indicated.
- B. Pre-Installation Conference: Conduct conference at Project Site to comply with requirements of Division 1 Section "Project Meetings."

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes.
 - 1. Neatly stack gypsum boards flat to prevent sagging.
- C. Handle gypsum boards to prevent damage to edges, ends and surfaces.
 - 1. Do not bend or otherwise damage metal corner beads, trim, track, and studs.

1.08 PROJECT CONDITIONS

- A. Comply with requirements for environmental conditions, room temperatures and ventilation specified in following Division 9 Section:
 - 1. "Gypsum Drywall."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of following:
 - 1. Domtar Gypsum Co.
 - 2. Georgia Pacific Corporation.
 - 3. Gold Bond Building Products Div., National Gypsum Co.
 - 4. United States Gypsum Co.

2.02 BASIC SYSTEM MATERIALS

- A. General: Provide standard materials and components listed in manufacturer's published product literature for gypsum board shaft wall systems of type and application indicated.
 - 1. Provide gypsum boards in max. lengths available to eliminate or minimize end-to-end butt joints and in thickness required to produce assemblies complying with structural and other performance requirements.
- B. Steel Framing: ASTM C 645, of profile, size, and base metal thickness required to produce assemblies complying with structural performance requirements, with sectional properties computed to conform with AISI "Specification for Design of Cold-Formed Steel Structural Members."

- C. Gypsum Shaftwall Board: ASTM C 442, Type X liner panel or coreboard designed for shaft wall construction, with moisture-resistant paper facings.
- D. Gypsum Wallboard: ASTM C 36, Type X, and as follows:
 - 1. Edges: Tapered.
 - 2. Edges: Tapered and featured (rounded or beveled) for prefilling.
- E. Gypsum Backing Board for Multi-Layer Applications: ASTM C 442 or, where backing board not available from manufacturer, gypsum wallboard, ASTM C 36, Type X, edge configuration as standard with manufacturer.
- F. Trim Accessories: Provide cornerbeads, edge trim and control joints of material and, for edge trim, shapes specified in Division 9 section referenced below and complying with ASTM C 1047 and gypsum board shaft wall manufacturer's recommendation for application indicated.
 - 1. "Gypsum Drywall."
- G. Gypsum Wallboard Joint Treatment Materials: Provide materials complying with ASTM C 475, ASTM C 840, recommendations of gypsum board shaft wall manufacturer for application indicated, and specified in Division 9 Section "Gypsum Drywall."
- H. Miscellaneous Materials: Provide auxiliary materials for gypsum board shaft wall systems of type and grade recommended by manufacturer of system and as follows:
 - 1. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum boards of type indicated.
 - 2. Gypsum Board Screws: ASTM C 1002.
 - 3. Runner Fasteners: Low-velocity tool-driven fasteners of type, size and material required to withstand loading conditions imposed on shaft wall system without exceeding allowable design stress of runner, fastener or structural substrate in which anchor embedded.
 - 4. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, gunnable synthetic rubber sealant complying with requirements specified in Division 7 Section "Joint Sealers."
 - 5. Spot Grout: ASTM C 475, setting-type joint compound of type recommended for spot grouting hollow metal door frames.
 - 6. Sound Attenuation Blankets: Unfaced mineral fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:
 - a. Mineral Fiber Type: Fibers manufactured from glass.

2.03 BASIC SYSTEM DESCRIPTION

- A. General: Characteristics of selected components described below for purposes of indicating discrete gypsum board shaft wall systems, manufacturers' standard assemblies.
 - 1. Provide complete shaft wall systems which comply with requirements indicated.
- B. Cavity Shaft Wall Systems: Provide assemblies consisting of gypsum shaft wall boards inserted between U- or J-shaped metal floor and ceiling tracks; with specially shaped studs engaged in tracks and fitted between shaftwall boards; and gypsum boards on finished side or sides applied to studs in number of layers, thicknesses and arrangement indicated.
 - 1. Shaftwall Board Thickness: Min. 1", unless noted otherwise.
 - 2. Stud Shape: C-T or C-H.
 - 3. Stud Thickness: 25 gage min. thickness of base metal.
 - 4. Stud Depth: 2-1/2", unless noted.
 - 5. Room-Side Finish: As indicated.
 - 6. Shaft-Side Finish: Two layers gypsum board of thickness indicated below.
 - a. Thickness: 5/8".
 - 7. Cavity Insulation: Provide sound attenuation blankets in cavity formed by studs between shaftwall board and room-side finish.
 - 8. UL Design Number: Construct shaft walls in full compliance with UL Design U428.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates which gypsum board shaft wall construction attaches to or abuts including preset hollow metal frames, elevator hoistway door frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of shaft wall construction.
- B. Do not proceed with installation until unsatisfactory conditions corrected.

3.02 INSTALLATION OF GYPSUM BOARD SHAFT WALL SYSTEMS

- A. General: Install gypsum board shaft wall systems to comply with performance and other requirements indicated as well as with manufacturer's installation instructions and following:
 - 1. ASTM C 754 for installation of steel framing.
 - 2. Division 9 Section "Gypsum Drywall" for application and finishing of gypsum wallboard.
- B. Do not bridge building expansion joints with shaft wall system, frame both sides of joints with furring and other support as indicated.
- C. Install supplementary framing, blocking and bracing to support gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings and similar work not adequately supported directly by regular framing of gypsum board shaft wall system.
- D. Support elevator hoistway door frames independently of shaft wall framing system, or reinforce system in accordance with system manufacturer's instructions.
- E. Where handrails indicated for direct attachment to gypsum board shaft wall system, provide min. of than 0.0341" thick x 4" wide galvanized steel reinforcement strip, accurately positioned and secured behind min. of one gypsum board face layer of 1/2" or 5/8" thickness.
- F. Coordinate gypsum board shaft wall construction with sprayed-on fireproofing of structure, so that both remain complete and undamaged.
 - 1. Patch or replace sprayed-on fireproofing removed or damaged during installation of shaft wall system.
- G. Integrate stair hanger rods with gypsum board shaft wall system where indicated (and where possible); by locating cavity of system as required to enclose rods.
- H. At penetrations in shaft wall, maintain fire resistance rating of entire shaft wall assembly by installing supplementary fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
- I. Isolate shaft wall system from transfer of structural loading to system, both horizontally and vertically.
 - 1. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
 - 2. Comply with details shown and with manufacturer's instructions.
- J. Seal gypsum board shaft walls at perimeter of each section which abuts other work and at joints and penetrations within each section.
 - 1. Install acoustical sealant to withstand dislocation by air pressure differential between shaft and external spaces; comply with manufacturer's instructions and ASTM C 919.

- K. In elevator shafts where gypsum board shaft wall system not positioned within 2" of shaft face of structural beams, floor edges and similar projections into shaft, install 1/2" or 5/8" thick gypsum board cants covering tops of projections as follows:
1. Slope cant panels max. of 15° from vertical.
 2. Set base-edge of panels in gypsum board adhesive and secure top edges to shaft walls at 24" o.c. with screws fastened to shaft wall framing.
 3. Where cants exceed 2", support gypsum board with steel studs spaced 24" o.c.; extend studs from top of projection to shaft wall framing behind cant.

3.03 PROTECTION

- A. Provide final protection and maintain conditions in manner acceptable to Installer, which ensures gypsum board shaft wall system construction being without damage or deterioration at time of Final Acceptance.

END OF SECTION 09270

SECTION 09290
GLASS REINFORCED DECORATIVE TRIM AND COLUMN COVERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the contract, including General Conditions and Supplementary Conditions and Division-1 Specification sections apply to the work of this section.

1.02 SUMMARY OF WORK

- A. Extent of each column covers indicated on drawings and defined herein.
 - 1. Units referred to on drawings as FRP trim and column covers.
 - 2. The contractor shall have the option of selecting and using one of the three types of units specified.
- B. Types of decorative trim and column covers include:
 - 1. Type #1: Fiberglass Reinforced Polyester (FRP) Composite Units:
 - 2. Type #2: Glass Reinforced Cement (GRC) Units:
 - 3. Type #3: Reinforced Concrete Units:
- C. This section covers all labor, material, accessories, scaffolding and appliances necessary for the complete installation of glass reinforced concrete units. Items not mentioned specifically herein, which are necessary to make a complete installation shall also be included.
- D. Related work specified in other sections include:
 - 1. Gypsum Drywall and Metal Studs; Division-9 Section.
 - 2. Painting; Division-9 Section

1.03 SUBMITTALS

- A. Shop drawings: Indicate materials, construction, dimensions, locations, tolerances, connections and installation details.
- B. Product data: Indicate materials, construction, dimensions, locations, tolerances, physical properties, connections and installation details.
 - 1. Indicate clear inside dimension of column covers and trim. Verify that specified columns will fit in the available space inside the column cover.
- C. Samples: Submit one sample of each component including a min. 24" long section of column cover shaft, base and capitol.

1.04 QUALITY ASSURANCE

- A. Manufacturer's qualifications: Minimum of five years experience in the actual production of Glass Reinforced Concrete.
- B. Installer's qualifications: Minimum of five years experience in installation of systems of similar complexity to those specified for this project.

1.05 WARRANTY

- A. Submit at the time of the shop drawings, the manufacturer's warranty that the materials furnished herein will not warp or sag and shall be free of defects for a period of no less than ten (10) years when installed in conformance with the manufacturer's recommendations.

1.06 DELIVERY AND STORAGE

- A. Adequately package and protect materials during shipment.
 - 1. Upon arrival at jobsite, Contractor inspect materials for damage and stains.
 - 2. Remove damaged or permanently stained materials from site and replace at no cost to Owner.
- B. Store materials in dry ventilated areas until installation.
- C. Reinforced units shall be crated in wooden crates, suitably designed for the specific product. The units shall be cushioned and blocked as necessary, to reduce the susceptibility to freight damage.
- D. All crates shall bear the manufacturer's name and a stamp indicating they have been inspected and checked by the Quality Assurance Department. The material is to be warranted against deviation from the shop drawings, by the manufacturer until removed from the crates.
- E. Reinforced units shall be stored on the job in a level area in the manufacturer's crates until ready for use.
- F. The Joint Compound and Primer shall be kept from freezing.

1.07 CERTIFICATIONS

- A. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- B. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

PART 2 - PRODUCTS

2.01 PRODUCTS

- A. Column Covers: Subject to compliance with requirements, provide products of one of following:
 - 1. First Class Building Products, Inc, Marietta, Georgia 30064 (770-514-8141)
 - 2. CRG Enterprises
 - 3. Plasterform Inc., Ontario, Canada; 1-905-677-8390
 - 4. Plasterform Ltd, Davidsonville, Maryland; 1-410-956-0941
 - 5. Weatherrok Division of Plastrglas, Inc; 4200 North 30th Street, Omaha, NE, 68111; Phone Number: 402-455 -0 65 2; Fax: 402-451-5375

2.02 MATERIALS:

- A. Provide trim units and column covers and other elements of one of the following types.
 - 1. Type #1: Fiberglass Reinforced Polyester (FRP) Composite Units: Proprietary blend of fiberglass, marble and dust resin.
 - 2. Type #2: Glass Reinforced Cement (GRC) Units: Fabricated of 'Dense-Crete EC' cement as manufactured by Georgia-Pacific Corporation, water, polymer and Type 'E' glass fiber mat.
 - 3. Type #3: Reinforced Concrete Units: Pre-fabricated glass reinforced concrete units using multi-directional unlayered spray lay-up procedure. Fabricate from Type III portland cement, washed and dried silica sand, potable water, alkali resistant glass fibers complying with PCI - MNL 128, and curing additives.

2.03 TRIM AND COLUMN COVERS

- A. General:
 - 1. Use only one material type for trim units and column covers through out the project.
 - 2. Trim units and column cover types to be suitable for both interior and exterior applications.
- B. Trim:
 - 1. Trim units shall be custom fabricated to profiles indicated on drawings.
 - 2. Joint: Units to be seamless unless otherwise indicated.
 - 3. Thickness of material: 1/2" minimum.
 - 4. Surface Texture: Smooth texture.
 - 5. Finish: Field Painted.
- C. Column Covers: Provide column covers of design indicated including capitals and base. Provide full round and partial round columns of shapes and in locations indicated. Column covers to be as follows:
 - 1. Shaft Diameter: Size as indicated on drawings.
 - 2. Thickness of material: 1/2" minimum.
 - 3. Shaft Type: Plain; non-fluted.
 - 4. Base: As detailed
 - 5. Capital: As detailed.
 - 6. Joint: Units to be seamless unless otherwise indicated.
 - 7. Surface Texture: Smooth texture.
 - 8. Finish: Field Painted.

2.04 FABRICATION

- A. Molds for the reinforced concrete units shall be rigid and constructed of material that will result in smooth, finished products conforming to profiles and dimensions indicated on the shop drawings.
- B. Tolerances (Fabrication): Units shall be fabricated to the following tolerances:
 - 1. Shell Thickness: 1/2" - 0"/+1/4"
 - 2. Dimensional: + or - 1/16" per part
 - 3. Warpage and bow: + or - 1/16" per part
- C. Portland cement, sand, water, chemical admixtures (water reducers, latex bonding agents, accelerators) shall be metered by electron measuring instruments to insure the highest consistency of the batch mix ingredients.
 - 1. The actual batch mixing process in the creation of the concrete slurry shall be timed to manufacturer's prescribed formulation.
 - 2. A quality assurance program shall be in place to assure adherence to the above methods.
- D. Meter glass fiber and concrete slurry rates at spray head to achieve desired mix proportion and glass content. Check in accordance with the standard procedures recommended by PCI.
- E. Machine spray in accordance with the manufacturer's standards for multi-directional, chopped fibers.
- F. Carefully remove units from molds and factory repair hollows, voids, scratches, or other surface imperfections. Surface shall be primer ready.
- G. Each reinforced concrete unit shall bear a stamp indicating it has been inspected and approved by the manufacturer's Quality Assurance Inspector.
- H. Joints: Joints to be covered and sealed in a manner recommended by manufacturer to provide a seamless appearance.
 - 1. Finish with joint compound recommended by manufacturer.
 - 2. Joint compound shall be a latex modified cement, tested in accordance with ASTM C900.
 - 3. Bond strength shall exceed 140 psi when tested on the manufacturer's GRC units.
 - 4. Water soluble joint fillers not permissible.
 - 5. Fill small cracks and voids with spackle of type recommended by manufacturer.

2.05 RELATED MATERIALS

- A. Fasteners: Of type and spacing recommended by column cover manufacturer.
- B. Adhesives: Solvent base construction adhesives
- C. Joint Tape: Of type recommended by column cover manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect areas directly adjacent to planned installation for conditions that will prevent proper installation of reinforced concrete units.
- B. Inspect parts from crates for variations from dimensions and tolerances shown on the manufacturer's shop drawings. Report any discrepancy to the manufacturer before proceeding.

3.02 PREPARATION:

- A. Provide metal stud framing in accordance with provisions of Section 09250, Gypsum Drywall, manufacturers recommendations and following:
 - 1. Space studs at a maximum of 6" O.C..
 - 2. Provide double studs at each column cover joint.
 - 3. Studs to be anchored to floor slab and supporting structure above.

3.03 INSTALLATION

- A. Install reinforced concrete units true, plumb, and level in accordance with the manufacturer's printed installation instructions and shop drawings.
- B. Repair any damage occurring during installation using materials and methods recommended by manufacturer.
- C. Vent all dead air spaces.
- D. Furnish all additional materials, accessories and labor to install materials in manner shown.
- E. Erect FRP components true, plumb and level within the allowable tolerances.
- F. Apply sealant to joints between trim and column covers and other materials.

3.04 FINISHING

- A. Prepare surface as recommended by manufacturer to receive finish specified under Section 09900 - Painting.
- B. Columns shall be cleaned, primed and painted on site by installer.
- C. Preparation: The contractor shall prepare column covers for painting in strict accordance with manufacturers written instructions and as follows:
 - 1. Sand all surfaces to be primed using a medium grit sandpaper.
 - 2. Blow off all dust with compressed air.
 - 3. Surface should be clean, dry, and free of contaminants.
 - 4. Prepare as required to obtain a Level 5 finish as defined in 'Level of Gypsum Board Finish' manual.

- D. Paint Primer: Each unit shall be primed by the contractor with primer recommended by column cover manufacturer prior to applying the finish coat.
1. The primer shall meet the following test requirements established for the coating: Freeze/Thaw Adhesion:
 - a. ASTM D 3359/2246 - A minimum rating a 4A after 10 cycles shall be required. (The test will demonstrate these adhesion characteristics on both the Glass Reinforced Concrete, and the joint compound.)
 2. One coat of primer shall be applied to the entire unit using a 3/8" nap roller at a spreading rate of 80 square feet per gallon.
 3. The primer shall be allowed to cure 12 hours at 75 degrees F prior to topcoating.
- E. Paint Finish Coat: Finish coating will be applied by the painting contractor, and will be an emulsified acrylic, latex, or water-based epoxy, and shall be suitable for exterior concrete.

END OF SECTION 09290

SECTION 09300
TILE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Related work specified in other sections include:
 - 1. Sheet waterproofing specified in Section 07115, Sheet Waterproofing.

1.02 DEFINITIONS

- A. "Thin Set": The term "Thin Set" is used to describe the method of installing tile with a bonding material usually 3/32" to 1/8" thickness. The term thin-set may be used interchangeably for "dry-set" portland cement mortar.
- B. "Wet Area": For the purposes of this section a "wet" area shall be defined as "tile surfaces that are either soaked, saturated, or subjected to moisture or liquids (usually water) such as would be found in shower enclosures, gang showers, tub enclosures, dressing rooms, can wash, laundries, steam rooms, exterior areas, and other areas defined on the drawings.

1.03 DESCRIPTION OF WORK

- A. Definition: Tile includes ceramic surfacing units made from clay or other ceramic materials.
- B. Extent of tile work indicated on drawings and schedules.
- C. Types of tile work in this Section include:
 - 1. Unglazed ceramic mosaic tile.
 - 2. Glazed wall tile.
 - 3. Stone thresholds.
 - 4. Stone window stools.
- D. Portland cement scratch coat over metal lath on wall surfaces indicated to receive tile, work of this Section.
- E. Sealing expansion and other joints in tile work with elastomeric joint sealers, work of this Section.

1.04 QUALITY ASSURANCE

- A. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout and setting materials.
- B. Use adequate numbers of skilled workmen thoroughly trained and experienced in necessary crafts and completely familiar with specified requirements and methods needed for proper performance of work under this Section.
- C. Furnish Master Grade Certificates for each shipment and type of tile, signed by manufacturer and Installer.
- D. Work performed under this Section to comply with the recommendations of the Tile Council of America (TCA).
 - 1. Where conflicts exist between the requirements of this Section and the recommendations of the TCA, the more stringent of the requirements shall govern.

- E. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information and installation instructions for materials required, except bulk materials.
 - 1. Submit as part of catalog data, a minimum of four (4) of TCA "Handbook for Ceramic tile Installation" and ANSI A108 standards that completely describe proposed methods and materials.
- B. Shop Drawings: Submit shop drawings indicating, as a minimum the following:
 - 1. Tile patterns and locations.
 - 2. Location and widths of control, contraction and expansion joints.
 - 3. Drawings to indicate applicable design number.
 - 4. Direction, location, and amount of floor slope.
- C. Material Samples: Submit the following samples of materials:
 - 1. Full size of each type of trim, accessory and for each color.
 - 2. 6" long stone thresholds.
 - 3. 6" long stone window stool.
 - 4. 6" metal edge strip.
- D. Initial Color Selection: Submit manufacturer's full line colors consisting of actual tiles or sections of tiles showing full range of colors, textures and patterns available for each type of tile indicated.
 - 1. Submit name of tile manufacturer.
 - 2. Architect to make selection from manufacturers full line.
 - 3. The Architect shall select a minimum of two and a maximum of four separate colors for each tile type.
 - 4. Accent colors shall be used to create linear graphics, accents stripes, and checkered board patterns.
 - 5. Submit complete color chest of tiles; color board not acceptable.
 - 6. Submit full line of available grout colors.
- E. Color Verification: Upon initial selection by Architect, submit:
 - 1. Min. 12" square sample on plywood or hardboard, fully grouted of each type tile, color and texture selected.
 - 2. Full size of each type trim and accessory in each color selected.
 - 3. 6" long stone threshold
 - 4. 6" long stone window stool.
- F. Certified Test Reports: Submit certified test reports from qualified independent testing laboratory evidencing compliance of tile and tile setting products with requirements specified based on comprehensive testing of current products.
 - 1. Include, in reports, testing laboratory's interpretation of test results relative to specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.
 - 1. Upon arrival at project site contractor shall inspect materials for damage and stains.
 - 2. Remove damaged and permanently stained units from the job site and replace at no cost to the contract.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.
- C. Store materials in dry ventilated areas until installation.

1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.
- C. Maintain temperatures at not less than 50°F (10°C) in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. General: Contractor shall utilize one of the listed manufacturers for tile type.
 - 1. Colors will be selected after award of contract.
 - 2. Architect has option of selecting colors and patterns from any series of tiles listed for selected manufacturer.
 - 3. Except where noted other wise the Architect will select several colors, blended to create custom patterns and graphic designs of rectilinear design without added cost to the contract.
- B. Manufacturers: Subject to compliance with requirements, provide products of one of following manufacturers:
 - 1. Manufacturers of Unglazed Ceramic Mosaic Tile:
 - a. American Olean Tile Co., Inc.
 - b. Dal-Tile Corp.
 - c. Mid-State Tile.
 - d. Summitville Tiles, Inc.
 - e. United States Ceramic Tile Co.
 - 2. Manufacturers of Glazed Wall Tile:
 - a. American Olean Tile Co., Inc.
 - b. Dal-Tile Corp.
 - c. Florida Tile.
 - d. Mid-State Tile.
 - e. Summitville Tiles, Inc.
 - f. United States Ceramic Tile Co.
 - 3. Manufacturers of Latex-Portland Cement Mortars:
 - a. American Olean Tile Co., Inc.
 - b. H.B. Fuller Co.
 - c. L & M Surco Mfg., Inc.
 - d. Laticrete International, Inc.
 - e. Summitville Tiles, Inc.
 - f. Upco Co. Div., Emhart Corp.
 - g. W.R. Bonsal Co.
 - 4. Manufacturers of Latex Portland Cement Grouts:
 - a. American Olean Tile Co., Inc.
 - b. H.B. Fuller Co.
 - c. L & M Surco Mfg., Inc.
 - d. Upco Co. Div., Emhart Corp.
 - e. W.R. Bonsal Co.
 - 5. Manufacturers of Glass-Mesh Mortar Units:
 - a. Durabond Division, USG Industries, Inc.
 - b. Georgia Pacific Corp.
 - c. Glascrete Inc.
 - 6. Manufacturers of Tile Cleaners:
 - a. Hillyard Chemical Co.
 - b. L & M Surco Mfg. Co., Inc.
 - c. Summitville Tiles, Inc.

7. Manufacturers of Filler for Quarry Tile:
 - a. Acqua Mix Products.
 - b. Bostik CeramaSeal
 - c. Watco-Dennis Corp.
8. Grout Release agent for tile:
 - a. Acqua Mix Products.
 - b. Bostik CeramaSeal
 - c. Custom Building Products
 - d. Watco-Dennis Corp
9. Sealer: Penetrating grout sealer equal to Custom Building Products 'Tilelab Grout and Tile Sealer'. Approved manufacturers subject to compliance with requirements contained herein:
 - a. Acqua Mix Products.
 - b. Bostik CeramaSeal
 - c. Custom Building Products
 - d. Watco-Dennis Corp
10. Anti-fracture membrane: Approved manufacturers subject to compliance with requirements contained herein:
 - a. Custom Elite Products 'UltraProof 1000'
 - b. Laticrete 'Blue 92'
 - c. Mer-Krete Fracture-Guard 5000

2.02 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.
 1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.
- C. CTI Standard for Glazed and Unglazed Special Purpose and Faience Tile: Comply with CTI Test Procedure CTI-69-5 for glazed and unglazed special purpose and faience tile indicated.
- D. Colors, Textures and Patterns: For tile, grout and other products requiring selection of colors, surface textures or other appearance characteristics, provide products to match characteristics indicated or, if not otherwise indicated, selected by Architect from manufacturer's standards.
 1. Tile colors and patterns selected by Architect from any of selected manufacturer's lines meeting specified requirements.
 2. Provide tile trim and accessories which match color and finish of adjoining flat tile.
- E. Temporary Wax Coating: Protect exposed surfaces of quarry tile against adherence of mortar and grout where indicated below by precoating with wax to produce continuous film.
 1. Use wax approved by manufacturers of both tile and grout as compatible with their materials and with cleaning method required to remove wax without damage to tile or grout.
 2. Apply wax in manner to avoid coating unexposed tile surfaces and edges; handle tile to prevent waxed surfaces from contacting backs or edges of other units.

2.03 TILE PRODUCTS

- A. Unglazed Ceramic Mosaic Floor Tile: Provide factory-mounted flat tile complying with following requirements:
 1. Type: Porcelain.
 2. Wearing Surface: Without abrasive content.
 3. Nominal Facial Dimensions: 2" x 2".
 4. Nominal Thickness: 1/4".
 5. Face: Plain with cushion or square edges.
 6. Application: Full setting bed unless noted otherwise.

7. Pattern:
 - a. Manufacturers standard with 25% accent colors, except as follows:
 - b. Drinking Fountain Alcoves: 100% accent tile.
 8. Color: As selected by Architect.
 9. Application: Electrical water cooler alcoves and elsewhere where indicated.
- B. Unglazed Ceramic Mosaic Floor Tile: Provide factory-mounted flat tile complying with following requirements:
1. Type: Porcelain.
 2. Wearing Surface: Without abrasive content.
 3. Nominal Facial Dimensions: 1/2" x 1/2".
 4. Nominal Thickness: 1/4".
 5. Face: Plain with cushion or square edges.
 6. Application: Thin set
 7. Pattern: 100 accent tile.
 8. Color: As selected by Architect.
 9. Application: Circular concrete columns; including partially round column covers.
- C. Glazed Wall Tile: Provide flat tile complying with following requirements:
1. Nominal Facial Dimensions: 4-1/4" x 4-1/4".
 2. Nominal Thickness: 5/16".
 3. Face: Plain with square edge, modified square edge, or cushion edge.
 4. Type: Bright, matte or crystal.
 5. Pattern: Graphic Design of linear configuration.
 - a. 20% bright accent colors except as follows:
 - b. Drinking Fountain Alcoves: 100% accent tile.
 6. Mounting: Pregrouted sheets of tile factory-assembled and grouted with manufacturer's standard silicone rubber complying with ANSI A118.6.
 7. Application: Electric Water Cooler Alcoves and elsewhere where indicated.
- D. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:
1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile, where applicable.
 - a. If no adjoining flat tile, 4-1/2" x 4-1/2" base, and where wainscot occurs, 4-1/2" x 2" cap, unless otherwise indicated.
 2. Shapes: As follows, selected from manufacturer's standard shapes:
 - a. Base for Portland Cement Mortar Installations: Coved.
 - b. Base for Thinset Mortar Installations: Straight.
 - c. Wainscot Cap for Portland Cement Mortar Installations: Bullnose Cap.
 - d. Wainscot Cap for Thinset Mortar Installations: Surface bullnose.
 - e. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot shown flush with wall surface above.
 - f. External Corners for Portland Cement Mortar Installations: Bullnose shape with radius min. of 3/4" unless otherwise indicated.
 - g. External Corners for Thinset Installations: Surface bullnose.
 - h. Internal Corners: Field-buttet square corners, except use coved base and cap angle pieces designed to member with stretcher shapes.
 - i. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2" to 1/4" across nominal 4" dimension.
- E. Accessories for Glazed Wall Tile: Provide vitreous china accessories of type and size indicated and in color and finish to match adjoining glazed wall tile.
1. One recessed soap holder for each shower where wall is ceramic tile.

2.04 STONE THRESHOLDS AND WINDOW STOOLS

- A. General: Provide stone which is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces. Stone to be either "natural" or "reconstructed" marble as described below.
- B. Marble: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and abrasion resistance for uses subject to heavy foot traffic.
 - 1. Provide white, honed marble complying with MIA Group "A" requirements for soundness.
 - 2. Color selected by Architect from Manufacturers standard colors
- C. Reconstructed Marble: Fabricate of crushed quarried marble blended with polyester resin in size, shape and thickness indicated with beveled edges and mitered corners:
 - 1. Color selected by Architect from Manufacturers standard colors:
 - 2. Approved Manufacturers:
 - a. Coastal Marble Co., Savannah, Georgia
 - b. Precast Marble, Inc., Gainesville, Georgia.
 - c. Mincey Marble Manufacturing, Inc., Atlanta, Georgia
- D. Thresholds: Fabricate to size and shapes indicated herein and on drawings.
 - 1. Fabricate with bevelled corners, chamfered edges and square ends, notched to match door frame. Edges to be chamfered 1/4" unless noted.
 - 2. Thickness to be as required to extend 1/4" above surface of floor tile.
 - 3. Where adjacent floor elevations differs, slope top surface at 1:12 to comply with handicapped provisions.
 - 4. Width of threshold to be minimum 4"; width as required to provide sloped surface at 1:12.
 - 5. Length to be as required to extend full rough opening of door or opening. Use maximum length sections; no section to be less than 3'-0" long.
- E. Window Stools: Stools to be of either "natural" or "reconstructed" marble of color to match marble thresholds and in compliance with the following:
 - 1. Fabricate to size and shapes indicated on drawings.
 - 2. Fabricate with bevelled edges (1/4") and rounded corners.
 - 3. Thickness to be 3/4" thick unless noted.
 - 4. Length to be as required to extend full rough opening of window. Use maximum length section; no section to be less than 4'-0" long.

2.05 SETTING MATERIALS

- A. Portland Cement Mortar Installation Materials: Provide materials to comply with ANSI A108.1 for installation method designated, unless otherwise indicated.
- B. Cleavage Membrane: Polyethylene film, 4-mil nominal thickness, ASTM C 171, Type 1.1.2.
- C. Reinforcing Wire Fabric: Galvanized welded wire fabric, 2" x 2" - WO.3 x WO.3 (16 ASW gage or 0.0625" diam.); comply with ASTM A 185 and ASTM A 82 except for min. wire size.
- D. Expanded Metal Lath: Provide diamond mesh lath complying with ASTM C 847 for requirements indicated below:
 - 1. Base Metal and Finish for Interior Applications: Fabricate lath from uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.
 - 2. Base Metal and Finish for Exterior Applications: Fabricate lath from zinc-coated (galvanized) steel sheet.
 - 3. Configuration Over Studs and Furring: Flat.
 - 4. Configuration Over Solid Surfaces: Self-furring.
 - 5. Weight: 3.4 lbs. per sq. ft.

- E. Latex-Portland Cement Mortar: Provide product complying with ANSI A118.4 and following requirement for composition:
 - 1. Prepackaged dry mortar mix incorporating dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.

- F. Organic Adhesive: Provide product complying with ANSI A136.1 for Type I.

2.10 GROUTING MATERIALS

- A. Latex-Portland Cement Grout: Provide product complying with ANSI A118.6 for following composition and of color indicated:
 - 1. Prepackaged dry grout mix incorporating dry polymer additive in form of re-emulsifiable powder to which only water added at jobsite.
 - 2. Grout Type: Commercial portland cement grout specified or supplied by latex manufacturer.
 - a. Application: Use to grout joints in floor tile, unless otherwise indicated.
 - 3. Grout Type: Dry-set grout specified or supplied by latex manufacturer.
 - a. Use latex additive without retarder with dry-set grout.
 - b. Application: Use to grout joints in glazed wall tile unless otherwise indicated.
 - 4. Colors selected by Architect from Manufacturers standard colors.
- B. Grout for PregROUTED Tile Sheets: Same silicone rubber used in factory pregROUTED sheets.

2.11 ELASTOMERIC SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.
- B. Compatibility: Provide sealants, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.
- C. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
- D. One-Part Mildew Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and as applicable to nonporous joint substrates indicated, O; formulated with fungicide for sealing interior joints in and around ceramic tile, showers, sinks and plumbing fixtures.
 - 1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Dow Corning 786"; Dow Corning Corp.
 - b. "SCS 1702"; General Electric Co.
 - c. "863 #345 White"; Pecora Corp.
 - d. "Proglaze White"; Tremco Corp.
- E. Multi-Part Pourable Urethane Sealant: Type M; Grade P; Class 25; Uses T, M, A and as applicable to joint substrates indicated, O.
 - 1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Hydroment 550", Bostik Const. Prod. Div., Emhart Corp.
 - b. "Vulkem 245"; Mameco International, Inc.
 - c. "NR-200 Urexpan"; Pecora Corp.
 - d. "THC-900"; Tremco Corp.

2.12 MISCELLANEOUS MATERIALS

- A. Glass-Mesh Mortar Units: Proprietary backing and underlayment panels composed of concrete core with glass fiber mesh reinforcing on both faces covered with portland cement treatment; average weight 3.4 lbs. per sq. ft.; thickness, 7/16" or 1/2" as standard with manufacturer.
 - 1. Application: For use with ceramic wall tile where applied to metal stud partitions.
- B. Metal Edge Strips: Zinc alloy or stainless steel terrazzo strips, 1/8" wide at top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated.
- C. Tile Cleaner: Product specifically acceptable to manufacturer of tile and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation, 112 North Alfred St., Alexandria, VA 22134 or Ceramic Tile Institute, 700 N. Virgil Ave., Los Angeles, CA 90029.
- D. Provide other materials, not specifically described, but required for complete and proper installation.
 - 1. Materials utilized subject to Architect's approval.

2.13 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers for accurately proportioning of materials, water or additive content, mixing equipment and mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine surfaces to receive tile work and conditions under which tile installed.
- B. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.
- C. Prior to installation of tile, representative of ceramic tile manufacturer, adhesive manufacturer and tile installer visit site and check tile's substrates for defects (including moisture) that may prevent tile's completely adhesion.
 - 1. Tile Installer notify, in writing, Contractor and Architect of acceptability of substrate in order that each party may guarantee his part of material and installation.
 - 2. Contractor correct defects that would prevent each party from guaranteeing his portion of Work.
- D. Ensure surfaces are steel troweled and are level with maximum surface variation 1/4-inch in 10-feet in areas to receive thick-set application.
 - 1. Ensure surfaces slope to drains.
- E. Inspect surface to receive flooring to verify that surface is smooth, level, and free of cracks and/or other surface imperfections which will affect the performance of the flooring.
 - 1. Where cracks exist, or recommended by system manufacturer or installer, apply manufacturers recommended anti-fracture membrane. Installation to be in full compliance with manufacture's written instructions.
 - 2. Where cracks exceed allowances of manufacturer for use of anti-fracture membrane, remove and replaced concrete.
 - 3. Where moisture content of floor slab exceeds manufacturers limitations, contractor to provide additional/alternate materials and methods required to allow system manufacture and installer to warrant installed system
- F. Ensure surfaces are clean and well cured.
- G. Do not begin until surface conditions are within required tolerances for proper installation.

- H. Installation of materials herein specified shall be construed as acceptance of substrate as being acceptable for installation and performance of materials herein specified.

3.02 INSPECTION OF SUBSTRATE

- A. Prior to installing products specified in this Section, product manufacturer's representatives and Installer visit jobsite and check substrate surfaces for any defects (including moisture) that may prevent each party from guaranteeing his portion of work.
 - 1. Report defects, in writing, to Contractor with copy to Architect.
 - 2. Contractor correct defects as required in order that each party will guarantee his portion of work.
- B. Do not allow resilient flooring work to proceed until subfloor surfaces satisfactory.

3.03 TESTING

- A. As part of the scope of the work the contractor shall arrange for, and pay costs associated with, third party testing as required by manufacturer, installer and as noted herein. Tests to include, as a minimum, the following:
 - 1. Moisture Testing
 - 2. Alkalinity testing.
 - 3. Bond testing.

3.04 MOISTURE TESTING

- A. Manufacturer recommendations: The work of this section to conform with recommendations and requirements of flooring manufacturer and work defined herein. Where a conflict in the requirements exist the more stringent of the requirements shall apply.
- B. Moisture: Contractor to perform moisture tests of concrete floor slab to verify that moisture is within tolerances allowed by manufacturer. If moisture content exceeds allowable levels, contractor shall implement measures to remove moisture from slab.
 - 1. Do not install flooring until moisture content is within manufacturers tolerances.
- C. Moisture Limits: The materials specified in this section shall not be installed until the moisture in the concrete slab is within the limits defined by the flooring manufacturer.
 - 1. Unless otherwise indicated, or unless more stringent requirements set by manufacturer, the limits for the moisture vapor emission rate (MEVR) shall be as follows:
 - a. 5lbs/1000sf/24hours
 - 2. Unless otherwise indicated, or unless more stringent requirements set by manufacturer, the limits for moisture for the RH Probe shall be as follows:
 - a. 80%
- D. Testing Agency: Testing to be performed by qualified third party testing agency acceptable to architect.
- E. Environmental Conditions: The conditions of the space in which the testing is to be performed shall meet the following conditions for no less than 48 prior to and after test is performed:
 - 1. Temperature: 75 degrees F +/- 10 degrees
 - 2. Humidity: 50% relative humidity +/- 10%
- F. Testing Types: Testing shall be of one of the types listed:
 - 1. Calcium Chloride Testing, using standard manufacturers test kits.
 - 2. Relative Humidity (RH) testing using Wagner Rapid RH Probe.
- G. Calcium Chloride Testing: Testing for moisture vapor emission rate (MEVR) shall be performed in accordance with above referenced, applicable ASTM standards and the following:
 - 1. Removal concrete coatings including curing compound.
 - 2. Commence test no sooner than 24 hours from the time the concrete curing compound was removed.
 - 3. Test shall be run for no less than 84 hours.

- H. Relative Humidity Testing: Perform tests in accordance with probe manufacturer written instructions.
 - 1. Drill hole of diameter required by probe.
 - 2. Insert probe into holes.
 - 3. Test results available within 45 minutes.
- I. Testing Frequency: Moisture testing shall be performed as required by flooring manufacturer, but no less than quantity indicated herein:
 - 1. Three (3) tests for the first 1,000 sf.
 - 2. One (1) test for each additional 1,000 sf.
- J. Testing Reports: Copies of third party testing reports to be submitted to the architect, contractor and flooring contractor prior to the installation of the flooring.
- K. Removal of Excess Moisture: It is the responsibility of the contractor to place the concrete slab at the specified water/cement ratio, properly cure concrete slabs, limit exposure to moisture, dry-in the building in a timely fashion and render building Hvac system operational in sufficient time to allow for the concrete slabs to dry sufficiently to allow for the application of the flooring.
 - 1. Should the concrete slab fail to meet the established maximum limits for moisture, the contractor shall be responsible for the implementation of necessary procedures to dry out the slab.
 - 2. Contractor responsible for cost for material, labor and/or equipment required to dry out building sufficiently for installation of flooring system.
 - 3. If attempts to dry out slab are unsuccessful the contractor shall bead blast the concrete slab and apply moisture barrier of type and using methods recommended by manufacture. Bead blasting and application of moisture barrier shall be at no additional cost to the contract.

3.05 ALKALINITY TESTING

- A. Perform alkalinity test of concrete floor slab to determine if concrete alkalinity suitable for application of adhesive and tile.

3.06 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".
- B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.
- C. Maintain min. temperature limits and installation practices recommended by materials manufacturers.
- D. Prepare surfaces to receive ceramic tile as recommended by ceramic tile and adhesive manufacturers.
 - 1. Unless specifically noted otherwise wall and floor tile to be set in full setting bed.
 - 2. Where floor tile is to be installed on full setting bed, depress floor slab 2" to receive floor tile and setting bed, unless greater depth noted.
- E. Extend tile work into recesses and under or behind equipment and fixtures, to form complete covering without interruptions, except as otherwise shown.
 - 1. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
- F. Accurately form intersections and returns.
 - 1. Perform cutting and drilling of tile without marring visible surfaces.
 - 2. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints.
 - 3. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.

- G. Jointing Pattern:
1. Unless otherwise shown, lay tile in grid pattern.
 2. Align joints when adjoining tiles on floor, base, walls and trim are same size.
 3. Layout tile work and center tile fields in both directions in each space or on each wall area.
 4. Adjust to minimize tile cutting.
 5. Provide uniform joint widths, unless otherwise shown.
 6. For tile mounted in sheets make joints between tile sheets same width as joints within tile sheets so that extent of each sheet not apparent in finished work.
- H. Lay out tile wainscots to next full tile beyond dimensions indicated.
- I. Floor Slope: Floors within areas in which floor drains are provided shall have surface of tile sloped uniformly to drain.
1. Floors in areas without drains shall be installed level (no slope), unless noted otherwise.
 2. The floor slope shall be created using the tile setting bed, unless noted or detailed otherwise.
 3. The floor slope, unless noted otherwise, shall comply with the following:
 - a. Slope floor uniformly from walls to floor drains.
 - b. Floor to be free of depressions or ridges which interfere with proper drainage.
 - c. Floor along walls to be run level.
 - d. Slope floor to drain at 1" in 20'-0".
- J. Expansion, Control and Contraction Joints: Locate and construct expansion joints and other sealant filled joints, including control, contraction and isolation joints, where indicated, and if not indicated in accordance with the following or the "Handbook for Ceramic Tile Installation"; which ever one is more stringent.
1. Locate and construct expansion joints in compliance with the following:
 - a. In compliance with recommendations of TCA EJ171.
 - b. Maximum spacing, each direction: 16'-0".
 - c. Where tile abuts a restraining surface (wall, column, etc.).
 - d. Where major offset(s) occur within space.
 - e. Where building expansion joint occurs.
 2. Construct in accordance with the requirements of TCA EJ171.
 3. Do not saw cut joints.
 4. Prepare joints and apply sealants to comply with requirements of referenced standards and sealant manufacturer.
- K. Grout tile to comply with requirements of following installation standards:
1. Prior to grouting of tile, contractor to apply to all exposed faces of tile, a grout release agent in strict compliance with manufacture's written recommendations.
 2. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts) comply with ANSI A108.10.
- L. Plumbing Fixtures: Floor drains, grates, and clean out covers shall be set square in room, level and true:
1. Surface of drain or cleanout shall be flush with floor.
 2. Drains to be set squarely in tile.
- M. Install glass-mesh mortar units to comply with manufacturer's directions.
- 3.07 FLOOR INSTALLATION METHODS
- A. Floor Tile: Install tile to comply with requirements indicated in "Schedule of Installation Methods" below.
- B. Ceramic Mosaic Tile: Install tile to comply with requirements indicated below for setting bed methods, and grout types:
1. Portland Cement Mortar: ANSI A108.1.
 - a. Bond Coat: Portland cement paste on plastic bed.
 - b. Grout: Latex-portland cement.

2. Dry-Set Portland Cement Mortar: ANSI A108.5.
 - a. Grout: Latex-portland cement.
 - C. Stone Thresholds: Install stone thresholds set in same type of setting bed as abutting field tile unless otherwise indicated.
 1. Install at locations indicated and where exposed edge of tile flooring meets other finished flooring material where top of adjacent finished flooring approximately equal in elevation.
 2. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent non-tile floor finish.
 3. Install in a manner necessary so that top surface of threshold is maximum 1/4" above adjacent finished flooring surface.
 4. Where possible use single piece threshold for each unbroken length.
 5. Miter outside and inside corners.
 - D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood or other flooring which finishes flush with top of tile.
- 3.08 WALL TILE INSTALLATION METHODS
- A. Wall Tile: Install tile to comply with requirements indicated in "Schedule of Installation Methods" below.
 - B. Install types of tile designated for wall application to comply with requirements indicated below for setting bed methods, and grout types:
 1. Latex-Portland Cement Mortar: ANSI A108.5.
 - a. Grout: Latex-portland cement.
- 3.09 WINDOW STOOL INSTALLATION
- A. Stone Window Stools: Install stone window stools at locations indicated; set in latex-portland cement mortar unless otherwise indicated.
 1. Install in accordance with manufacturers recommendations.
 2. Where possible use single piece stool.
 3. Install with 1/2" projection from face of wall, square in opening, with front edge parallel to wall.
- 3.10 CLEANING AND PROTECTION
- A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Unglazed tile cleaned with acid solution only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation.
 2. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of acid cleaning.
 3. Flush surface with clean water before and after cleaning.
 4. Remove temporary wax coating from quarry tile, using methods recommended by manufacturers of tile and grout.
 5. Apply quarry tile filler to clean, dry quarry tile in compliance with filler manufacturer's directions.
 - a. Repeat application as necessary to obtain uniform color in appearance of both tile and grout.
 - B. Sealer: Apply sealer to clean, dry grout joints in compliance with filler manufacturer's directions. Repeat application as necessary to obtain uniform color in appearance of grout.
 1. All grouted joints to be sealed.
 2. Tile shall not be sealed.
 - C. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.

- D. Protection:
1. When recommended by tile manufacturer, apply protective coat of neutral protective cleaner to completed tile walls and floors.
 2. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage and wear.
 3. Prohibit foot and wheel traffic from using tiled floors for min. 7 days after grouting completed.
 4. Protect tile floors subject to foot and equipment traffic with wooden planks over kraft paper.
 5. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.11 SCHEDULE OF INSTALLATION METHODS

- A. Installation methods indicated are intended to represent the design standard for installation of ceramic and quarry wall, floor and base. Refer to drawings for:
1. Type of flooring, wall tile and base.
 2. Bed Type: Setting application (Thin set or setting bed).
 3. Subfloor/Conditions: Substrate to which these finishes are to be applied.
 4. Location of Use: Wet or dry conditions
- B. Select applicable design number from the charts below. Selected design numbers shall comply with conditions and installations methods indicated on drawings.
- C. Install floor tile to comply with requirements indicated below for TCA installation methods related to types of subfloor construction:

Application	Bed Type	Subfloor / Conditions	Location	TCA Design
EWC Alcove	Setting Bed	Concrete slab on grade	Interior-Dry	F112
EWC Alcove	Thin Set	Concrete slab on grade	Interior-Dry	F113

- D. Install wall tile to comply with requirements indicated below for TCA installation methods related to types of wall construction:

Application	Bed Type	Substrate Type / Condition	Location	TCA Design
Ewc Alcove	Setting Bed	New Concrete block; Unpainted	Interior-Dry	W211
EWC Alcove	Setting Bed	Existing block; new painted block	Interior-Dry	W222
EWC Alcove	Setting Bed	Over Cementitious Backer Board	Interior	W244

END OF SECTION 09300

**SECTION 09445
TERRAZZO TILE**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Marble terrazzo tile and base, for installation on concrete floors.
- B. Concrete slabs specified in Division-3 Section.
- C. Cementitious underlayment for leveling of floor slab specified in Division 3.

1.03 REFERENCES

- A. ASTM C 109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
- B. ASTM D 2047 - Standard Test Method for Static Coefficient of Polish-Coated Floor Surfaces as Measured by the James Machine.
- C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- E. ASTM E662-83/NFPA 258 - Test for evaluating the smoke generation characteristics of solid materials.
- F. ASTM C-501 - Standard test method for relative resistance to wear of unglazed ceramic tile by the TABOR Abraser.
- G. ASTM D-4060 - Standard test method for abrasion resistance of organic coatings by the Tabor Abraser.

1.04 SUBMITTALS

- A. Product Data: Manufacturer's product literature, including installation instructions, maintenance requirements, and sample warranty.
- B. Shop Drawings: Submit shop drawings showing layout of tile and base, including special patterns, and borders.
 - 1. Indicate location of expansion joints.
- C. Samples for Initial Selection Purposes: Submit manufacturer's standard color charts in form of actual sections of terrazzo tile, including accessories, showing full range of colors and patterns available.
 - 1. Provide a min. of 20 standard colors from which architect may select.
- D. Samples for Verification Purposes: Submit following samples of each type, color, and pattern of terrazzo tile required, showing full-range of color and pattern variations.
 - 1. Full size tile samples.
 - 2. Full size sample of terrazzo tile base.
- E. Other materials as required.
- F. Maintenance Data: Manufacturer's printed cleaning and maintenance information.
- G. Warranty: Sample warranty

- H. Certification for Fire Test Performance: Submit certification from independent testing laboratory acceptable to authorities having jurisdiction that resilient flooring complies with fire test performance requirements.
 - I. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
 - J. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.
- 1.05 LAYOUT AND PATTERNS:
- A. It is the intent that the multiple color tiles be used to provide borders and graphic patterns.
 - 1. The architect shall not be limited to the number of tile colors which may selected for use in each area or on the project.
 - 2. The use of accent tiles for boarders and graphic designs shall be at no additional cost to the contract.
- 1.06 QUALITY ASSURANCE
- A. Installer's Qualifications: Engage Installer certified in writing by flooring manufacturer as qualified for installation of materials specified herein and having following qualifications:
 - 1. Having the technical qualifications, experience, trained personnel and facilities required.
 - 2. Minimum of three successful installations of the same manufacturer's tile within the last three years.
 - B. Moisture Emission Test for Concrete: Do not install terrazzo tile on concrete which has moisture emission greater than 3.0 pounds per 1000 square feet per 24 hours.
 - 1. Before beginning test, shot-blast or scarify a small portion of the surface where test will be conducted.
 - 2. Use an anhydrous calcium chloride 72 hour test unit and weigh within one hour of test.
 - C. Flatness:
 - 1. Verify that required flatness tolerances have been met.
- 1.07 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials to jobsite in original unopened containers, free of damage, with manufacturer's identification and brand name clearly marked.
 - B. Store materials in a protected area, kept dry.
 - C. Store on pallets complying with manufacturer's requirements, at not less than 40 degrees F nor more than 100 degrees F.
- 1.08 ENVIRONMENTAL REQUIREMENTS
- A. Store materials on site at 70 degrees F for at least 48 hours prior to installation, separating tile boxes from pallets so as to allow tile to fully acclimate to ambient temperature.
 - B. Do not begin work until temperature at the site is at least 70 degrees F, has been maintained at that temperature for at least 48 hours, and will continue to be maintained using permanent heating systems.
 - C. Install resilient flooring and accessories after other finishing operations, including painting, completed.
 - 1. Do not install resilient flooring over concrete slabs until latter cured and sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

1.09 WARRANTY

- A. Furnish, as part of closeout documents, the following warranties:
 - 1. Twenty (20) year warranty covering defective materials and workmanship.
 - 2. Twenty (20) year wear warranty

1.010 MAINTENANCE MATERIALS

- A. Furnish and deliver to Owner, maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
- B. Terrazzo Tile Flooring: Furnish min. one box for each 50 boxes or fraction thereof, for each type, color, pattern and size installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Product specifications based on the following Fritztile manufactured by Fritz Industries, Inc., 500 Sam Houston Road, Dallas, TX 75149. Telephone: (800) 955-1323. Fax: (214) 270-0179.
- B. The following manufactures are acceptable, subject to conformance with requirements of technical specifications:
 - 1. Floorazzo by Mats, Inc
 - 2. Fritztile
 - 3. Nurazzo

2.02 PHYSICAL CHARACTERISTICS

- A. The terrazzo tile and base shall have the following physical properties:
 - 1. Abrasive wear loss, in accordance with ASTM C-501, Taber abraser, CS-17 wheels, at 1000 cycles with 1000 gram load .0007" average loss.
 - 2. Compressive strength, in accordance with ASTM C-109 between 2950 and 4000 psi.
 - 3. Hardness; Matrix: Shore D 75-83; Aggregate: Barcol 55-100.
 - 4. Coefficient of friction, when tested in accordance with ASTM D 2047: Greater than 0.7, average 0.74.
 - 5. Flame spread, in accordance with ASTM E 84: Class A.
 - 6. Critical radiant flux, in accordance with ASTM E 648: 0.45 watt/cubic centimeter, Class 1.
 - 7. Smoke generation, in accordance with ASTM 662-83 NFPA-258.

2.03 MATERIALS

- A. Marble Terrazzo Tile: Marble chips embedded in pigmented flexible thermosetting resin matrix.
 - 1. Type: Fritztile "**Classic 8000** Series."
 - 2. Tile thickness: 3/16 inch (3.2 mm).
 - 3. Tile face size: Nominal 12 inches by 12 inches.
 - 4. Color and Chip Distribution: Color, chip distribution and appearance of tile to match existing.
- B. Tile Factory Finish: Permanent finish designed to accept topical protective coatings in the acrylic dressing family.
- C. Leveling/Patching Materials: Floor slab leveling materials to comply with provision of Section 03650, Cementitious Underlayment.

- D. Adhesives (Cements):
 - 1. Unless otherwise noted provide waterproof, stabilized type recommended by flooring manufacturer to suit material and substrate conditions. Adhesive shall of type suitable for applications where:
 - a. RH (Relative Humidity) is 90% or less
 - b. Moisture Emissions (MEVR) up to 10#/1000sf
 - c. PH range is between 7 to 11.
 - 2. Provide epoxy type adhesive where tile indicated to be installed in wet areas.
 - a. At electric water coolers extend epoxy adhesive 4'-0" each side and out from water cooler.
 - b. At lunchroom provide 6'-0" wide area of epoxy adhesive adjacent to kitchen and dishreturn.
 - 3. Use of asphalt "cut-back" adhesive not acceptable.
- E. Sealant: Clear water-resistant silicone caulk.
- F. Sealer/Polish: Provide type recommended by manufacturer.

PART 3 - EXECUTION

3.04 EXAMINATION

- A. Prior to installing products specified in this section, each product manufacturer's representative and installer visit jobsite and check substrate surfaces for any defects, including moisture and alkalinity that may prevent each party from guaranteeing his portion of work.
 - 1. Report defects, in writing, to Contractor with copy to Architect.
 - 2. Contractor correct defects as required in order that each party will guarantee his portion of work.
- B. Installer to inspect subfloor surfaces to determine if satisfactory, one smooth and free from debris, cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.
- C. Do not allow flooring work to proceed until subfloor surfaces satisfactory.
- D. Do not proceed until unsatisfactory conditions have been corrected.
- E. Installation of flooring shall be considered as the floor contractor's acceptance of the subfloor as being suitable to receive finished flooring.

3.01 TESTING

- A. As part of the scope of the work the contractor shall arrange for, and pay costs associated with, third party testing as required by manufacturer, installer and as noted herein. Tests to include, as a minimum, the following:
 - 1. Moisture Testing
 - 2. Alkalinity testing.
 - 3. Bond testing.

3.02 MOISTURE TESTING

- A. Manufacturer recommendations: The work of this section to conform with recommendations and requirements of flooring manufacturer and work defined herein. Where a conflict in the requirements exist the more stringent of the requirements shall apply.
- B. Moisture: Contractor to perform moisture tests of concrete floor slab to verify that moisture is within tolerances allowed by manufacturer. If moisture content exceeds allowable levels, contractor shall implement measures to remove moisture from slab.
 - 1. Do not install flooring until moisture content is within manufacturers tolerances.

- C. Moisture Limits: The materials specified in this section shall not be installed until the moisture in the concrete slab is within the limits defined by the flooring manufacturer.
1. Unless otherwise indicated the limits for the moisture vapor emission rate (MEVR) shall be as follows:
 - a. Sheet vinyl flooring: 3lbs/1000sf/24hours
 - b. Vinyl floor tile (VCT): 5lbs/1000sf/24hours
 2. Unless otherwise indicated the limits for moisture for the RH Probe shall be as follows:
 - a. Sheet vinyl flooring: 75%
 - b. Vinyl floor tile (VCT): 80%
- D. Testing Agency: Testing to be performed by qualified third party testing agency acceptable to architect. Testing shall not be performed by the contractor or contractor's employees.
- E. Environmental Conditions: The conditions of the space in which the testing is to be performed shall meet the following conditions for no less than 48 prior to and after test is performed:
1. Temperature: 75 degrees F +/- 10 degrees
 2. Humidity: 50% relative humidity +/- 10%
- F. Testing Types: Testing shall be of one of the types listed:
1. Calcium Chloride Testing, using standard manufacturers test kits.
 2. Relative Humidity (RH) testing using Wagner Rapid RH Probe.
- G. Calcium Chloride Testing: Testing for moisture vapor emission rate (MEVR) shall be performed in accordance with above referenced, applicable ASTM standards and the following:
1. Removal concrete coatings including curing compound.
 2. Commence test no sooner than 24 hours from the time the concrete curing compound was removed.
 3. Test shall be run for no less than 84 hours.
- H. Relative Humidity Testing: Perform tests in accordance with probe manufacturer written instructions.
1. Drill hole of diameter required by probe.
 2. Insert probe into holes.
 3. Test results available within 45 minutes.
- I. Testing Frequency: Moisture testing shall be performed as required by flooring manufacturer, but no less than quantity indicated herein:
1. Three (3) tests for the first 1,000 sf.
 2. One (1) test for each additional 1,000 sf.
- J. Testing Reports: Copies of third party testing reports to be submitted to the architect, contractor and flooring contractor prior to the installation of the flooring.
- K. Removal of Excess Moisture: It is the responsibility of the contractor to place the concrete slab at the specified water/cement ratio, properly cure concrete slabs, limit exposure to moisture, dry-in the building in a timely fashion and render building Hvac system operational in sufficient time to allow for the concrete slabs to dry sufficiently to allow for the application of the flooring.
1. Should the concrete slab fail to meet the established maximum limits for moisture, the contractor shall be responsible for the implementation of necessary procedures to dry out the slab.
 2. Contractor responsible for cost for material, labor and/or equipment required to dry out building sufficiently for installation of flooring system.
 3. If attempts to dry out slab are unsuccessful the contractor shall bead blast the concrete slab and apply moisture barrier of type and using methods recommended by manufacture. Bead blasting and application of moisture barrier shall be at no additional cost to the contract.
- 3.03 ALKALINITY TESTING
- A. Perform alkalinity test of concrete floor slab to determine if concrete alkalinity suitable for application of adhesive and tile.

3.04 PREPARATION

- A. Prepare substrates in accordance with tile manufacturer's instructions and recommendations.
- B. Do not allow resilient flooring work to proceed until subfloor surfaces satisfactory.

3.05 PREPARATION

- A. Require installer to inspect subfloor surfaces to determine if satisfactory, one smooth and free from debris, cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.
- B. Grind all areas scheduled to receive finished flooring, using concrete grinding equipment, surface of concrete flooring as required to obtain a smooth, uniform surface free from irregularities.
- C. Level floor slab with cementitious poured leveling materials in accordance with the requirements of Section 03650.
 - 1. Finished Slab Flatness: 1/16" in 10'-0".
- D. Sand entire surface of area to receive flooring using power buffing machines with abrasive pads. Remove all ridges, high areas, mortar, concrete droppings, paint, adhesives and other 'foreign' materials.
- E. Remove coatings from subfloor surfaces that prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.
- F. Apply concrete slab primer, if recommended by flooring or floor adhesive manufacturer, prior to application of adhesive; apply in compliance with manufacturer's directions.
- G. Broom clean and vacuum surfaces to remove all dirt, dust and debris and inspect subfloor; repeat activities until surface found to be smooth, clean and suitable for installation of flooring.
- H. Installation of flooring shall be considered as the floor contractor's acceptance of the subfloor as being suitable to receive finished flooring.

3.06 INSTALLATION; GENERAL

- A. Install in accordance with tile manufacturer's instructions.

3.07 ADHESIVE

- A. Apply adhesive to substrate, set tile, and remove spots and smears of adhesive immediately.
 - 1. Bleeding of adhesive not acceptable. Where bleeding of adhesive occurs, remove tile and adhesive and replace with new.

3.08 TERRAZZO TILE FLOORS

- A. Lay tile from center marks established with principal walls, discounting minor offsets, so tile at opposite edges of room are of equal width.
 - 1. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters.
 - 2. Lay tile square to room axis, unless otherwise shown.
- B. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered.
 - 1. Cut tile neatly around all fixtures.
 - 2. Broken, cracked, chipped, or deformed tiles not acceptable.
 - 3. Lay tile in "checkerboard" fashion with grain reversed in adjacent tiles.
- C. Lay design symmetrically off center lines of rooms.

- D. Make joints tight, inconspicuous, and in true alignment.
- E. Cut tile to fit snugly at fixed vertical projections.
- F. Control Joints: Install control joints in terrazzo tile floor immediately above expansion and control joints in concrete slab.
- G. Roll tile into adhesive with 150 pound roller in north/south, east/west, and diagonal direction to tile alignment until adhesive has set and entire installation is flat and smooth.

3.09 INITIAL CLEANING AND SEALING

- A. Damp Wash and Rinse. Do not flood floor.
- B. Seal entire floor area with 2 coats of sealer using a rayon string mop, applied as soon as possible after adhesive has cured.
- C. Seal edges of tile at floor perimeter with clear caulk.

3.10 QUALITY CONTROL

- A. Examine installation for excess adhesive, high tile edges, tile bond, and curling. Repair or replace areas that are defective.
- B. Prior to requesting "final" inspection by Architect general and flooring contractors shall conduct detailed inspection of flooring and base and verify that flooring complies with requirements contained herewith.
 - 1. Items found deficient shall be corrected by contractor prior to requesting Architect's inspection.
- C. Flooring: Completed installation of flooring shall comply with the recommendations of the manufacturer and requirements contained in this section. In addition to these requirements, floor tile shall be:
 - 1. Set squarely in space, with joints properly aligned, and free of gaps between adjacent sections of tile.
 - 2. Securely adhered to subfloor; free of bleeding (adhesive).
 - 3. Of neat, clean, uniform appearance, free of surface imperfections, dents, nicks, cracks, or surface protrusions.
- D. Base: Completed installation of base shall comply with the recommendations of the manufacturer and requirements contained in this section. In addition to these requirements, base tile shall be:
 - 1. Set straight and true, with joints properly aligned, and free of gaps between adjacent sections of tile.
 - 2. Securely adhered to wall; free of bleeding (adhesive).
 - 3. Of neat, clean, uniform appearance, free of surface imperfections, dents, nicks, cracks, or surface protrusions.

3.11 PROTECTION

- A. Keep all traffic off new floor installations for at least 24 hours after completion of installation.
- B. Install protective covering and maintain until project completion; do not apply masking tape directly to tile. Remove covering at completion.
- C. Protect flooring against damage during construction period to comply with resilient flooring manufacturer's directions.
- D. Protect flooring against damage from rolling loads for initial period following installation by covering with plywood or hardboard; use dollies to move stationary equipment or furnishings across floors.
- E. Cover flooring with undyed, untreated building paper until inspection for Final Acceptance.

3.12 CLEANING PRIOR TO OCCUPANCY

- A. Do not strip finish with strong stripping solutions; damage to factory finish will occur.
- B. Do not flood floor with water: Water-based adhesives can be impaired.
- C. Damp Wash and Rinse. Do not flood the floor.
- D. Finish with a minimum of five coats of floor polish.

END SECTION 09445

**SECTION 09510
ACOUSTICAL CEILINGS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of each type of acoustical ceiling shown and scheduled on drawings.
- B. Types of acoustical ceilings specified in this section include following:
 - 1. Acoustical panel ceilings, exposed suspension.
 - 2. Sub-Ceiling panels, heavy duty grid.
 - 3. Metal systems for support of gypsum drywall ceilings and soffits.
 - 4. Gypsum Lay-in panels
 - 5. Fiberglass Reinforced Plastic Panels, exposed suspension.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type acoustical ceiling unit and suspension system required.
- B. Coordination Drawings: Submit reflected ceiling plans, prepared by Installer for installation purposes, drawn accurately to scale and coordinated with related mechanical, electrical and other work above, penetrating, or connected to acoustical ceiling.
 - 1. Develop a drawing, at 1/8" + 1'-0" and show as a minimum, the following:
 - a. Location of each type of ceiling tile and grid systems to be utilized.
 - b. Location of ceiling suspension members, cross members, and method of anchorage to building structure of hangers.
 - c. Location of ceiling-mounted work including sprinkler heads, light fixtures, diffusers, grilles, and special moldings.
 - d. Obtain plumbing, mechanical, and electrical layouts from engineering drawings.
 - e. Obtain Sprinkler System layouts from Sprinkler shop drawings.
- C. Samples for Initial Selection Purposes: Submit manufacturers' standard size samples of acoustical units, but min. 6" square, and of exposed ceiling suspension members including wall and special moldings.
 - 1. Provide samples showing full range of colors, textures and patterns available for each type component required.
- D. Samples for Verification Purposes: Submit following:
 - 1. 6" square samples of each acoustical panel type, pattern and color.
 - 2. Set of 12" long samples of exposed runners and moldings for each color and system type required.
- E. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- F. Asbestos Certification: Submit as part of shop drawings, and latter as part of close-out documents, letter from each manufacturer of products furnished under this section indicating that products furnished are 100% free from asbestos containing materials.

1.04 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide acoustical ceiling components identical to those tested for following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.
 - 2. Surface Burning Characteristics: As follows, tested per ASTM E 84.
 - a. Flame Spread: 25 or less.
 - b. Smoke Developed: 50 or less.
- B. Fire Resistance Ratings: As indicated by reference to design designation in UL "Fire Resistance Directory" for floor, roof or beam assemblies in which acoustical ceilings function as fire protective membrane; tested per ASTM E 119.
 - 1. Provide protection materials for lighting fixtures and air ducts to comply with requirements indicated for rated assembly.
- C. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition system (if any).

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store in fully enclosed space where protected against damage from moisture, direct sunlight, surface contamination or other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.06 PROJECT CONDITIONS

- A. Space Enclosure: Do not install interior acoustical ceilings until space enclosed and weatherproof, wet-work in space completed and nominally dry, work above ceilings complete, and ambient conditions of temperature and humidity continuously maintained at values near those indicated for final occupancy.
- B. Completed Work: Prior to installing materials specified in this section the following work shall be completed and systems noted operational:
 - 1. Building envelope (walls, roof, and openings) completed to the extent where the building is dry and ready for installation of finishes.
 - 2. HVAC system components complete and system operational.
 - 3. Work above ceilings, including fire safing, completed and inspected by authorities having jurisdiction.
- C. Commencing at the time of installation of materials herein specified and extending continuously to the date of final acceptance, the contractor shall maintain temperature of building between 65F and 80F, with relative humidity less than 50%.

1.07 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

1.08 EXTRA MATERIALS

- A. Deliver extra materials to Owner.
- B. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with appropriate labels.
- C. Acoustical Ceiling Units: Furnish quantity of full size units equal to 2.0% of amount installed.
- D. Exposed Suspension System Components: Furnish quantity of each exposed component equal to 2.0% of amount installed.

1.09 WARRANTY

- A. Ceiling Panels: Submit written warranty executed by ceiling panel manufacturer agreeing to repair or replace acoustical panels that fail or exhibit sagging, warping or deformation during warranty period.
 - 1. Warranty Period: 15 Years.
- B. Ceiling Grid: Submit written warranty executed by grid manufacturer agreeing to repair or replace ceiling grid from manufacturer defects or that fail or rust during warranty period.
 - 1. Warranty Period: 15 Years.
- C. Warranty shall not deprive the Owner of rights the Owner may have under other provisions of the contract documents.
 - 1. The warranty shall be in addition and shall run concurrently with other warranties made by the contractor under the requirements of the contract documents.

PART 2 - PRODUCTS

2.01 ACOUSTICAL CEILING UNITS, GENERAL

- A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated, prepared for mounting method designated and complying with FS SS-S-118 requirements, including those indicated by reference to type, form, pattern, grade (NRC or NIC' as applicable), light reflectance coefficient (LR), edge detail, and joint detail (if any).
 - 1. Mounting Method for Measuring NRC: No. 7 (mechanically mounted on special metal support), FS SS-S-118; or Type E-400 mounting as per ASTM E 795.
- B. Ceiling Attenuation Class: Provide acoustical ceiling units with ratings for ceiling sound attenuation class (CAC) of value indicated as determined according to AMA 1-II "Ceiling Sound Transmission Test by Two-Room Method" with ceilings continuous at partitions and supported by a metal suspension system of type appropriate for ceiling unit of configuration indicated (concealed for tile, exposed for panels).
- C. Colors, Textures, and Patterns: Provide products to match appearance characteristics indicated or, if not otherwise indicated, selected by Architect from manufacturer's standard colors, surface textures, and patterns available for acoustical ceiling units and exposed metal suspension system members of quality designated.

2.02 ACOUSTICAL PANELS

- A. Type AT: Acoustical Tile; Mineral Composition - Water Felted Panels with Standard Washable Painted Finish, Fissured and Perforated Pattern, Non-Fire Resistance Rated:
1. Physical Characteristics:
 - a. Color/Light Reflectance: White, LR .84 Minimum
 - 1) NRC: .70 Minimum, UL Certified Performance Marked on Each Carton
 - 2) CAC: 33 Minimum, UL Certified Performance Marked on Each Carton
 - 3) Edge Detail: Square Edge Lay-in
 - 4) Size: 24" x 24" x 3/4" except as otherwise indicated
 - b. Mold/Mildew Resistance: Manufacturers special biocide antimicrobial paint on face and back of panels that resists surface growth of mold and mildew.
 2. Products: Subject to compliance with requirements, provide one of following:
 - a. "Fine Fissured Hugh NRC" with Humiguard Plus Performance, Armstrong World Industries, Inc.
 - b. Fine Fissured High NRC – CertainTeed # HHF-457-DP
 - c. Radar Clima Plus – USG # 22311'
- B. Type GLP: Gypsum Panels - Gypsum Core, with Vinyl Facing, Stippled Pattern, Fire Resistant Rated:
1. Physical Characteristics:
 - a. Color/Light Reflectance: White LR/1 (75% and over).
 - b. Grade: Not Applicable.
 - c. STC Range: 45-49.
 - d. Edge Detail: Square.
 - e. Size: 24" x 24" x 1/2".
 2. Products: Subject to compliance with requirements, provide one of following:
 - a. "Vinyltone Vinyl Faced Gypsum Lay-in Panels", Celotex Corp., Jim Walter Co.
 - b. "Gridstone Vinyl Laminated Gypsum Panels", Gold Bond Products, Div. National Gypsum Co.
 - c. "GLIP Stipple Pattern", USG Acoustical Products Co.
- C. Type FRP (Fiberglass reinforced plastic): Fiberglass reinforced plastic, light stipple pattern, Class A Rated:
1. Physical Characteristics:
 - a. Color: To be selected from Manufactures Standard Colors.
 - b. Weight: Minimum 0.7 Pounds per Square Foot.
 - c. Flame Spread: Class A.
 - d. Smoke Developed: Maximum 200.
 - e. Water Absorption: Maximum 0.4%
 - f. Size: 24" x 24" x 0.09".
 2. Products: Subject to compliance with requirements, provide one of following:
 - a. Kemlit Company; Fire X Glasboard.
 - b. Nudo Products, Inc., Fiber-Lite Liner Panels.
 - c. Sequentia, Incorporated, Structoglas Panels.
- D. Type 'Sub Ceiling': Acoustical Tile; Mineral Composition - Water Felted Panels with Standard Washable Painted Finish, Fissured and Perforated Pattern, Non-Fire Resistance Rated:
1. Physical Characteristics:
 - a. Classification: ASTM E 1264 for Type III, mineral base paintable finish.
 - b. Color: White.
 - c. Edge Detail: Square
 - d. Size: 24" x 48" x 5/8" except as otherwise indicated.
 - e. Mold/Mildew Resistance: Manufacturers special biocide to face and back of panels to inhibit or retard growth of mold and mildew.
 2. Products: Subject to compliance with requirements, provide one of following:
 - a. "Fine Fissured with HumiGuard Max with Bio Block" Lay-in, Armstrong World Industries, Inc.
 - b. ""Vantage 10", Celotex Corp., Jim Walter Co.
 - c. "Omni 90", USG Acoustical Products Co

2.03 METAL SUSPENSION SYSTEMS, GENERAL

- A. Standard for Metal Suspension Systems: Provide commercial quality hot dipped galvanized metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C 635 requirements.
- B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated.
 - 1. For exposed suspension members and accessories with painted finish, provide color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's full range of standard colors.
- C. High Humidity Finish: Prepainted aluminum cap over grid members for applications as follows:
 - 1. Gypsum lay-in panels (Type GLP).
- D. Edge Moldings and Trim: Metal or extruded plastic of types and profiles indicated or, if not indicated, provide manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.
 - 1. Unless noted or detailed otherwise, edge molding to be of angle shape with 1" exposed face.
 - 2. For lay-in panels with reveal edge details, for Type TAT ceilings, and elsewhere as indicated, provide stepped edge (shadow line) molding which forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - 3. For narrow faced suspension systems, provide suspension system manufacturer's standard edge moldings which match width and configuration of exposed runners.

2.04 EXPOSED METAL DIRECT-HUNG SUSPENSION SYSTEMS

- A. Non-Fire-Resistance-Rated Double Web Steel Suspension System: Manufacturer's standard system roll-formed from prefinished cold-rolled hot dipped galvanized steel sheet with 15/16" wide exposed faces on structural members; other characteristics as follows:
 - 1. Structural Classification: Provide structural classification indicated:
 - a. Intermediate-Duty System Application:
 - 1) All ceiling types unless indicated otherwise.
 - b. Heavy-Duty System Application:
 - 1) Sub-ceiling systems including gypsum drywall support systems
 - 2) Gypsum Lay-In Panels (GLP)
 - 2. System Type:
 - a. Provide Standard type system unless otherwise noted.
 - b. Provide gypsum drywall support system at suspended gypsum board ceilings unless other type system detailed or specified.
 - 3. Finish: Provide corrosion resistant ceiling grid of finish type indicated:
 - a. Painted, Low Sheen White Application:
 - 1) All ceiling types unless indicated otherwise.
 - b. Aluminum Cap, Painted Low Sheen White Application:
 - 1) GLP ceilings.
- B. Fire-Resistance-Rated Double Web Steel Suspension System: Manufacturer's standard system roll-formed from prefinished cold-rolled hot dipped galvanized steel sheet with 15/16" wide exposed faces on structural members; other characteristics to match non-rated system.
- C. Manufacturers: Subject to compliance with requirements, provide products of one of following:
 - 1. Manufacturers of Non-Fire-Resistance-Rated Double Web Steel Suspension Systems:
 - a. Armstrong World Industries, Inc.
 - b. BPB
 - c. Chicago Metallic Corporation.
 - d. Donn USG Interiors.
 - 2. Manufacturers of Fire-Resistance-Rated Double Web Steel Suspension Systems:
 - a. Armstrong World Industries, Inc.
 - b. BPB
 - c. Chicago Metallic Corporation.
 - d. Donn USG Interiors.

2.05 EXPOSED EXTRUDED PLASTIC DIRECT-HUNG SUSPENSION SYSTEMS

- A. Non-Fire-Resistance-Rated Extruded Plastic Suspension System: Manufacturer's standard system of extruded plastic with 15/16" wide exposed faces on structural members.
 - 1. Application: For use with Type FRP (Fiberglass reinforced plastic) ceiling panels.
- B. Products: Subject to compliance with requirements, provide one of following:
 - 1. Kemlit Company; Fire X Glasboard.
 - 2. Nudo Products, Inc., Fiber-Lite Liner Panels.
 - 3. Sequentia, Incorporated, Structoglas Panels.

2.06 MISCELLANEOUS MATERIALS

- A. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung.
- B. Concrete Inserts: Inserts formed from hot-dipped galvanized sheet steel and designed for attachment to concrete forms and for embedment in concrete, with holes or loops for attachment at hanger wires.
- C. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, prestretched, Class 1 coating, sized so that stress at 3-times hanger design load (ASTM C 635, Table 1, Direct Hung), will be less than yield stress of wire, but provide min. gages as indicated:
 - 1. Finished ceiling grid hanger wire:
 - a. Light Ceilings (Type AT, CAT, TAT): Min. 12 gage.
 - b. Heavy Ceilings (Type GLP and CP): Min. 10 gage
 - 2. Sub ceiling grid hanger wire:
 - a. All Conditions: Min. 8 gage
 - 3. Suspended Gypsum Board:
 - a. Vertically and Horizontally: Min. 8 gage
- D. Hold-Down Clips for Rated and Non-Fire-Rated Ceilings: Provide hold-down clips spaced 2'-0" o.c. on all cross tees in locations indicated:
 - 1. For interior ceilings composed of lay-in panels weighing less than 1 lb./s.f. where ceiling where part of a fire rated assembly or smoke tight assembly.
 - 2. Sub ceilings where insulation is located immediately above and in contact with sub ceiling.
 - 3. At ceilings where installation is an orientation other than horizontal (sloping and domed).
 - 4. Elsewhere where indicated.
- E. Impact Clips: Where indicated provide manufacturer's standard impact clip system designed to absorb impact forces against lay-in panels.
 - 1. Unless noted otherwise use impact clips to retain ceiling where acoustical ceiling indicated in Gymnasiums (including auxiliary rooms), P.E. Facilities and multi-purpose rooms and areas where space above the ceiling is a return air plenum.
- F. Drywall Clip: Where acoustical tile ceiling is specified to be installed below a gypsum board ceiling or fire rated assembly provide drywall anchor clip on face of gypsum board ceiling to allow for attachment of suspended acoustical tile ceiling grid hanger wires without penetration of fire rated assembly.
 - 1. Gypsum Drywall clip shall be similar to National Rolling Mills DWC Clip.
 - 2. Chicago Metallic Corporation.
 - 3. Donn USG Interiors.
 - 4. Armstrong World Industries, Inc.

- G. Column Collar: Where Acoustical Tile abut round or partially round concrete columns provide preformed Column Trim of inside dimension to match column diameter.
1. Column Collar to be Single piece extruded aluminum of finish to match ceiling grid.
 2. Size: Provide edge moldings fabricated to diameter required to fit penetration exactly.
 2. Style: 3/4" Reveal Edge; of type to accommodate ceiling specified.
 3. Approved Manufacturers; Subject to conformance with specification:
 - a. Fry Reglet Corporation.
 - b. MM Systems Corporation.
 - a. Alabama Metal Industries
- H. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
 2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
 3. Acoustical sealant shall [have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).] [comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."]

PART 3 - EXECUTION

3.01 PROJECT CONDITIONS

- A. Refer to Part 1 above for project conditions which shall exist prior to installation of materials herein specified. The contractor shall be solely responsible for determining if the building is ready for installation of materials.
1. Materials damaged as a result of premature installation, whether a result of physical damage, corrosion, cupping, warpage, or other factors, shall be replaced at no cost to the contract.

3.02 PREPARATION

- A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.
1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.
- B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling.
1. Avoid use of less-than-half width units at borders.
 2. Comply with reflected ceiling plans wherever possible.

3.03 INSTALLATION

- A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and CISCA standards applicable to work.
- B. Arrange acoustical units and orient directionally-patterned units (if any) in manner shown by reflected ceiling plans or if no reflective ceiling plans provided, as noted herein.
1. Install tile with pattern running in one direction.
- C. Fire Rated Units: Where ceiling is indicated to be part of fire rated assembly, install grid, panels and accessories in accordance with applicable U.L. Design number. Penetrations through ceiling shall be with appropriate rated sealant; recessed fixtures to be protected with approved rated " housings".
1. If not indicated otherwise protect recessed fixtures in accordance with U.L. Design Number P225.

- D. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members and in accordance with the following:
 - 1. Locate hangers min. 6" from each end and 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".
 - 2. Provide additional hangers at each corner of grid supporting light fixtures, HVAC grilles or similar ceiling mounted items.
 - 3. Support wire shall be of single piece units of length required; splices in support wire not permissible.
- E. Ceiling Expansion Joints: Where indicated or where required by manufacturer provide perimeter expansion joint system of type and configuration recommended by manufacturer. Provide, as min., perimeter ceiling expansion joints as follows:
 - 1. Where cementitious panels indicated to be used; full perimeter of ceiling.
 - 2. Install in a manner to allow for 1" of movement.
- F. Drywall Clip: Where acoustical tile ceiling is specified to be installed below a gypsum board ceiling or fire rated assembly provide drywall anchor clip on face of gypsum board ceiling to allow for attachment of suspended acoustical tile ceiling grid hanger wires without penetration of fire rated assembly.
 - 1. Screw attach dry wall clip through gypsum board to gypsum board support system
 - 2. Do not penetrate gypsum board fire rated assembly with hanger wires for acoustical tile ceiling grid.
- G. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices secure and appropriate for substrate, and not deteriorate or fail with age or elevated temperatures.
 - 1. At all points of attachment, wire supports shall be bent, using pliers, to form a sharp 180 degree bend. Loose end of wire to be turned (wrapped) around hanger wire a min. of five (5) full turns.
 - 2. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum not part of supporting structural or ceiling suspension system.
 - 3. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, counter splaying or other equally effective means.
- H. Main and Cross Tees: Install main and cross tees in accordance with the following:
 - 1. Main and cross tees shall be installed straight, true and square within room.
 - 2. Grid shall be level to within 1/8" in 12'-0".
 - 3. Install 2 main runners for each ceiling span.
 - 4. Coordinate direction of main runner with light fixtures so that main runners occur on each end of recessed light fixtures.
- I. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.
- J. Attach moldings to substrate at max. intervals of 16" o.c. and max. 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0".
 - 1. Miter corners accurately and connect securely.
 - 2. Use power driven nails or other fastening methods as recommended by grid manufacture for applications and substrates indicated.
 - 3. Install fasteners in manner so as to avoid damage to partitions to which grid is attached.
 - 4. Repair or replace partitions where damaged from installation of ceiling grid.
- K. Screw-attach moldings to substrate at max. intervals of 16" o.c. and max. 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0".
 - 1. Miter corners accurately and connect securely.
 - 2. Provide 1/4" x 1-1/4" hex-head Tapcon screws at concrete and masonry walls.
 - 3. Avoid use of power driven nails or other fastening methods which promote cracking of masonry.
 - 4. Repair or replace block partitions where damaged from installation of ceiling grid.

- L. Sealant Bed: Provide sealant bead at underside of grid between grid and surface of wall where indicated and as required to provide a finished appearance and to comply with applicable codes and regulations. Where sealant is utilized the sealant shall be continuous around the perimeter of the space. Provide sealant, as a minimum, in the following locations:
1. Where required to maintain specified partitions ratings (acoustical, smoked and fire).
 2. At music, choral, band, practice, auditoriums and other similar type rooms and spaces.
 3. Where a gap exists between face of wall and back leg of ceiling due to irregularities in the face of the wall or in the installation of the grid.
- M. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members.
1. Scribe and cut panels to fit accurately at borders and at penetrations.
 2. Place edges of panels in close contact with metal supports and in true alignment.
 3. Install hold-down clips in areas indicated, and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.
- N. Penetrations through Panels: Where Pipes or conduits penetrate ceiling the contractor shall:
1. Cut tile carefully, with cut out matching penetration size.
 2. Caulk Around pipe penetration; where panels are fire rated, sealant to be rated.
 3. Provide two piece escutcheon ring of color to match ceiling; secure to ceiling tile.
 4. If tile must be cut to allow for installation of panel, provide ceiling grid member to fully support panel and conceal cut.
- O. Ceiling Height Transitions: Where transitions in ceiling height are shown or required to accommodate conditions, the contractor shall construct transitions using 5/8" gypsum board on 3-5/8" metal studs.
1. Gypsum Board furring shall extend 2" below lower ceiling level; 4" above upper ceiling.
 2. Use of acoustical tile turned vertically to create transition not acceptable.
- 3.04 CLEANING
- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
1. Remove and replace work not successfully cleaned and repaired to permanently eliminate evidence of damage.
- 3.05 DAMAGED MATERIAL
- A. Ceiling panels found to be damaged shall be removed and replaced at no cost to the owner. Materials considered to be damaged include, but are not limited to:
1. Panels found to be stained, soiled, discolored, or of non-uniform finish.
 2. Panels found to be chipped, nicked, dented, or of non-uniform face texture.
 3. Panels found to be warped, bowed, or twisted.
- B. Ceiling grid found to be damaged shall be removed and replaced at no cost to the owner. Materials considered to be damaged include, but are not limited to:
1. Grid found to be stained, soiled, discolored, or of non-uniform finish.
 2. Grid found to be chipped, nicked, dented, or of non-uniform face texture.
 3. Grid found to be bent, warped, bowed, or twisted.
 4. Grid found to be corroded.
- C. Contractor shall note that the determination as to whether the building is ready for installation of ceiling tile and grid is solely that of the contractor. Materials damaged as a result of excessive humidity or moisture in the building shall be replaced by the contractor at no cost to the owner.
1. Field painting of ceiling grid is not an acceptable remedy for grid found to be corroded.

END OF SECTION 09510

SECTION 09520
ACOUSTICAL PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of acoustical panels shown on drawings.
- B. Types of acoustical panels in this Section include:
 - 1. Back-mounted acoustical wall panels.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of acoustical panel required.
- B. Samples for Initial Selection Purposes: Submit manufacturer's standard size swatches of material indicated as facing for acoustical panels showing full range of colors, textures, and patterns available for each type of panel and facing material required.
- C. Samples for Verification Purposes:
 - 1. Submit 12" square samples of each type of acoustical panel required and in each color, texture and pattern indicated or selected for facing materials.
 - 2. Include representative samples of installation devices and accessories.
- D. Certified Test Reports: Submit test data from independent testing agency, acceptable to authorities having jurisdiction, evidencing that panel assemblies comply with requirements indicated for fire performance characteristics.
- E. Certificates: Submit certificates from manufacturers of acoustical panels attesting that their products comply with specified requirements including those for fire performance characteristics.
- F. Shop Drawings: Provide drawings showing layout and installation of acoustical wall panels.
 - 1. Provide large scale details indicating method by which panels are to be installed.
 - 2. Provide layout of panels. Coordinate with openings, doors, windows, Hvac grilles and other all mounted items.

1.04 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide acoustical panels, with surface-burning characteristics as indicated below, determined by testing assemblies of identical materials and construction according to ASTM E 84 by testing organization acceptable to authorities having jurisdiction.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.
- B. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- C. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.

2. Statement also state that proposed application of product on project is suitable and proper.

1.05 PRODUCT HANDLING

- A. Protect acoustical panels from excessive moisture in shipment, storage, and handling.
- B. Deliver in unopened bundles and store in dry place with adequate air circulation.
- C. Do not deliver material to building until "wet work" such as concrete and plaster completed and cured to condition of equilibrium.

1.06 PROJECT CONDITIONS

- A. Do not begin installation until spaces to receive acoustical panels enclosed and maintained at approximately same humidity and temperature conditions planned for occupancy.
 - 1. Maintain temperature and humidity as recommended by panel manufacturer.

1.07 EXTRA MATERIALS

- A. Deliver extra materials to Owner.
- B. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with appropriate labels:
 - 1. Acoustical Panels: Furnish quantity of full size units equal to 2.0% of each type and size installed.

PART 2 - PRODUCTS

2.01 ACOUSTICAL PANELS, GENERAL

- A. Fabricate panels to sizes and configurations indicated; attach facing materials to cores to produce installed panels with visible surfaces fully covered and free from wrinkles, sags, blisters, seams, adhesive or other foreign matter.
- B. Fabricate back-mounted panels in factory to exact sizes required to fit wall surfaces based on field measurements of completed substrates indicated to receive panels.
- C. Where radius corners indicated, attach facing material so no seams or gathering of material.
- D. Sound Absorption Performance: Provide acoustical panels with min. noise reduction coefficients (NRC) indicated determined by testing per ASTM C 423 for mounting type specified under individual product requirements.
- E. Colors, Textures and Patterns: Where manufacturer's standard material indicated, provide acoustical panels faced with manufacturer's material complying with following requirements:
 - 1. Provide color, texture and pattern as selected from manufacturer's full range of standard materials of type indicated.

2.02 BACK-MOUNTED ACOUSTICAL WALL PANELS

- A. Back-Mounted Edge-Reinforced Acoustical Wall Panels: Manufacturers standard panel construction consisting of facing material laminated to front, edges and back border of molded glass fiber board core, with edges chemically hardened to reinforce panel perimeter against warpage and damage, and complying with following requirements:
 - 1. Core Density: 6 - 7 lbs. per cu. ft.
 - 2. Thickness/NRC: Nominal overall thickness of either 2" or 2-1/16"/NRC of 0.95 for Type A (#4) mounting.
 - 3. Type "WF" Facing Material: Manufacturer's standard woven polyester or polypropylene fabric.
 - 4. Panel Size: As indicated.
 - 5. Edge Detail: Chamfered (beveled).
 - 6. Corner Detail: Square.

- B. Back-Mounting Accessories: Manufacturer's standard or recommended accessories for securely mounting panels of type and size indicated to substrates provided and complying with following requirements:
 - 1. Mechanically-Mounted Edge-Reinforced Acoustical Wall Panels: Metal panel clip and base support bracket system and consisting of 2-part panel clips, with one part of each clip mechanically attached to back of panel and the other to wall substrate, designed to support panels literally; and base support brackets designed to support full weight of panels; with both designed to allow panel removal.

- C. Product: Subject to compliance with requirements, provide one of following:
 - 1. Back-Mounted Edge-Reinforced Acoustical Wall Panels:
 - a. Armstrong World Industries, Inc.
 - b. BPB
 - c. AVL Systems, Inc.
 - d. Fabro-Vicracoustic, Inc.
 - e. L.E. Carpenter & Co., Inc.
 - f. Metal Building Interior Products Co.
 - g. Owens-Corning Fiberglas Corp.
 - h. Sound Reduction Corporation
 - i. USG Interiors, Inc.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Wall Panels: Install acoustical panels in locations indicated with vertical surfaces and edges plumb, top edges level, and in alignment with other panels, scribed to fit adjoining work accurately at borders and at penetrations.
 - 1. Comply with panel manufacturer's printed instructions for installation of panels using type of mounting accessories indicated or, if none indicated, as recommended by manufacturer.

- B. Remove and replace damaged panels unacceptable to Architect.

- C. Panels shall be installed secure, plumb, level, straight, true and uniform with tops and bottoms properly aligned.

END OF SECTION 09520

**SECTION 09550
GYMNASIUM WOOD FLOORING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Section 01700; Closeout Procedures for video record of instruction and maintenance requirements.
- C. Section 03300; Concrete for steel toveled slab with depression
- D. For installation of waterproofing below concrete floor slab at gymnasium wood floor refer to Division-7 Section 07115, Waterproofing.

1.02 DESCRIPTION OF WORK

- A. Extent of wood flooring indicated on drawings and in schedules.
- B. Types of wood flooring required include following:
 - 1. Gymnasium Flooring: Wood strip flooring system.

1.03 REFERENCES

- A. MFMA: Maple Flooring Manufacturers Association , Grading rules for hard Maple (Acer Saccharum)
- B. DIN Part 2: Sport Halls; Halls for Gymnastics and Games; Floors for Sporting Activities; Requirements for testing Deutes Institut Fur Normung

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed technical product data and installation instructions for each type of wood flooring.
 - 1. Include instructions for handling, storage, installation, finishing, protection and maintenance.
- B. Samples: Submit sets of range samples for each type of wood flooring.
 - 1. Include finish where factory-finished flooring required.
 - 2. Include min. 6" long samples of each type of required accessory item such as wood or metal channels and feature strips, reducer strips, baseboard, trim molding and nosings.
- C. Shop Drawings: Contractor to develop completed, detailed shop drawings showing floor installation, floor terminations, court layouts, graphic designs and layouts.
 - 1. Provide complete installation details including method of anchoring, location and spacing of channel systems, depth of depressed slab and other related items.
 - a. Indicate location of anchors and inserts
 - 2. Floor Terminations to include details of floor to wall, floor to floor a differing materials and floor to floor conditions at entrance doors.
 - 3. Provide layout for each type of court.
 - a. Submit 1/8 inch + 1'-0" floor plan showing game line layout.
 - 4. Provide complete graphic layout of graphics, lettering, and borders.
 - a. The Owner shall provide a conceptual drawing of the proposed art work for the graphics.
 - b. The contractor shall be responsible for developing, from Owner generated art work, any necessary art work, scaled drawings and/or templates required for use in layout of graphics.
- D. WSFI Recommendations: Submit three (3) copies of WSFI recommendations for the correct preparation, finishing, and testing of concrete sub-floor surfaces to receive wood flooring.

- E. Maintenance Literature - Upon completion of floor installation provide, as part of close out documents data describing care and maintenance, including temperature and humidity ranges for areas where flooring is installed.

1.05 QUALITY ASSURANCE

- A. General Standard: Comply with recommendations of the Maple Flooring Manufacturer's Association.
- B. Source Quality Control: Obtain flooring of each type from single manufacturer or source, to ensure match of quality, color, pattern and texture.
- C. Flooring System Installer: The complete installation of the flooring system, as described in the scope of these specifications, shall be carried out by an experienced installer (Flooring Contractor), and the work shall be performed in accordance with most recent installation instructions of the manufacturer.
 - 1. Installer (Flooring Contractor) shall be liable for all matters related to installation for a period of one year after the floor has been substantially installed and completed.
 - 2. Installer Qualifications: Specialized wood flooring firm with not less than 5 years successful experience in installation of flooring types specified.
 - a. Submit a list of a minimum of ten (10) completed projects of similar magnitude and complexity
 - 3. Flooring installer shall be approved by the flooring system manufacturer for the installation of the flooring.
- D. Product Quality Control: Each bundle of flooring shall bear MFMA grade mark and each strip of wood flooring shall be identified on the underside with the MFMA trademark.
- E. General Standard: Comply with recommendations of "Hardwood Flooring Installation Manual" by National Oak Flooring Manufacturer's Association (NOFMA).
- F. Performance Testing: Flooring system shall have been independently tested and certified to meet or exceed Athletic Performance according to the international standard DIN 18032, Part 2.
 - 1. Consistency - Test point variance no greater than 3% +/- to the average force reduction and average ball rebound.
 - 2. Flooring system shall have been independently tested and evaluated for Engineering Performance according to the Structural Testing and Engineering Measures (STEM).

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Moisture Content: At time of delivery, limit average moisture content of wood flooring to 12%, with 14% max. for any piece.
- B. Protect wood flooring from excessive moisture in shipment, storage, and handling.
- C. Deliver in unopened cartons or bundles and store in dry place, with adequate air circulation.
- D. Do not deliver material to building until "wet work" such as concrete and plaster completed and cured to condition of equilibrium.
- E. Flooring Storage: Flooring shall be stored in a dry, warm, well-ventilated, water tight area, not in contact with the masonry, to acclimate to building conditions and shall be installed at a moisture content compatible with the normally expected environmental range of temperature and relative humidity achieved while the facility is occupied.
 - 1. Move wood flooring into spaces where it will be installed, at least seven days before installation.

1.07 JOB CONDITIONS

- A. Notice to Installer/Manufacturer: The manufacturer and installer are advised that the space in which this flooring system is to be installed is not air conditioned.
 - 1. Installation procedures and methods to allow for changes on humidity and temperature of space without adversely affecting floor system.

- B. Concrete Floor Slab: The concrete subfloors shall be determined dry by industry standard testing procedures, free of foreign materials, and turned over to the installer (Flooring Contractor) broom clean.
- C. Building Construction Status: The wood flooring specified herein shall not be installed until all masonry, painting, plaster, tile, marble and terrazzo work has been completed, and overhead mechanical trades and painters have finished in the wood floor areas
 - 1. The building shall be enclosed and weather-tight.
 - 2. Do not proceed with installation until re-roofing activities on roof area of Gymnasium have been completed and the building is watertight.
- D. Lighting, Ventilation, Heating and Air Conditioning: Permanent heat, light and ventilation shall be installed and operating during and after installation, maintaining a temperature range compatible with the expected low and high moisture content of the flooring.
 - 1. Do not proceed with installation of wood flooring until spaces enclosed and at approximate humidity condition planned for occupancy.
 - 2. Condition wood for 7 days prior to start of installation by placing in spaces to receive flooring and maintaining ambient temperature between 65°F. and 70°F. (18°C. and 21°C.) before, during, and after installation.
 - 3. Humidity conditions within the building shall approximate the humidity conditions which will prevail when the building is occupied.
 - 4. Open packages of sealed wood flooring (if any) to permit natural adjustment of moisture content.
- E. Protection of Finished Flooring: After floors are finished, area to be kept locked by general contractor to allow curing time for finish. If after required curing time general contractor or owner requires use of gym, he shall protect the floor by covering with non-marring kraft paper or red rosin paper with taped joints until acceptance by owner of complete gymnasium floor.

1.08 SPECIAL PROJECT WARRANTY

- A. Submit 3-year warranty signed by Manufacturer, Installer, and Contractor, agreeing to repair or replace wood flooring which shrinks, warps, cracks, or otherwise deteriorates excessively, or which breaks anchorage or bond with substrate or otherwise fails to perform as required, due to failures of materials and/or workmanship and not due to **unusual** exposure to moisture or other abusive forces or elements not anticipated for application.
 - 1. The manufacturer is advised that the space in which the flooring is to be installed may not be air conditioned. The warranty shall contain no language which limits the coverage of the warranty where temperature and humidity within the space are not controlled through the use of mechanical equipment.

1.09 EXTRA STOCK/REPLACEMENT MATERIAL

- A. After completion of wood flooring work, deliver to project site min. 1.0% of quantity of each type wood flooring installed on project.
 - 1. Provide in manufacturer's original, unopened cartons or bundles.

1.10 CERTIFICATIONS

- A. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- B. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

PART 2 - PRODUCTS

2.01 WOOD STRIP FLOORING SYSTEMS

- A. Anchored Sleeper/Panel-Type Assemblies:
 - 1. Wood strip flooring.
 - 2. Two layers plywood panels.
 - 3. Nylon collared steel drive pins.
 - 4. Rectangular rubber pads.
 - 5. Steel channels
- B. Basis for the design:
 - 1. Connor Sports Flooring: ARS-DIN Anchored, Rezill Channel DIN.
- C. Manufacturer: Subject to compliance with technical requirements, and subject to being equal to the system used as the basis for design provide products of one of the following:
 - 1. Connor Sports Flooring
 - 2. Aacer Flooring
 - 3. Robbins, Inc.

2.02 MATERIALS

- A. Wood Strip Flooring: MFMA-graded hard maple standard strip flooring, tongue-and-grooved, end-matched, random-length and kiln-dried.
 - 1. Species Northern Hard Maple (*acer saccharum*)
 - 2. Grade: Second and better; TGEM, MFMA Grade marked and stamped.
 - 3. Cut: Plain Sawn.
 - 4. Thickness: 25/32"
 - 5. Width: 2-1/4 inch (57 mm).
 - 6. Grade: MFMA Third & Better.
 - 7. Lengths: Provide standard random length strips, complying with applicable grading rules.
 - 8. Seasoning: Manufacture wood strip flooring from kiln-dried lumber; Maximum moisture content at time of delivery to be 8%.
- B. Subfloor (DIN): Factory assembled panels, constructed of two layers of 15/32" APA rated plywood sheeting, Exposure 1 with 1/2" X 2" X 2" Resilient Pads attached nominally 8" on center each way.
- C. Channels - 16 gauge coated continuous steel.

2.03 ACCESSORY MATERIALS FOR WOOD FLOORING

- A. Vapor Barrier: Provide as indicated or required by flooring manufacturer.
 - 1. Polyethylene Sheeting: 6 mil (0.006") thick, standard manufacture.
- B. Adhesive/Mastic: Polyvinyl acetate or special mastic of type recommended by manufacturer of flooring, and complying with flammability and environmental control restrictions.
- C. Fasteners: As recommended by manufacturer, but not less than recommended by NOFMA in "Installation Manual."
 - 1. Flooring fasteners - 2" barbed cleats or coated staples.
 - 2. Channel anchors - 1-1/4" long steel drive pins (or length as dictated by site conditions - achieving a minimum 900 lbs pull-out strength) applied with an air driven or low velocity power actuated tool
- D. Gymnasium Line Paint: Flooring Manufacturer's standard, compatible with finish, in colors selected by Architect. Paint shall be of type recommended by floor finish manufacturer and shall meet the following criteria:
 - 1. Compatible floor finish.
 - 2. Color fast and shall not run or streak.
 - 3. Non-yellowing.

- E. Floor Finish: Polyurethane varnish as recommended by flooring system Manufacturer's standard system to meet warranty requirements.
 - a. Polyurethane Varnish Finish: Moisture curing type polyurethane finish, specially compounded for multiple-coat application on wood floors; FS TT-C-542.
 - 2. Varnish shall be non-yellowing.
- F. Floor Sealer: Penetrating type, pliable, wood-hardening finish/sealer; Penetrating Seal #21 by Hillyard Chemical Co., or Penetrating Triple XXX Seal-O-San by Huntington Laboratories, Inc., or equivalent sealer as recommended by flooring manufacturer.
- G. Floor Wax: Liquid, solvent-type, slip-resistant, FS P-W-158, Type I, Class 2.
- H. Wood Filler: Paste type wood filler, pigmented if necessary to match Architect's sample.
- I. Cork Expansion Strip: Composition cork expansion strip FS HH-C- 576, Type I-B, Class 2.
- J. Wood Trim: Except as otherwise indicated, provide wood stripping, reducer strips, nosings, saddles and thresholds, as indicated in or adjacent to wood flooring, of same species, grade, and cut as wood flooring.
 - 1. Reducer Strip: 2" wide tapered reducer strip in thickness, species and finish to match wood flooring.
 - 2. Wood Feature Strip: 2" wide, square-edged strip furnished in lengths as long as practical and in thickness to match wood flooring.
- K. Vented Base: Provide vented hard rubber base as follows:
 - 1. Wall Base - 3" X 4", heavy duty, molded, vented cove base with pre-molded outside corners.
 - 2. Color: Black

PART 3 - EXECUTION

3.01 INSPECTION

- A. The concrete slab shall be jointly inspected by the Flooring Manufacturer, Flooring Contractor, and General Contractor. Any deficiencies found which would have and adverse affect on the performance of the floor if left uncorrected or that would affect the issuance of the required warranties shall be brought to the attention of the General Contractor and the Architect prior to installing the floor.
 - 1. The installation of the flooring shall be considered acceptance of the concrete floor slab as a suitable substrate for the installation of the new flooring.
- B. Prior to ordering any material for the project site the contractor shall perform tests to verify that the concrete slab is suitable for mechanically attaching new flooring.
 - 1. Notify Architect of any conditions which prevent the contractor from installing the finished flooring in accordance with the provisions of these specifications.
- C. The concrete slab shall be checked with a Surveyors level to determine if the slab is within tolerance for degree of levelness.
 - 1. Slabs found to deviate from level in excess of the amount allowed by these specifications shall be corrected prior to installation of gymnasium flooring.

3.01 INSPECTION OF SUBSTRATE

- A. Prior to installing products specified in this section, each product manufacturer's representative and installer visit jobsite and check substrate surfaces for any defects, including moisture and alkalinity that may prevent each party from guaranteeing his portion of work.
 - 1. Report defects, in writing, to Contractor with copy to Architect.
 - 2. Contractor correct defects as required in order that each party will guarantee his portion of work.
- B. Do not allow resilient flooring work to proceed until subfloor surfaces satisfactory.

3.02 TESTING

- A. As part of the scope of the work the contractor shall arrange for, and pay costs associated with, third party testing as required by manufacturer, installer and as noted herein. Tests to include, as a minimum, the following:
 - 1. Moisture Testing
 - 2. Alkalinity testing.
 - 3. Bond testing.

3.03 MOISTURE TESTING

- A. Manufacturer recommendations: The work of this section to conform with recommendations and requirements of flooring manufacturer and work defined herein. Where a conflict in the requirements exist the more stringent of the requirements shall apply.
- B. Moisture: Contractor to perform moisture tests of concrete floor slab to verify that moisture is within tolerances allowed by manufacturer. If moisture content exceeds allowable levels, contractor shall implement measures to remove moisture from slab.
 - 1. Do not install flooring until moisture content is within manufacturers tolerances.
- C. Moisture Limits: The materials specified in this section shall not be installed until the moisture in the concrete slab is within the limits defined by the flooring manufacturer.
 - 1. Unless otherwise indicated the limits for moisture for the RH Probe shall be 80% maximum.
- D. Testing Agency: Testing to be performed by qualified third party testing agency acceptable to architect. Testing shall not be performed by the contractor or contractor's employees.
- E. Environmental Conditions: The conditions of the space in which the testing is to be performed shall meet the following conditions for no less than 48 prior to and after test is performed:
 - 1. Temperature: 75 degrees F +/- 10 degrees
 - 2. Humidity: 50% relative humidity +/- 10%
- F. Testing Types: Testing shall be performed using:
 - 1. Relative Humidity (RH) testing using Wagner Rapid RH Probe or similar devices.
- G. Calcium Chloride Testing: Testing for moisture vapor emission rate (MEVR) shall be performed in accordance with above referenced, applicable ASTM standards and the following:
 - 1. Removal concrete coatings including curing compound.
 - 2. Commence test no sooner than 24 hours from the time the concrete curing compound was removed.
 - 3. Test shall be run for no less than 84 hours.
- H. Relative Humidity Testing: Perform tests in accordance with probe manufacturer written instructions.
 - 1. Drill hole of diameter required by probe.
 - 2. Insert probe into holes.
 - 3. Test results available within 45 minutes.
- I. Testing Frequency: Moisture testing shall be performed as required by flooring manufacturer, but no less than quantity indicated herein:
 - 1. Three (3) tests for the first 1,000 sf.
 - 2. One (1) test for each additional 1,000 sf.
- J. Testing Reports: Copies of third party testing reports to be submitted to the architect, contractor and flooring contractor prior to the installation of the flooring.
- K. Removal of Excess Moisture: It is the responsibility of the contractor to place the concrete slab at the specified water/cement ratio, properly cure concrete slabs, limit exposure to moisture, dry-in the building in a timely fashion and render building Hvac system operational in sufficient time to allow for the concrete slabs to dry sufficiently to allow for the application of the flooring.
 - 1. Should the concrete slab fail to meet the established maximum limits for moisture, the contractor shall be responsible for the implementation of necessary procedures to dry out the slab.
 - 2. Contractor responsible for cost for material, labor and/or equipment required to dry out building sufficiently for installation of flooring system.

3. If attempts to dry out slab are unsuccessful the contractor shall bead blast the concrete slab and apply moisture barrier of type and using methods recommended by manufacture. Bead blasting and application of moisture barrier shall be at no additional cost to the contract.

3.04 ALKALINITY TESTING

- A. Perform alkalinity test of concrete floor slab to determine if concrete alkalinity suitable for application of adhesive and tile.

3.05 INSTALLATION

- A. General: Comply with flooring manufacturer's instructions and recommendations, but not less than recommended by NOFMA in "Hardwood Flooring Installation Material" and by recommendations of America Parquet Flooring Association, Inc., as applicable to type flooring required.
- B. Pattern: Comply with pattern or direction of pattern for laying wood flooring as indicated or, if not indicated, as directed by Architect.
 1. Pattern: Strip Flooring System in straight running pattern.
- C. Sub Flooring Installation:
 1. After substrate found acceptable for floor installation, install vapor barrier in accordance with flooring system manufacturer's instructions.
 - a. Lap 4" all joints and laps in vapor barrier. Seal with two row of approved tape.
 - b. Seal rips, tears and punctures in vapor barrier two rows of approved tape.
 2. Fasten first row of channels to concrete perpendicular to finish flooring with steel anchors driven approximately 14" on center along base of channels and within 3" of channel ends.
 3. Place pre-assembled subfloor panels parallel to channels, spacing end joints a minimum of 1/4". Capture exposed side edges of subfloor panel with adjacent channel. Offset channels end 4' from adjacent rows.
 4. Align each adjacent row of subfloor panels to form continuous 45 degree end joints throughout the subfloor assembly.
 5. Provide 1-1/2" expansion voids at perimeter and at all vertical obstructions.
 6. Install solid blocking under bleachers in the stacked position.
- D. Maple flooring Installation:
 1. Install maple flooring by power nailing or stapling approximately 12" on center with end joints properly driven up.
 2. If required, size joints between flooring strips to allow for intermediate expansion in accordance with local humidity conditions.
 3. Provide 1-1/2" expansion voids at perimeter and at all vertical obstructions. Unless fully concealed by trim, fill expansion space with flush cork expansion strip.
 4. Scribe wood flooring to all permanent obstructions.

3.06 SANDING AND FINISHING

- A. Machine sand installed unfinished flooring to remove offsets and non-level conditions, ridges, cups, and sanding machine marks visually noticeable after finishing.
 1. Use 3 grades of sandpaper, ending with 00 grade.
 2. Vacuum clean floor.
 3. After sanding floor buff the entire floor using 100 grit screenback or equal grit sand paper with heavy duty buffing machine.
 - a. Floor shall have a smooth surface free from drum stop marks, gouges, streaks, or shiners.
 - b. Re-work floor until it meet above stated requirements.
 4. Vacuum clean and immediately apply finish.
 - a. Wood floor surface shall be acceptable to the Finishing System Subcontractor and finish manufacturer prior to applying finish.
 5. Do not permit traffic on floor after sanding and until finish completed.
 6. Cover sanded floor with building paper to provide access for application of first finish coats.
- B. Apply stain if needed to match approved sample.
- C. Apply wood filler by brush, followed by wiping across grain to work into pores and cracks.

- D. Apply a min. of five coats of floor varnish in accordance with manufacturer's instructions, buffing after each coat. First coat may be thinned as sealer or, at Installer's option, first coat may be shellac sealer.
- E. Apply line and graphics paint after seal coat applied and cured prior to application of finish coats.
 - 1. Installation of painted lines shall comply with manufacturers applicable written instructions.
 - 2. Line layout to comply with National High School Association requirements.
- F. Play Court Graphics: In addition to the painting of the game lines the contractor shall paint play court graphics as follows:
 - 1. Center court Graphics: Graphic of a school mascot; type of mascot to be determined during shop drawings phase.
 - a. Location: Center court.
 - b. Size: Size of center circle plus 2'-0" each side (approximately)
 - c. Quantity: One (1) each.
 - d. Number of Colors to be Used: Four colors
 - e. Art work of mascot to be furnished at the time of the shop drawing submission
 - 2. Side court Graphics:
 - a. Solid court boarder; 3'-0" all four sides.
 - b. Name of team printed along side court in boarder.
- G. Game Line Paint: Contractor shall paint lines for Main Basket Ball Court; Two Side Courts and Two Volley Ball Courts.
 - 1. Installation of painted lines shall comply with manufacturers applicable written instructions.
 - 2. Line layout to comply with National High School Association requirements.
- H. Wax and buff completed finish before permitting traffic.

3.07 PROTECTION

- A. Protect completed wood flooring during remainder of construction period with heavy Kraft paper or other suitable covering, so that flooring and finish without damage or deterioration at time of Final Acceptance.

3.08 ACCEPTANCE

- A. The following shall be considered conditions for acceptance of flooring:
 - 1. Flooring system shall be installed and certified by installer as having been installed in full compliance with contract provisions.
 - 2. Work shall be 100% complete, final inspection conducted, and punch list corrected.
 - 3. Floor shall be level to within 1/8" in 10'-0".
 - 4. Flooring system shall be free from cracks, cups, warpage, or other defects.
 - 5. Finish shall be clear, free from streaks, drips and other imperfections.
 - 6. Floor surface shall be free from "dead" areas.

END OF SECTION 09550

**SECTION 09650
RESILIENT FLOORING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of resilient flooring and accessories is shown on drawings and in schedules.
- B. Cementitious underlayment for leveling of floor slab specified in Division 3.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of resilient flooring and accessories produced by single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.
- B. Fire Test Performance: Provide resilient flooring complying with following fire test performance criteria determined by independent testing laboratory acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux (CRF): Min. 45 watts/sq. cm. per ASTM E 648
 - 2. Flame Spread Max. 75 per ASTM E 84.
 - 3. Smoke Developed: Max. 450 per ASTM E 84.
 - 4. Smoke Density: Max. 450 per ASTM E 662.
- C. Moisture Vapor Emission Rate (MVER):
 - 1. Calcium Chloride Test; ASTM F1869
 - 2. Relative Humidity (RH) Test: ASTM F2170.
 - 3. MVER for Resilient Flooring: ASTM F710
- D. Installer's Qualifications: Engage Installer certified in writing by resilient flooring manufacturer as qualified for installation of sheet vinyl employing heat welded seams.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type resilient flooring and accessory.
- B. Samples for Initial Selection Purposes: Submit manufacturer's standard color charts in form of actual sections of resilient flooring, including accessories, showing full range of colors and patterns available, for each type resilient flooring required.
- C. Samples for Verification Purposes: Submit following samples of each type, color, and pattern of resilient flooring required, showing full-range of color and pattern variations.
 - 1. Full size tile samples.
 - 2. 6" x 9" samples of sheet flooring.
 - 3. 2½" long samples of resilient flooring accessories.
- D. Other materials as required.
- E. Certification for Fire Test Performance: Submit certification from independent testing laboratory acceptable to authorities having jurisdiction that resilient flooring complies with fire test performance requirements.
- F. Certification of Asbestos-Free Materials: Submit certification from manufacturer that all flooring materials, accessories and adhesives are 100% free of asbestos.

- G. Maintenance Instructions: Submit 2 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.
 - H. Colors: Submit a minimum of three sets of the manufacturers full line of color line from which Owner/Architect may select. Do not submit any samples which are either discontinued or not available for selection.
 - 1. Once color samples of all interior finishes have been received the Architect will select colors from those submitted.
 - 2. The architect shall not be limited to the number of tile colors which may selected for use in each area or on the project. The selection of multiple colors shall be at no additional cost to the contract.
 - I. Accent Tile. Borders and Graphic Designs: It is the intent that different colored tiles be utilized to create borders and linear type graphic designs.
 - 1. As part of the color selection process the architect will layout the graphic designs to be used in the installation of the floor tile. The patterns may, at the option of the architect, include linear type designs, including borders, graphic designs, inlaid patterns, or other linear designs, either aligned with the floor tile pattern or at 45 degrees to the floor tile pattern. All designs and/or patterns to of a rectilinear type design and shall not include curved or free style cuts.
 - 2. The use of accent tiles for borders and graphic designs shall be at no additional cost to the contract.
 - J. Other materials as required.
- 1.05 PROJECT CONDITIONS
- A. Maintain min. temperature of 70°F and a maximum of 90°F in spaces to receive resilient flooring for min. 72 hours prior to installation, during installation, and min. 72 hours after installation.
 - 1. Store resilient flooring materials in spaces where to be installed for min. 72 hours before beginning installation.
 - 2. Subsequently, maintain min. temperature of 60°F in areas where work completed.
 - B. Install resilient flooring and accessories after other finishing operations, including painting, completed.
 - 1. Do not install resilient flooring over concrete slabs until latter cured and sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following:
 - 1. Manufacturers of Vinyl Composition Tile:
 - a. Armstrong World Industries, Inc.
 - b. Azrock Floor Products Div., Azrock Industries, Inc.
 - c. Kentile Floors, Inc
 - d. Mannington Commercial
 - e. Tarkett Inc.
 - 2. Manufacturers of Rubber Base, Treads, Risers, and Skirtings:
 - a. Allstate Rubber Corp.
 - b. Burke Flooring Products Div., Burke Industries, Inc.
 - c. Flexco Div., Textile Rubber Co.
 - d. Johnson Rubber Co., Inc.
 - e. Nora Rubber Flooring
 - f. R.C. Musson Rubber Co., Inc.
 - g. R.C.A. Rubber Co.
 - h. Roppe Rubber Corp.
 - 3. Manufacturers of Cleaning Compound:
 - a. Hilliard Chemical Co.
 - b. Huntington Laboratories
 - c. Johnson Laboratories, Inc.

4. Manufacturers of Floor Wax:
 - a. Hilliard Chemical Co.
 - b. Huntington Laboratories
 - c. Johnson Laboratories, Inc.

2.02 RESILIENT FLOORING COLORS AND PATTERNS

- A. Provide color and patterns indicated, or if not otherwise indicated, selected by Owner/Architect from manufacturer's standards.

2.03 TILE FLOORING

- A. Premium Vinyl Composition Tile: Meet or exceed ASTM F 1066 Class 1 or 2, non-asbestos formulated and as follows:
 1. Style: Through-Pattern style.
 2. Size: 12" x 12"
 3. Gage: 1/8".
 4. Static Load; Provide materials with static load limit of 400 psi or higher.
 5. Color, Pattern and Appearance: Equal to Azrock, Vinyl Enhanced Tile. Azterra, minimum of 14 colors.
 6. Warranty; 10 limited year

2.04 ACCESSORIES

- A. Rubber Wall Base: Type TS, Thermoset Vulcanized Extruded Rubber Cove Base, in rolls (4' cut lengths not permitted) with matching end stops and preformed or molded corner units, and as follows:
 1. Type: Group 1; Solid Homogenous
 2. Height: 4".
 3. Thickness: 1/8" gage.
 4. Style: Standard top-set cove.
 5. Finish: Matte.
- B. Resilient Stair Treads: Provide treads where shown, single-piece units for width of stair treads, or equal-length units if tread width exceeds available manufactured lengths.
 1. Rubber: Type TS, Thermoset Vulcanized Extruded Rubber; FS RR-T-650, Type A, sanded backs, style as indicated.
 2. Raised profile surface pattern as selected by Architect from manufacturers standard lines.
 3. Thickness: Min. 3/16" nominal and 1/4" at nosing.
 4. Nose Design: Class 2 - square nose.
- C. Resilient Risers: Provide single-piece riser for height and width of stair risers or equal-sized units if riser width exceeds available manufactured lengths.
 1. Rubber Type TS, Thermoset Vulcanized Extruded Rubber.
 2. Size: 7" cove base, 1/8" ga.
- D. Resilient Stringer Skirt: Cut to match riser and tread provide and to meet wall base height, of same material and color as base unless otherwise indicated.
- E. Resilient Edge Strips: 1/8" thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, color to match flooring, or selected by Architect from standard colors available; minimum width 1", and as herein noted:
 1. Vinyl Tile Reducer Strip; manufacturers standard.
 2. Vinyl Tile Edge Strip; 1/8" x 2" vinyl.
 3. Vinyl Tile Divider Strip; manufactures standard.
 4. Other Vinyl Tile Accessories.

- F. Metal Edge Strips:
 - 1. Of width shown and of required thickness to protect exposed edge of resilient flooring. Min. thickness of 0.062", unless otherwise noted.
 - 2. Provide units of max. available length, to minimize number of joints.
 - 3. Material: Extruded aluminum with finish as selected by Owner/Architect, unless otherwise shown.
 - 4. Type: Butt type metal edge strips for concealed anchorage.
- G. Adhesives (Cements):
 - 1. Unless otherwise noted provide waterproof, stabilized type recommended by flooring manufacturer to suit material and substrate conditions. Adhesive shall of type suitable for applications where:
 - a. RH (Relative Humidity) is 90% or less
 - b. Moisture Emissions (MEVR) up to 10#/1000sf
 - c. PH range is between 7 to 11.
 - 2. Provide epoxy type adhesive where tile indicated to be installed in wet areas.
 - a. At electric water coolers extend epoxy adhesive 4'-0" each side and out from water cooler.
 - b. At lunchroom provide 6'-0" wide area of epoxy adhesive adjacent to kitchen and dishreturn.
 - 3. Use of asphalt "cut-back" adhesive not acceptable.
- H. Concrete Slab Primer: Non-staining type recommended by flooring manufacturer.
- I. Leveling Compound: Cementitious type recommended by flooring manufacturer. Use of gypsum based leveling compounds not acceptable.

PART 3 - EXECUTION

3.01 INSPECTION OF SUBSTRATE

- A. Prior to installing products specified in this section, each product manufacturer's representative and installer visit jobsite and check substrate surfaces for any defects, including moisture and alkalinity that may prevent each party from guaranteeing his portion of work.
 - 1. Report defects, in writing, to Contractor with copy to Architect.
 - 2. Contractor correct defects as required in order that each party will guarantee his portion of work.
- B. Do not allow resilient flooring work to proceed until subfloor surfaces satisfactory.

3.02 TESTING

- A. As part of the scope of the work the contractor shall arrange for, and pay costs associated with, third party testing as required by manufacturer, installer and as noted herein. Tests to include, as a minimum, the following:
 - 1. Moisture Testing
 - 2. Alkalinity testing.
 - 3. Bond testing.

3.03 MOISTURE TESTING

- A. Manufacturer recommendations: The work of this section to conform with recommendations and requirements of flooring manufacturer and work defined herein. Where a conflict in the requirements exist the more stringent of the requirements shall apply.
- B. Moisture: Contractor to perform moisture tests of concrete floor slab to verify that moisture is within tolerances allowed by manufacturer. If moisture content exceeds allowable levels, contractor shall implement measures to remove moisture from slab.
 - 1. Do not install flooring until moisture content is within manufacturers tolerances.
- C. Moisture Limits: The materials specified in this section shall not be installed until the moisture in the concrete slab is within the limits defined by the flooring manufacturer.
 - 1. Unless otherwise indicated the limits for the moisture vapor emission rate (MEVR) shall be as follows:
 - a. Vinyl floor tile (VCT): 5 lbs/1000sf/24hours
 - 2. Unless otherwise indicated the limits for moisture for the RH Probe shall be as follows:
 - a. Vinyl floor tile (VCT): 80%

- D. Testing Agency: Testing to be performed by qualified third party testing agency acceptable to architect. Testing shall not be performed by the contractor or contractor's employees.
 - E. Environmental Conditions: The conditions of the space in which the testing is to be performed shall meet the following conditions for no less than 48 prior to and after test is performed:
 - 1. Temperature: 75 degrees F +/- 10 degrees
 - 2. Humidity: 50% relative humidity +/- 10%
 - F. Testing Types: Testing shall be of one of the types listed:
 - 1. Calcium Chloride Testing, using standard manufacturers test kits.
 - 2. Relative Humidity (RH) testing using Wagner Rapid RH Probe.
 - G. Calcium Chloride Testing: Testing for moisture vapor emission rate (MEVR) shall be performed in accordance with above referenced, applicable ASTM standards and the following:
 - 1. Removal concrete coatings including curing compound.
 - 2. Commence test no sooner than 24 hours from the time the concrete curing compound was removed.
 - 3. Test shall be run for no less than 84 hours.
 - H. Relative Humidity Testing: Perform tests in accordance with probe manufacturer written instructions.
 - 1. Drill hole of diameter required by probe.
 - 2. Insert probe into holes.
 - 3. Test results available within 45 minutes.
 - I. Testing Frequency: Moisture testing shall be performed as required by flooring manufacturer, but no less than quantity indicated herein:
 - 1. Three (3) tests for the first 1,000 sf.
 - 2. One (1) test for each additional 1,000 sf.
 - J. Testing Reports: Copies of third party testing reports to be submitted to the architect, contractor and flooring contractor prior to the installation of the flooring.
 - K. Removal of Excess Moisture: It is the responsibility of the contractor to place the concrete slab at the specified water/cement ratio, properly cure concrete slabs, limit exposure to moisture, dry-in the building in a timely fashion and render building Hvac system operational in sufficient time to allow for the concrete slabs to dry sufficiently to allow for the application of the flooring.
 - 1. Should the concrete slab fail to meet the established maximum limits for moisture, the contractor shall be responsible for the implementation of necessary procedures to dry out the slab.
 - 2. Contractor responsible for cost for material, labor and/or equipment required to dry out building sufficiently for installation of flooring system.
 - 3. If attempts to dry out slab are unsuccessful the contractor shall bead blast the concrete slab and apply moisture barrier of type and using methods recommended by manufacture. Bead blasting and application of moisture barrier shall be at no additional cost to the contract.
- 3.04 ALKALINITY TESTING
- A. Perform alkalinity test of concrete floor slab to determine if concrete alkalinity suitable for application of adhesive and tile.
- 3.05 FLOOR SLAB FLATNESS
- A. Inspect floor slab for flatness. Unless otherwise required by flooring manufacturer, surface of concrete slab to be level to within 1/8" in 8'-0".
 - 1. The surface of the floor shall be smooth, level, and free of ridges, depressions and other imperfections.
 - B. Where concrete floor slab is found to be unlevel, grind high areas and fill depressions in order to obtain a smooth stable surface for installation of finished flooring.

- C. Use leveling and patching compounds recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.

3.06 PREPARATION

- A. Require installer to inspect subfloor surfaces to determine if satisfactory, one smooth and free from debris, cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.
- B. Apply concrete slab primer, if recommended by flooring or floor adhesive manufacturer, prior to application of adhesive; apply in compliance with manufacturer's directions.
- C. Remove coatings from subfloor surfaces that prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.
- D. Grind all areas scheduled to receive finished flooring, using concrete grinding equipment, surface of concrete flooring as required to obtain a smooth, uniform surface free from irregularities.
- E. Sand entire surface of area to receive flooring using power buffing machines with abrasive pads. Remove all ridges, high areas, mortar, concrete droppings, paint, adhesives and other 'foreign' materials.
- F. Broom clean and vacuum surfaces to remove all dirt, dust and debris and inspect subfloor; repeat activities until surface found to be smooth, clean and suitable for installation of flooring.
- G. Installation of flooring shall be considered as the floor contractor's acceptance of the subfloor as being suitable to receive finished flooring.

3.07 INSTALLATION, GENERAL

- A. Where movable partitions shown, install resilient flooring before partitions erected.
- B. Install resilient flooring using method indicated in strict compliance with manufacturer's printed instructions.
 - 1. Extend into toe spaces, door reveals, and into closets and similar openings.
 - 2. Scribe, cut, and fit to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.
- C. Maintain reference markers, holes, or openings in place or plainly mark for future cutting by repeating on finish flooring as marked on subfloor; use chalk, other non-permanent marking device.
- D. Install resilient flooring on covers for telephone and electrical ducts, and other such items as occur within finished floor areas.
 - 1. Maintain overall continuity of color and pattern with pieces of flooring installed on covers.
 - 2. Tightly cement edges to perimeter of floor around covers and to covers.
- E. Tightly cement resilient flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.
 - 1. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.
- F. Bleeding of adhesive not acceptable.
 - 1. Where bleeding of adhesive occurs, remove tile and adhesive and replace with new.

3.08 INSTALLATION OF TILE FLOORS

- A. Lay tile from center marks established with principal walls, discounting minor offsets, so tile at opposite edges of room are of equal width.
 - 1. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters.
 - 2. Lay tile square to room axis, unless otherwise shown.

- B. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered.
 - 1. Cut tile neatly around all fixtures.
 - 2. Broken, cracked, chipped, or deformed tiles not acceptable.
 - 3. Lay tile in "checkerboard" fashion with grain reversed in adjacent tiles.
- C. Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.
- D. Lay no floor tile over dirty, rough or unlevel surfaces.
 - 1. Thoroughly clean surface prior to installing tile.

3.9 INSTALLATION OF ACCESSORIES

- A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base required.
 - 1. Install base in lengths long as possible without joints, with preformed corner units, or fabricated from base materials with mitered or coped inside corners.
 - 2. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
 - 3. Set base in full bed of adhesive; remove excess adhesive from adjacent finishes.
 - 4. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of base with manufacturer's recommended adhesive filler material.
- B. Place resilient edge strips tightly butted to flooring and secure with adhesive; install edging strips at edges of flooring otherwise exposed. Install edge strips where indicated on drawings, where required, and as noted herein:
 - 1. Vinyl Tile Reducer Strip: Apply at all doors or cased openings between rooms receiving VCT and those not receiving VCT.
 - 2. Vinyl Tile Edge Strip: Apply under doors between rooms receiving vinyl tile.
 - 3. Vinyl Tile Divider Strip (edge strip): Install where tile abuts carpet or other flooring.
 - 4. Vinyl Tile Feature Strip: Install where indicated.
 - 5. Other Vinyl Tile Accessories: Install where indicated.
- C. Apply overlap metal edge strips where shown on drawings, and after flooring installation; secure units to substrate with countersunk stainless steel anchors, complying with edge strip manufacturer's recommendations.
 - 1. Install edging strips at edges of flooring otherwise exposed.
 - 2. Install edge strips where indicated on drawings, where required to cover flooring edge and as necessary to transition between different flooring type.
- D. Apply butt type metal edge strips where shown on drawings, and before installation of resilient flooring; secure units to substrate with countersunk stainless steel anchors, complying with manufacturer's recommendations.
 - 1. Install butt type edge strips where adjacent floor finish thickness are not the same. If flooring thicknesses are the same provide overlap type metal edge strips.
- E. Secure metal edge strips to concrete slab with stainless steel screws spaced at a maximum of 12" on center and 6" from each end.
- F. Intermediate Landings; Rubber Stair Treads, Risers and Skirts:
 - 1. Stair landings at main floor areas shall match floor finishes of the adjoining spaces.
 - 2. Intermediate landings, stair treads and risers shall be rubber tile
 - 3. All treads shall be installed with a 2" abrasive strip (of a contrasting color) recessed the full length of tread at impact area to help prevent slipping and to help the visually impaired when furnished in contrasting color. Colors to be selected by Owner.
 - 4. All stair treads and risers shall be furnished and installed in full width pieces, with no end splice joints across width of stair.

- G. Apply resilient accessories to stairs indicated and in strict accordance with manufacturer's installation instructions.

3.10 CLEANING, APPLICATION OF FINISH AND PROTECTION

- A. Pre-Application Meeting: Pre-work meeting shall be held on site to determine if the flooring is ready to receive floor care products.
 - 1. The Owner, architect, contractor, floor tile manufacture, floor finish manufacture and the finish installer shall be present for the meeting.
 - 2. At this meeting the manufacturers representative will be required to review floor care product installation and usage.
 - 3. Contractor shall furnish to the Owner and architect, as part of this meeting a schedule identifying the areas that will receive floor finish.
- B. Finish Applicator's Qualification: The floor finish shall be applied by a firm actively involved in the application of floor finish of the types to be used and for the applications indicated.
 - 1. Firm shall have a minimum of 10 years experience in the application of finish.
 - 2. Use only trained and qualified applicators for the application of the finish.
 - 3. Use of general contractor's personnel for application of finish not acceptable.
- C. All work to be performed in strict accordance with the manufactures written requirements and the requirements contained herein. Where a conflict exists between these requirements the more stringent requirement shall govern.
- D. Perform following operations immediately upon completion of resilient flooring:
 - 1. Sweep or vacuum floor thoroughly.
 - 2. Do not wash floor until time recommended by resilient flooring manufacturer elapsed to allow resilient flooring to become well sealed in adhesive.
 - 3. Damp-mop floor being careful to remove black marks and excessive soil.
 - 4. Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturers.
 - 5. Clean entire floor with specified compound following manufacturer's written instructions.
- E. Tests shall be performed to ensure that the floor is cleaned and neutralized before any floor finish can be applied.
 - 1. Test shall be done according to the manufacturers recommendations and supervision.
 - 2. Documentation for each room shall be provided that the floor is ready for finish.
- F. Factory Applied Finish: Prior to application of finish the contractor shall remove, using chemical methods, the factory applied protective finish as well as any protective floor polish applied after completion of installation.
- G. Clean resilient flooring as recommended by cleaning compound manufacturer.
- H. Application of Finish: Apply floor finish and sealer in strict compliance with the manufacturers written instructions.
 - 1. Apply sealers of type recommended by floor finish manufacture.
 - 2. Apply no less than five coats of finish (wax).
 - 3. Allow each coat of finish to fully cure prior to application of successive coat.
 - 4. Machine buff and burnish each coat of finish prior to application of successive coats of finish.
 - 5. Special care and attention shall be taken to ensure that the floor finish does not splash on the base cove or any other surrounding surfaces.
 - 6. Submit documentation/reports clearly describing the materials, used, the methods by which they were applied, time between coats, number of coats and other information to clearly indicate compliance with manufactures requirements and the requirements of this section.

- I. Architect and Owner's shall be notified that this application of finish has been completed and is ready for inspection prior to any furniture being setup.
 - 1. If the floor finish is not acceptable, an additional coat or coats may be required at no additional cost to the Owner and must be rescheduled for inspection.
 - J. Protect resilient flooring against damage from rolling loads for initial period following installation by covering with plywood or hardboard; use dollies to move stationary equipment or furnishings across floors.
 - 1. Cover resilient flooring with undyed, untreated building paper until inspection for Final Acceptance.
 - K. Clean flooring max. 4 days prior to date scheduled for inspections intended to establish date of Substantial Completion.
- 3.11 EXTRA STOCK
- A. Furnish and deliver to Owner, maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
 - B. Tile Flooring: Furnish min. one box for each 50 boxes or fraction thereof, for each type, color, pattern and size installed.
- 3.12 COMPLETED INSTALLATION
- A. General: Prior to requesting "final" inspection by Architect general and flooring contractors shall conduct detailed inspection of flooring and base and verify that flooring complies with requirements contained herewith.
 - 1. Items found deficient shall be corrected by contractor prior to requesting Architect's inspection.
 - B. Flooring: Completed installation of flooring shall comply with the recommendations of the manufacturer and requirements contained in this section. In addition to these requirements, floor tile shall be:
 - 1. Set squarely in space, with joints properly aligned, and free of gaps between adjacent sections of tile.
 - 2. Joints in adjacent tile to align.
 - 3. Securely adhered to subfloor; free of bleeding (adhesive).
 - 4. Adjacent sections of tile to be level and smooth.
 - 5. Floor tile shall be completely adhered to concrete floor slab. There shall be hollow 'sounding' areas below tile.
 - 6. Of neat, clean, uniform appearance, free of surface imperfections, dents, nicks, cracks, or surface protrusions.
 - C. Base: Completed installation of base shall comply with the recommendations of the manufacturer and requirements contained in this section. In addition to these requirements, base tile shall be:
 - 1. Set straight and true, with joints properly aligned, and free of gaps between adjacent sections of tile.
 - 2. Securely adhered to wall; free of bleeding (adhesive).
 - 3. Of neat, clean, uniform appearance, free of surface imperfections, dents, nicks, cracks, or surface protrusions.

END OF SECTION 09650

SECTION 09670
EPOXY WALL COATING SYSTEMS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work of this Section.

1.02 WORK INCLUDED

- A. Furnish all necessary materials, labor and equipment required to prepare substrate and install Epoxy/Urethane High-Build Coating System.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division I Specification Sections.
- B. Manufacturer's Data: Submit manufacturer's specifications on specific products of the Epoxy/Urethane Coating System and an overall system description, with installation instructions.
 - 1. Transmit copy of each installation instruction to Applicator.
- C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors and finishes available.
 - 1. Manufacturer's standard color charts shall also be submitted.
 - 2. Submit 2-1/2' x 4 samples of color chips from color chart selection designated by the Architect.
 - 3. Submit 3 sets of samples of each type and color required and show range of color and pattern variation.
 - 4. Sample submittals reviewed for color, texture, and pattern only.
 - 5. The applicator shall submit a 6"X6" system sample for verification purposes and finish texture approval and color.
- D. Material certificates signed by manufacturer certifying that the epoxy resin composition flooring complies with requirements specified herein.
- E. Maintenance Instructions: Submit 4 copies of manufacturer's written instructions for recommended maintenance practices.
- F. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- G. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Obtain primary Epoxy/Urethane Coating System materials including primers, resins, hardening agents, specially blended aggregates, and finish coats from a single manufacturer providing materials of the type specified in this section. Provide unblended aggregates, solvents and other secondary materials from a source recommended by the manufacturer of primary materials.

- B. Portable mock-up: Prior to starting application of coating system, provide full scale portable mock-up to establish acceptable quality, durability, and appearance. Mock-up size must not be less than 4 square feet.
 - 1. Acceptable mock-up to be standard of quality for installed work.
 - 2. Unacceptable installed work to be removed and replaced until acceptable. Aesthetically unacceptable but well bonded work may be recoated per Manufacturer's instructions if thickness clearances permit.
- C. Applicator Qualifications: Installation shall be performed by an applicator with not less than three years of satisfactory experience in the application of the type of system as specified in this section, and shall be approved by the manufacturer of the Epoxy/Urethane Coating System.
 - 1. Installer must be acceptable to architect, manufacturer, and owner.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Primary system materials shall be delivered in the manufacturer's undamaged, unopened containers. Each container shall be clearly marked with the following:
 - 1. Product name
 - 2. Manufacturer's name
 - 3. Component designation (A or B, etc.)
 - 4. Mixing ratio of component mixture
- B. Provide equipment and personnel to handle the materials by methods which prevent damage.
- C. The applicator shall promptly inspect all direct job site deliveries to assure that quantities are correct and that materials comply with requirements and are not damaged.
- D. Store materials in accordance with manufacturer's instructions, with seals and labels intact and legible. Maintain temperatures within the required range. Do not use materials that have been stored for a longer period of time than the manufacturer's maximum recommended shelf life.

1.06 PROJECT CONDITIONS

- A. Maintain the ambient room and the floor temperatures at 60 degrees Fahrenheit, or above, for a period extending from 72 hours before, during and after floor installation. Concrete to receive surfacing shall have cured for at least 28 days and shall have been free of water for at least 7 days.
- B. Dew Point: Substrate temperature must be minimum of 5 degrees above dew point prior to, during or up to 24 hours after application of wall coating system.
- C. Illumination: Apply wall coating system only where a minimum of 30 footcandles exist when measured 3 feet from surface.

1.07 PROTECTION

- A. Protect adjacent surfaces not scheduled to receive the wall coating by masking, or by other means, to maintain these surfaces free of the wall coating material.
- B. Provide adequate ventilation and fire protection at all mixing and placing operations. Prohibit smoking or use of spark or flame producing devices within 50 feet of any mixing or placing operation.
- C. Provide polyethylene or rubber gloves or protective creams for all workmen engaged in applying products containing epoxy.

1.08 WARRANTY

- A. Contractor to guarantee work under this Section to be free from defects of material and installation for the duration of the warranty period. Defects occurring during warranty period shall be repaired, in a manner satisfactory to the Owner and the Architect, at no additional cost to the Owner.
 - 1. Warranty Period: One (1) Year.

SECTION 2 - MATERIALS

2.01 MATERIALS

- A. Material shall be produced by epoxy wall coating manufacturer or be approved in writing by epoxy wall coating manufacturer for the epoxy wall coating system specified.
- B. Follow manufacturers instructions for cure time and preparation for succeeding coats.
- C. System Overview: Provide a high-build, high gloss coating system with a total thickness of 15 mils. The following components shall be used:
 - 1. Block Filler: 100% solids Epoxy Block Filler; Key Resin #533
 - 2. Binder: Primer/Low Modulus Binder, Key Resin #502.
 - 3. Bodcoaty: 100% Solids Epoxy Wall Coating, Key Resins #544.
 - 4. Top Coat: Urethane Top Coat; Key Resins #450
- D. Crack Filler: Prior to system application, all control joints and cracks are to be treated with semi-rigid epoxy joint filler and rigid epoxy crack filler respectively as described in the execution section.
 - 1. Semi-rigid epoxy control joint filler: Key #780 Joint Filler
 - 2. Rigid epoxy crack filler: Key #730 or Key #715 Crack Filler
- E. Epoxy based main composition wall coating specification based Key Resins Company products.
 - 1. Approved Suppliers subject to compliance with technical provisions of contract documents:
 - a. Dex-O-Tex - Rancho Dominguez, California
 - b. Selby - Jacksonville, Florida
 - c. Suresin - Pittsburgh, Pennsylvania
 - d. Tnemec Company, Inc; Kansas City, MO.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Prior to installing products specified in this Section, product manufacturer's representatives and Installer visit jobsite and check substrate surfaces for any defects (including moisture) that may prevent each party from guaranteeing his portion of work.
 - 1. Report defects, in writing, to Contractor with copy to Architect.
 - 2. Contractor correct defects as required in order that each party will guarantee his portion of work.
- B. Inspect surfaces to receive wall coating and verify that condition is smooth and free from conditions that will adversely affect execution, permanence, or quality of work.
 - 1. Remove all projections, all debris detrimental to wall coating system, and dirt, oil contaminates, grease, and surface coatings affecting bond.
 - 2. Notify Architect in writing prior to commencing work of any conditions deemed unsatisfactory for the installation; installation of wall coating materials is understood as acceptance of the substrate as satisfactory.
 - 3. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Applicator.

3.02 TESTING

- A. As part of the scope of the work the contractor shall arrange for, and pay costs associated with, **third party** testing as required by manufacturer, installer and as noted herein. Tests to include, as a minimum, the following:
 - 1. Moisture Testing
 - 2. Alkalinity testing.
 - 3. Bond testing.

3.03 MOISTURE TESTING

- A. Manufacturer recommendations: The work of this section to conform with recommendations and requirements of wall coating manufacturer and work defined herein. Where a conflict in the requirements exist the more stringent of the requirements shall apply.
- B. Moisture: Contractor to perform moisture tests of concrete block to verify that moisture is within tolerances allowed by manufacturer. If moisture content exceeds allowable levels, contractor shall implement measures to remove moisture from walls.
 - 1. Do not install wall coating system until moisture content is within manufacturers tolerances.
- C. Moisture Limits: The materials specified in this section shall not be installed until the moisture in the concrete block is within the limits defined by the wall coating manufacturer.
 - 1. Unless otherwise indicated the limits for moisture using the calcium chloride test shall be 3#/1000 sf per 24 hours.
 - 2. Unless otherwise indicated the limits for moisture for the relative humidity probe test shall be 75%.
- D. Testing Agency: Testing to be performed by qualified **third party** testing agency acceptable to architect.
- E. Environmental Conditions: The conditions of the space in which the testing is to be performed shall meet the following conditions for no less than 48 prior to and after test is performed:
 - 1. Temperature: 75 degrees F +/- 10 degrees
 - 2. Humidity: 50% relative humidity +/- 10%
- F. Testing Types: Moisture vapor emission and moisture content testing shall conform with the requirements of ASTM F-1869-11 (Calcium Chloride Test) and ASTM F-2170-11 (Relative Humidity Probe Test).
- G. Testing Frequency: Moisture testing shall be performed as required by wall coating manufacturer, but no less than quantity indicated herein:
 - 1. Three (3) tests for the first 1,000 sf.
 - 2. One (1) test for each additional 1,000 sf.
- H. Testing Reports: Copies of third party testing reports to be submitted to the architect, contractor and wall coating contractor prior to the installation of the wall coating system.
- I. Removal of Excess Moisture: It is the responsibility of the contractor to place the concrete block at the specified water/cement ratio, properly cure concrete block, limit exposure to moisture, dry-in the building in a timely fashion and render building Hvac system operational in sufficient time to allow for the concrete block to dry sufficiently to allow for the application of the wall coating.
 - 1. Should the concrete block fail to meet the established maximum limits for moisture, the contractor shall be responsible for the implementation of necessary procedures to dry out the slab.
 - 2. Contractor responsible for cost for material, labor and/or equipment required to dry out building sufficiently for installation of wall coating system.
 - 3. If any test result shows excessive levels of moisture content or vapor emission rate, apply manufacturer's recommended moisture vapor emission control material based on the highest reading.

3.04 ALKALINITY TESTING

- A. Perform alkalinity test of concrete block to determine if concrete alkalinity suitable for application of wall coating system.

3.05 PREPARATION

- A. Remove concrete block laitance by steel shot blasting or other method approved by wall coating manufacturer and achieve minimum surface profile of CSP-3.
- B. Cracks and non-expansion joints shall be routed and filled with crack filler and epoxy joint filler respectively.

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- A. General: Apply each component of the Epoxy/Urethane Coating System in compliance with manufacturer's installation instructions including mixing and application methods, recoat windows, cure times and environmental restrictions. The system is to be applied directly over all non-expansion joints and cracks.
- B. Cracks and Non-Expansion Joints
 - 1. Cracks less than 1/16" wide after surface preparation shall be filled with neat, rigid epoxy resin of type indicated, mixed and applied as recommended by the manufacturer's printed instructions.
 - a. Treated cracks shall be sanded prior to applying primer.
 - b. Non-Expansion Control (Contraction) Joints shall be routed and filled with semi-rigid epoxy.
 - 2. Cracks larger than 1/16" wide shall be routed and filled with rigid epoxy, mixed and applied as recommended by the manufacturer's printed instructions.
- C. Epoxy Primer: Apply epoxy primer by squeegee and back roll at the rate of 250 square feet per gallon to thoroughly wet surface, but taking care not to "pond" the material.
 - 1. If using alternate primer or moisture vapor control system approved by Manufacturer, follow mixing and application instructions.
- D. Coating Application: Apply 2 coats of epoxy bodycoat at a minimum total thickness of 12 mils, minimum.
 - 1. Follow manufacturer's instructions for mixing and application techniques.
 - 2. Add during mixing or broadcast non-skid grit into epoxy coating application to provide required textured finish.
- E. Urethane Top Coat: Apply urethane top coat to the cured epoxy coating to a minimum thickness of 3 dry mils.
 - 1. Add non-skid grit (fine grade) to urethane coating application to provide required textured finish
 - 2. Cure to manufacturer's recommendations.
- F. Obtain architect's approval of the system just after completion of the final coat, prior to completion of curing.

3.07 CURING AND PROTECTION

- A. Cure High-Build Epoxy/Urethane Coating System materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of the application and prior to completion of the curing process.
- B. Apply temporary protection until floor is fully cured. The General Contractor shall protect the finished floor from the time that the sub-contractor completes the work.

3.08 CLEANING AND PROTECTION

- A. Remove any surface blemishes from installed surfaces using neutral cleaners and procedures as recommended by trowel-applied resilient wall coating manufacturer.
 - 1. Protect installed wall coating from damage by use of heavy kraft paper or other covering.
- B. Finishing: After completion of project and just prior to final inspection of work, thoroughly clean floors in accordance with manufacturer's instructions.

END OF SECTION 09670

SECTION 09685
VINYL CUSHION TUFTED TEXTILES

PART 1 - GENERAL

1.01 NOMENCLATURE:

- A. Vinyl Cushioned Tufted Textiles also referred to as 'Carpet' on drawings.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.03 SUMMARY

- A. Extent, location and details of each type of flooring are indicated on drawings, data sheets and in schedules.
- B. Work of this section includes furnishing and installation of flooring, adhesives and accessories.
- C. Cementitious leveling materials specified in Section 03650, Cementitious Underlayment.

1.04 DEFINITIONS

- A. Flooring intended for use in commercial and public spaces, with construction, fire ratings, static control and appearance appropriate for this use.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature and installation instructions for each type of flooring material and installation accessory required.
 - 1. Include methods of installation for each type of substrate.
 - 2. Submit written data on physical characteristics, durability, resistance to fading and flame resistance characteristics.
 - 3. Submit technical data on adhesive and certify that it meets manufacturer's recommendations.
 - 4. Submit size and type of trowel to apply adhesive and certify that it meets manufacturers recommendations.
- B. Shop Drawings: Submit shop drawings showing flooring layout and seaming diagrams, clearly indicating flooring direction, and types of edge strips.
 - 1. Indicate columns, doorways, enclosing walls/partitions, built-in cabinets, and locations where cutouts required in flooring.
 - 2. Show installation details at special conditions.
- C. Samples for Initial Selection Purposes: Submit manufacturer's standard size samples of each type flooring scheduled.
 - 1. Submit full range of colors for each type flooring to be furnished.
 - 2. Samples to be identical to those to be furnished, including weight, texture, density and other physical characteristics. Failure to submit samples identical to materials to be furnished will subject flooring to rejection.
- D. Samples for Verification Purposes: Submit following:
 - 1. 18" square samples of each type of flooring material required.
 - 2. 12" long samples of each type exposed edge stripping and accessory items.
 - 3. Prepare samples from same material to be used on Project.

1.06 CERTIFICATIONS

- A. As part of shop drawing submittals, provide certification from manufacturer of product that materials provided under this Section comply with the technical provisions contained herein.
 - 1. Deviations from technical specifications shall be specifically noted.

- B. Producer's Statement of Applicability:
 - 1. Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 2. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 3. Statement also state that proposed application of product on project is suitable and proper.
- C. Manufacturer's Certification:
 - 1. Submit manufacturer's written certification that installer trained and approved to install manufacturer's flooring.
 - 2. Submit manufacturer's certificate stating that materials furnished comply with specified fire performance requirements.
 - 3. Include supporting certified laboratory testing data indicating that material meets following test requirements for fire performance characteristics.
 - a. Provide flooring identical to that tested for following fire performance requirements, according to test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - b. Flammability: As follows:
 - 1) Rating: Passing Methenamine Pill Test.
 - 2) Test Method: ASTM D 2859.
 - c. Surface Burning Characteristics; as follows:
 - 1) Flame Spread: Not more than 25.
 - 2) Smoke developed: Not more than 50.
 - 3) Test Method: ASTM E 84.
 - d. Critical Radiant Flux: As follows:
 - 1) Rating: Not less than 0.45 watts per sq. centimeter.
 - 2) Test Method: ASTM E 648.
 - 3) Test Method: NFPA 253.
 - e. Smoke Density: As follows:
 - 1) Rating: Max. 450.
 - 2) Test Method: ASTM E 662.
 - 4. Ship no fabric to project site until Owner receives and approves manufacturer's certificates.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm (material producer) with min. 10 (ten) years of production experience, whose published literature clearly indicates general compliance of products with requirements of this Section.
 - 1. All yarn to be of domestic origin.
- B. Installer Qualifications: Firm specializing in flooring installation with min. 2 years of experience in installation of flooring similar to that required for Project.
 - 1. Installation shall be performed by a manufacturer certified installer.
- C. Flooring manufacturer and installer jointly responsible for proper adhesive used and proper installation.
 - 1. Flooring manufacturer provide technical representative at jobsite at beginning of installation to advise and assist flooring installer in use of recommended adhesives and methods of installation.
- D. Single Source Responsibility: Provide material produced by single manufacturer for each flooring type.
- E. Field Mock-Up: Prior to installation of flooring, the contractor shall prepare floor slab and install flooring and base completely within one instructional space (classroom) for viewing and approval by Architect.
 - 1. The Architect shall view the completed room and advise the contractor of any modifications required prior to be acceptable.
 - 2. Field mock-up, when accepted, to serve as a standard by which the remaining installation will be judged.
 - 3. Contractor shall not proceed with installation of flooring in remainder of building until mock-up has been accepted by the Architect.

- F. Post Installation Inspection: Upon completion of flooring installation the manufacturer shall inspect completed installation to verify that the products have been installed in a manner consistent with the manufacturer's recommendations.
 - 1. Contractor shall correct any noted deficiencies.
 - 2. Contractor shall submit a letter, as part of the closeout documents, issued by the manufacturer of the flooring indicating that the installation complies with the manufacturers written recommendations.

- 1.08 COLOR SELECTION:
 - A. Submit full line of color samples from which Architect may select.
 - 1. Provide a min. of 10 colors for selection purposes.

 - B. The architect shall not be limited to the number of flooring colors which may selected for use on the project.

 - C. Borders: It is the intent that different colored flooring be utilized to create borders in areas listed. The use of multiple color flooring for construction of borders shall be at no additional cost to the project. Areas in which borders to be utilized include:
 - 1. Corridors
 - 2. Lobby.
 - 3. Administration

- 1.09 TESTING
 - A. Prior to shipping to jobsite:
 - 1. Contractor ship to Architect two (2) yards of flooring he proposes to use on project
 - 2. Architect will have flooring tested by independent testing laboratory for compliance with these specifications.
 - 3. Ship no flooring to jobsite until prior approval given by Architect that flooring meets or exceeds requirements of specifications.
 - 4. Copies of test reports furnished to Contractor.
 - 5. No test required for fire test under this Section; manufacturer's certification specified herein will suffice.

 - B. Prior to Installation:
 - 1. Contractor in presence of Architect or his representative, cut two (2) yards from one roll of delivered flooring and send to Architect.
 - 2. Architect will have flooring tested by independent testing laboratory for compliance with specifications.
 - 3. Install no flooring until prior approval given by Architect that flooring meets or exceeds requirements of specifications.
 - 4. Copies of test reports furnished to Contractor.

 - C. Cost: Testing shall be at contractors expense. Refer to Section 01400, Quality Control.

 - D. Physical Properties: Provide flooring identical to that tested for following physical properties, according to test method indicated.
 - 1. Flooring Construction, Including, but not limited to: Flooring Fiber type, Tufted Yarn Weight, Finished Pile Thickness, Gauge: 1/12, Stitches per inch, Primary Backing Type, Secondary Backing Type, Face weight, Total weight, Density and Weight Density
 - 2. Sound Absorption Characteristics: ASTM C 423 test rating, passing sound absorption coefficient level.
 - 3. Fade Resistance: AATCC 16E test rating, max. grey scale factor of 40 hours.
 - 4. Static Resistance Rating: 3.5 KV when AATCC 134 tested at 20% RH/70°F.
 - 5. Microbial Resistance:
 - a. AATCC 100 test rating: Min. 90% bacterial reduction
 - b. AATCC 30 test rating: Max. 20% fungal growth.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, fire hazard classification, and lot number.
 - 1. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity; laid flat, blocked off ground to prevent sagging and warping.
 - 2. Maintain temperature in storage area above 40°F.
- B. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

1.11 JOB CONDITIONS

- A. Environmental Requirements: Maintain minimum temperature of 65 degrees in spaces to receive flooring for a period of twenty-four (24) hours prior to and after installation.
- B. Coordination: All trades complete their work prior to start of installation.

1.12 SEQUENCING AND SCHEDULING

- A. Sequence flooring installation with other work to minimize possibility of damage and soiling during remainder of construction period.
- B. Flooring shall not be installed until all building fully enclosed and dried-in and other finishes completed.
- C. Flooring shall not be installed until following activities completed:
 - 1. All masonry walls, gypsum board walls and other rough framing to be completed.
 - 2. All finishes, including painting, wall covering, ceiling work completed.
 - 3. All plumbing, mechanical and electrical work within area to receive flooring completed.
- D. No finishing operation to take place after flooring installed.

1.13 WARRANTY

- A. The manufacturer shall guarantee, in writing, that the flooring meets or exceeds all requirements for the specified materials.
- B. Flooring Contractor Guarantee:
 - 1. The flooring contractor shall guarantee, in writing, that any defects in materials or workmanship shall be corrected, at no cost to the Owner, for a period of two (2) years from the date of substantial completion.
 - 2. The contractor shall also guarantee, in writing, for five (5) years against not more than ten (10) percent surface wear on a non-prorated basis for both material and labor.
- C. Yarn Manufacturer Guarantee: The yarn manufacturer shall provide the following written guarantees:
 - 1. Ten (10) year color fastness guarantee
 - 2. Five (5) year guarantee against damage due to atmospheric contaminants.
 - 3. Lifetime guarantee against static buildup (3.5 KVA or less as tested under AATCC-134).
- D. Special Project Product Warranty: Present above warranty in writing, signed by official of Flooring Manufacturer's corporation.
 - 1. Provide Owner written full term non-prorated warranty from Flooring Manufacturer, for period of Fifteen (15) years from date of Final Acceptance, providing for following at no cost to Owner:
 - a. Wear: Replacement of worn areas with same type of material, including installation, that warrants that no part of wearing surface will wear more than 15% by weight.
 - b. Edge Ravel: Warrant flooring against edge ravel and against seam separation and curling (including those in direct contact with chair caster action); repair or replace affected areas upon request by Owner.

- c. Delamination: All areas of use including those in direct contact with chair caster action, against delamination (separation of face material from backing).
 - d. Resiliency: No deterioration of closed-cell cushion; remain resilient for life of product.
- E. Special Project Installation Warranty: Manufacturer and installer jointly guarantee installation of flooring for min. of ten (10) years from date of Architect's final acceptance; submit guarantee with closeout documents.
- 1.14 MAINTENANCE
- A. Maintenance Instructions:
 - 1. Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated traffic and use conditions.
 - 2. Include precautions against materials and methods detrimental to finishes and performance.
 - B. Replacement Materials:
 - 1. After completion of work, deliver not less than 2% of each type, color, and pattern of flooring, exclusive of material required to properly complete installation.
 - 2. Furnish accessory components as required.
 - 3. Furnish replacement materials from same production run as materials installed.
 - 4. Package replacement materials with protective covering, identified with appropriate labels.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fiber Type: Branded BCF (Bulk continuous filament) type 6 or Type 6.6 nylon, cationic.

2.02 VINYL CUSHION TUFTED TEXTILE "VCTT":

- A. Products: Provide vinyl cushion tufted textile equal to or better than vinyl cushion tufted textiles listed, but meeting minimum characteristics listed below.
 - 1. Basis for Specifications:
 - a. Shaw Contract Group, '4 Square'
 - 2. Approved manufacturers subject to conformance with technical requirements specified and subject to being equal to product specified as 'basis for specifications':
 - a. Collins and Aikman
 - b. Interface Flooring Systems, Inc.
 - c. Mannington
 - d. Shaw Contract Group
- B. VCTT shall have been tested against and passed the CRI Green Label Plus for Indoor Air Quality, the State of Washington Protocol for Indoor Air Quality and the Collaborative for High Performance Schools (CHPS) Indoor Air Quality tests.
- C. Carpet C1: Shaw 4 Square
 - 1. Size: 24" x 24" carpet tiles
 - 2. Gauge: No less than 12th gauge
 - 3. Face Weight: Minimum 30 ounces
 - 4. Stitches Per Inch: 12.0
 - 5. Finish Pile Thickness: 0.143"
 - 6. Total Thickness: 0.300"
 - 7. Average Density: 7552
 - 8. Primary Backing: Synthetic
 - 9. Construction: Multi-level pattern loop
 - 10. Fiber: Eco solution 'Q' nylon.
 - 11. Dye Method: 100% solution dyed.
 - 12. Secondary Backing: Ecoworx tile
 - 13. Pattern Repeat: None
 - 14. Protective Treatment: SSP Shaw soil protection.

- D. Backing Systems:
1. Primary Tufting Substrate: Synthetic non-woven
 2. Sealant Coat (Pre-Coat): Sealant vinyl
 3. Backing Type: Closed cell vinyl cushion
 4. Backing Weight: 35.5 oz/square yard
 5. Backing Density: 18.5 lbs/cubic feet
 6. Backing Thickness: No less than 0,156"
 7. Backing Compressive Set: Maximum 10%
 8. Backing Compressive Deflection: Minimum 7 lbs at 25%
 9. Installation Adhesive: Factory supplied or applied adhesive with no detectable VOC's.
 10. Seam Types: Continuously chemically welded seams.
 11. Antimicrobial: No anti-microbial (pesticide) treatments applied in backing during manufacturing in compliance with the "The Healthy School Handbook" an NEA Publication. AATCC-74 shall not demonstrate a zone of inhibition when tested.
 12. Moisture Barrier; Seams: Moisture penetration by impact at seams at 10 psi: No penetration after 10,000 impacts. The use of the 'British Spill Test' is not an acceptable measurement for moisture barrier.

2.03 ACCESSORIES

- A. Installation Adhesives:
1. Water-resistant, non-staining as recommended by flooring manufacturer, which complies with flammability requirements for installed flooring. Adhesive shall of type suitable for applications where:
 - a. RH (Relative Humidity) is 90% or less
 - b. Moisture Emissions (MEVR) up to 10#/1000sf
 - c. PH range is between 7 to 11.
- B. Base: Base to be carpet of material to match flooring.
1. Continuously hem top edge of base to provide a uniform, straight edge.
- C. Metal Flooring Edges: All exposed edges and ends of flooring occurring at doorways, fixed frames and sidelights not covered by base, openings, and dissimilar floor finishes shall be terminated with aluminum edge trim (moldings).
1. Flooring edge strips to be aluminum anodized with finish of color selected by Owner.
 2. Strips shall be 1-1/2" min. width installed with min. 2" long stainless steel screws.
- D. Seaming Vinyl cushion tufted textile: Hot-melt seaming adhesive or similar product recommended by flooring manufacturer, for taping seams and butting cut edges at backing to form secure seams and preventing pile loss at seams.
- E. Miscellaneous Materials: As recommended by manufacturers of vinyl cushion tufted textile, cushions, and other vinyl cushion tufted textile products; selected by Installer to meet project circumstances and requirements.

PART 3 - EXECUTION

3.01 INSPECTION OF SUBSTRATE

- A. Prior to installing products specified in this Section, product manufacturer's representatives and Installer visit jobsite and check substrate surfaces for any defects (including moisture) that may prevent each party from guaranteeing his portion of work.
1. Report defects, in writing, to Contractor with copy to Architect.
 2. Contractor correct defects as required in order that each party will guarantee his portion of work.
- B. Do not allow resilient flooring work to proceed until subfloor surfaces satisfactory.

3.02 TESTING

- A. As part of the scope of the work the contractor shall arrange for, and pay costs associated with, third party testing as required by manufacturer, installer and as noted herein. Tests to include, as a minimum, the following:
 - 1. Moisture Testing
 - 2. Alkalinity testing.
 - 3. Bond testing.

3.03 MOISTURE TESTING

- A. Manufacturer recommendations: The work of this section to conform with recommendations and requirements of flooring manufacturer and work defined herein. Where a conflict in the requirements exist the more stringent of the requirements shall apply.
- B. Moisture: Contractor to perform moisture tests of concrete floor slab to verify that moisture is within tolerances allowed by manufacturer. If moisture content exceeds allowable levels, contractor shall implement measures to remove moisture from slab.
 - 1. Do not install flooring until moisture content is within manufacturers tolerances.
- C. Moisture Limits: The materials specified in this section shall not be installed until the moisture in the concrete slab is within the limits defined by the flooring manufacturer.
 - 1. Unless otherwise indicated the limits for the moisture vapor emission rate (MEVR) shall be as follows:
 - a. Carpet (VCTT): 5lbs/1000sf/24hours
 - 2. Unless otherwise indicated the limits for moisture for the RH Probe shall be as follows:
 - a. Carpet (VCTT): 80%
- D. Testing Agency: Testing to be performed by qualified third party testing agency acceptable to architect.
- E. Environmental Conditions: The conditions of the space in which the testing is to be performed shall meet the following conditions for no less than 48 prior to and after test is performed:
 - 1. Temperature: 75 degrees F +/- 10 degrees
 - 2. Humidity: 50% relative humidity +/- 10%
- F. Testing Types: Testing shall be of one of the types listed:
 - 1. Calcium Chloride Testing, using standard manufacturers test kits.
 - 2. Relative Humidity (RH) testing using Wagner Rapid RH Probe.
- G. Calcium Chloride Testing: Testing for moisture vapor emission rate (MEVR) shall be performed in accordance with above referenced, applicable ASTM standards and the following:
 - 1. Removal concrete coatings including curing compound.
 - 2. Commence test no sooner than 24 hours from the time the concrete curing compound was removed.
 - 3. Test shall be run for no less than 84 hours.
- H. Relative Humidity Testing: Perform tests in accordance with probe manufacturer written instructions.
 - 1. Drill hole of diameter required by probe.
 - 2. Insert probe into holes.
 - 3. Test results available within 45 minutes.
- I. Testing Frequency: Moisture testing shall be performed as required by flooring manufacturer, but no less than quantity indicated herein:
 - 1. Three (3) tests for the first 1,000 sf.
 - 2. One (1) test for each additional 1,000 sf.
- J. Testing Reports: Copies of third party testing reports to be submitted to the architect, contractor and flooring contractor prior to the installation of the flooring.

- K. Removal of Excess Moisture: It is the responsibility of the contractor to place the concrete slab at the specified water/cement ratio, properly cure concrete slabs, limit exposure to moisture, dry-in the building in a timely fashion and render building Hvac system operational in sufficient time to allow for the concrete slabs to dry sufficiently to allow for the application of the flooring.
1. Should the concrete slab fail to meet the established maximum limits for moisture, the contractor shall be responsible for the implementation of necessary procedures to dry out the slab.
 2. Contractor responsible for cost for material, labor and/or equipment required to dry out building sufficiently for installation of flooring system.
 3. If attempts to dry out slab are unsuccessful the contractor shall bead blast the concrete slab and apply moisture barrier of type and using methods recommended by manufacture. Bead blasting and applciaiton of moisture barrier shall be at no additional cost to the contract.

3.04 ALKALINITY TESTING

- A. Perform alkalinity test of concrete floor slab to determine if concrete alkalinity suitable for application of adhesive and tile.

3.05 FLOOR SLAB FLATNESS

- A. Inspect floor slab for flatness. Unless otherwise required by flooring manufacturer, surface of concrete slab to be level to within 1/8" in 8'-0".
1. The surface of the floor shall be smooth, level, and free of ridges, depressions and other imperfections.
- B. Where concrete floor slab is found to be unlevel, grind high areas and fill depressions in order to obtain a smooth stable surface for installation of finished flooring.
- C. Level floor using cementitious underlayment as specified in Section 03650, Cementitious Underlayment.

3.06 PRE-INSTALLATION REQUIREMENTS

- A. Inspect substrates for conditions which would be detrimental to installation of flooring.
1. Repair minor holes, cracks, depressions or rough areas using material recommended by flooring or adhesive manufacturer.
 2. Notify Contractor in writing of major conditions detrimental to proper completion of work.
 3. Do not proceed until unsatisfactory conditions corrected.
- B. The installation of material specified in this Section shall be considered acceptance, by the installer and flooring manufacturer, of the condition of the substrate on to which the flooringing is to be installed and the condition of the building as being acceptable for flooring installation at the time of the flooring installation.
- C. Do not install flooring until space enclosed and permanent temperature and humidity control in operation.
- D. Before installing flooring allow flooring to acclimate and relax for twenty-four hours.

3.07 PREPARATION

- A. Clear away debris and scrape up cementitious deposits from surfaces to receive flooring; vacuum clean immediately before installation.
1. Check concrete surface to ensure no "dusting" through installed flooring; apply sealer where required to prevent dusting.
- B. Clean sub-floor to remove dust, oils, grease, wax, sealers, curing compounds, paint, and other foreign materials which may affect the installation of the flooring
- C. Repair minor holes, cracks, depressions, and rough areas using material recommended by flooring or adhesive manufacturer.
- D. Patch and level floor slabs as required using cementitious underlayment as specified in Section 03650, Cementitious Underlayment.

- E. Seal floor slab using liquid latex underlayment as recommended by flooring manufacturer.
- F. Sequence flooring with other work to minimize possibility of damage and soiling of flooring during remainder of construction period.

3.08 INSTALLATION

- A. Comply with manufacturer's recommendations for seam locations and direction of flooring; maintain uniformity of flooring location and lay of pile.
 - 1. Follow seaming diagram as submitted and approved.
 - 2. At doors, center seams under doors; do not place seams in traffic direction at doorway.
- B. Extend flooring under open-bottomed obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.
- C. Provide cut-outs where required, and bind cut edges properly where not concealed by protective edge guards or overlapping flanges.
- D. Install flooring edge guard where edge of flooring is exposed; anchor guards to substrate.
- E. Expansion Joints: Do not bridge building expansion joints with continuous flooring; provide for movement.
- F. Install flooring on covers for telephone and electrical outlets and ducts and other such items as occur within finished floor area.
 - 1. Maintain overall continuity of color and pattern with pieces of flooring installed on covers.
 - 2. Tightly cement edges of perimeter of floor around covers and to covers.
- G. Cutting, Patching and Seaming:
 - 1. No patching of flooring permitted.
 - 2. Flooring strips less than 2'-0" wide prohibited.
 - 3. Flooring seams not shown or approved on shop drawings prohibited.
- H. Glue-Down Installation:
 - 1. Fit sections of flooring into each space prior to application of adhesive.
 - 2. Trim edges and butt cuts with seaming cement.
 - 3. Apply adhesive uniformly to substrate in accordance with manufacturer's instructions.
 - 4. Butt flooring edges tightly together to form seams without gaps.
 - 5. Roll entire flooring area lightly to eliminate air pockets and ensure uniform bond.
 - 6. Remove any adhesive promptly from face of flooring by method which will not damage flooring face.
 - 7. Allow no foot or construction traffic over flooring until adhesive is completely dry, as recommended by manufacturer, and maintain temperature and humidity control during this period.
- I. Seaming: Continuously weld seams as recommended by flooring manufacturer.

3.09 CLEANING

- A. Remove and dispose of debris and unusable scraps.
 - 1. Vacuum flooring using commercial machine with face-beater element.
 - 2. Remove spots and replace flooring where spots cannot be removed.
 - 3. Remove any protruding face yarn using sharp scissors.

3.10 PROTECTION

- A. Provide protective methods and materials needed to ensure that flooring will be without deterioration or damage at time of Final Acceptance.

3.11 ACCEPTANCE OF COMPLETED INSTALLATION

- A. Flooring shall be installed in accordance with manufacturers written instructions in a workmanship manner.
- B. Seams shall be tight, straight, true, and uniform in appearance and such seams shall not be visible from normal viewing angles and lighting.
- C. Installed flooring lay flat and true.

END OF SECTION 09685

**SECTION 09700
EPOXY FLOORING SYSTEMS**

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work of this Section.

1.02 WORK INCLUDED

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the epoxy resin composition flooring and integral base as scheduled on the drawings and/or specified herein.
- B. Type and Application: Trowel-applied resilient flooring system referred to as "Seamless Flooring System; (SF) or Epoxy Flooring System on drawings and in schedules:
 - 1. Trowel -applied resilient flooring system to be of water-proof, slip retardant formulation for use in wet areas, including showers and dressing rooms.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division I Specification Sections.
- B. Manufacturer's Data:
 - 1. For information only, submit 4 copies of manufacturer's technical data and installation instructions for each type trowel-applied flooring required.
 - 2. Transmit copy of each installation instruction to Applicator.
- C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors and finishes available.
 - 1. Submit 2-1/2' x 4 samples of color chips from color chart selection designated by the Architect.
 - 2. Submit 3 sets of samples of each type and color required and show range of color and pattern variation.
 - 3. Sample submittals reviewed for color, texture, and pattern only.
 - 4. Compliance with all other requirements exclusive responsibility of Contractor.
- D. Material certificates signed by manufacturer certifying that the epoxy resin composition flooring complies with requirements specified herein.
- E. Maintenance Instructions: Submit 4 copies of manufacturer's written instructions for recommended maintenance practices.
- F. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- G. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer or applicator who has had five (5) years experience installing resinous flooring types similar to that required for this project and who is approved by manufacturer of primary materials.
 - 1. Applicator to be certified or licensed by trowel-applied resilient flooring materials manufacturer.

- B. Single-source Responsibility: Obtain epoxy resin composition flooring materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.
- B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Comply with epoxy resin composition flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect Work.
- B. Lighting: Permanent lighting will be in place and working before installing resinous flooring.

SECTION 2 - MATERIALS

2.01 MATERIALS

- A. Epoxy based main composition flooring specification based TNEMEC Company, Inc. Kansas City, MO.
 - 1. Approved Suppliers subject to compliance with technical provisions of contract documents:
 - a. Dex-O-Tex - Rancho Dominguez, California
 - b. Key Resins
 - c. Selby - Jacksonville, Florida
 - d. Suresin - Pittsburgh, Pennsylvania

2.02 PROPERTIES

- A. Physical Properties: Provide flooring system that meet or exceed the listed minimum physical property requirements when tested according to the referenced standard test method in parentheses.
 - 1. Compressive Strength (ASTM C 579): No less than 11,240 psi, average of 6 tests.
 - 2. Tensile Strength (ASTM C 307): No less than 1570 psi, average of 6 tests.
 - 3. Flexural Strength (ASTM C 580): No less than 2800 psi flexural strength, average of 6 tests. No less than 913,000 psi flexural modulus, average of 6 tests.
 - 4. Water Absorption (ASTM C 413): No more than 1.6%, average of 4 tests.
 - 5. Surface Hardness (ASTM D-2240): No less than 78 type D hardness.
 - 6. Abrasion (ASTM D-4060, CS-17): No more than 76 mg loss after 1,000 cycles, average of 3 tests.
 - 7. Impact (ASTM D 2794): No less than 160 foot-lbs average, direct impact.
 - 8. Adhesion (ASTM D 4541): No less than 833 psi pull, average of 3 tests.
 - 9. Surface Burning Characteristics (ASTM E-648): System meets the BOCA National Building Code Class 1 requirements pertaining to Critical Radiant Flux.
 - 10. Coefficient of Friction (ASTM D 2047): No less than 0.67 static, average of 12 tests.

2.03 SUPPLEMENTAL MATERIALS

- A. Elastomeric membrane (Modified Polyurethane) to form a monolithic, impermeable liner, applied to a thickness of between 50 - 100 mils, as recommended by manufacturer for application indicated. Membrane to comply with following:
 - 1. Elongation: (Extension to Break) (ASTM D 412): 345 to 425%.
 - 2. Tensile Strength (ASTM D 412): 565 to 650 psi.
 - 3. Abrasion (ASTM D 4060): No more than 3 mg loss after 1000 cycles.
 - 4. Deflection Temp (ASTM D 648): Below -60°F.
 - 5. Hardness (ASTM D 2240 Shore A): No less than a rating of 60.
 - 6. Impact Resistance (ASTM D 2794): No less than 160 in/lbs average direct and reverse impact.

7. Moisture Vapor Transmission (ASTM D 1653): Permeability to Water Vapor .05 perms.
 8. Mullen Burst Strength (ASTM D 751): Minimum 150 psi.
 9. Tear Resistance (ASTM D 624): 115 to 120 lbs/in.
- B. Material shall be produced by epoxy flooring manufacturer or be approved in writing by epoxy flooring manufacturer for the epoxy flooring system specified.
- C. Follow manufacturers instructions for cure time and preparation for succeeding coats.
- D. Textured Top Coat: Type recommended or produced by manufacturer of epoxy resin matrix flooring system for type and profile of desired final finish.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions where the epoxy resin composition flooring is to be installed and notify the Contractor of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Applicator.

3.02 INSPECTION OF SUBSTRATE

- A. Prior to installing products specified in this Section, product manufacturer's representatives and Installer visit jobsite and check substrate surfaces for any defects (including moisture) that may prevent each party from guaranteeing his portion of work.
1. Report defects, in writing, to Contractor with copy to Architect.
 2. Contractor correct defects as required in order that each party will guarantee his portion of work.
- B. Do not allow resilient flooring work to proceed until subfloor surfaces satisfactory.

3.03 TESTING

- A. As part of the scope of the work the contractor shall arrange for, and pay costs associated with, third party testing as required by manufacturer, installer and as noted herein. Tests to include, as a minimum, the following:
1. Moisture Testing
 2. Alkalinity testing.
 3. Bond testing.

3.04 MOISTURE TESTING

- A. Manufacturer recommendations: The work of this section to conform with recommendations and requirements of flooring manufacturer and work defined herein. Where a conflict in the requirements exist the more stringent of the requirements shall apply.
- B. Moisture: Contractor to perform moisture tests of concrete floor slab to verify that moisture is within tolerances allowed by manufacturer. If moisture content exceeds allowable levels, contractor shall implement measures to remove moisture from slab.
1. Do not install flooring until moisture content is within manufacturers tolerances.
- C. Moisture Limits: The materials specified in this section shall not be installed until the moisture in the concrete slab is within the limits defined by the flooring manufacturer.
1. Unless otherwise indicated the limits for the moisture vapor emission rate (MEVR) shall be as follows:
 - a. Epoxy Flooring: 3lbs/1000sf/24hours
 2. Unless otherwise indicated the limits for moisture for the RH Probe shall be as follows:
 - a. Epoxy Flooring 75%
- D. Testing Agency: Testing to be performed by qualified third party testing agency acceptable to architect.

- E. Environmental Conditions: The conditions of the space in which the testing is to be performed shall meet the following conditions for no less than 48 prior to and after test is performed:
 - 1. Temperature: 75 degrees F +/- 10 degrees
 - 2. Humidity: 50% relative humidity +/- 10%
- F. Testing Types: Testing shall be of one of the types listed:
 - 1. Calcium Chloride Testing, using standard manufacturers test kits.
 - 2. Relative Humidity (RH) testing using Wagner Rapid RH Probe.
- G. Calcium Chloride Testing: Testing for moisture vapor emission rate (MEVR) shall be performed in accordance with above referenced, applicable ASTM standards and the following:
 - 1. Removal concrete coatings including curing compound.
 - 2. Commence test no sooner than 24 hours from the time the concrete curing compound was removed.
 - 3. Test shall be run for no less than 84 hours.
- H. Relative Humidity Testing: Perform tests in accordance with probe manufacturer written instructions.
 - 1. Drill hole of diameter required by probe.
 - 2. Insert probe into holes.
 - 3. Test results available within 45 minutes.
- I. Testing Frequency: Moisture testing shall be performed as required by flooring manufacturer, but no less than quantity indicated herein:
 - 1. Three (3) tests for the first 1,000 sf.
 - 2. One (1) test for each additional 1,000 sf.
- J. Testing Reports: Copies of third party testing reports to be submitted to the architect, contractor and flooring contractor prior to the installation of the flooring.
- K. Removal of Excess Moisture: It is the responsibility of the contractor to place the concrete slab at the specified water/cement ratio, properly cure concrete slabs, limit exposure to moisture, dry-in the building in a timely fashion and render building Hvac system operational in sufficient time to allow for the concrete slabs to dry sufficiently to allow for the application of the flooring.
 - 1. Should the concrete slab fail to meet the established maximum limits for moisture, the contractor shall be responsible for the implementation of necessary procedures to dry out the slab.
 - 2. Contractor responsible for cost for material, labor and/or equipment required to dry out building sufficiently for installation of flooring system.
 - 3. If attempts to dry out slab are unsuccessful the contractor shall bead blast the concrete slab and apply moisture barrier of type and using methods recommended by manufacture. Bead blasting and applciaiton of moisture barrier shall be at no additional cost to the contract.

3.05 ALKALINITY TESTING

- A. Perform alkalinity test of concrete floor slab to determine if concrete alkalinity suitable for application of adhesive and tile.

3.06 FLOOR SLAB FLATNESS

- A. Inspect floor slab for flatness. Unless otherwise required by flooring manufacturer, surface of concrete slab to be level to within 1/8" in 8'-0".
 - 1. The surface of the floor shall be smooth, level, and free of ridges, depressions and other imperfections.
- B. Where concrete floor slab is found to be unlevel, grind high areas and fill depressions in order to obtain a smooth stable surface for installation of finished flooring.
- C. Use leveling and patching compounds recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.

3.07 PREPARATION

- A. Substrate: Perform preparation and cleaning procedures according to flooring manufacturers instructions for particular substrate conditions involved, and as specified. Provide clean, dry, sound substrate for flooring application.
- B. Concrete Surfaces: Shot-blast, or power scarify as required to obtain optimum bond flooring to concrete. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminants. Repair damaged and deteriorated concrete to acceptable condition. Leave surface free of dust, dirt, laitance, and efflorescence.
- C. Materials: Mix resin hardener and aggregate when required, and prepare materials according to flooring system manufacturer's instructions.

3.08 APPLICATION

- A. General: Apply each component of epoxy resin composition flooring system according to manufacturer's directions to produce a uniform monolithic flooring surface of thickness indicated.
- B. Bond Coat: Apply bond coat over prepared substrate at of type and at rate indicated, unless thicker application recommended by manufacturer:
 - 1. TNEMEC Series 201 Epoxoprime (primer) applied at a dry film thickness of 6.0 - 8.0 mils.
- C. Body Coat: Broadcast body coat over primer application at 1/16 inch each at nominal 1/8-inch thickness. When cured, level protrusions and sweep up excess from each broadcast application.
 - 1. TNEMEC Series 222 Deco-tread (body coat) applied at a minimum dry film thickness of 1/8".
- D. Finish or Sealing Coats: After body coat has cured sufficiently, apply finish coats of type and thickness using spreading rates and coats recommended by flooring manufacturer to produce finish matching approved sample. Final finish coat shall be in color and skid retail profile a approved by the Architect. Finished floor shall be 1/8" thick, uniform in color and free of trowel marks.
 - 1. TNEMEC Series 284 TNEME-Glaze applied at a dry film thickness 8.0 - 12.0 mils. (Additional coats may be required for appearance or hiding.)
- E. Cove Base: Apply cove base mix to wall surfaces in areas in which epoxy flooring indicated to be installed to form cove base height of 4 inches unless otherwise indicated. Follow manufacturer's printed instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of cove base.
 - 1. TNEMEC Series 237 PowerTread for forming coves.

3.09 CURING

- A. Cure epoxy resin composition flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

3.010 CLEANING AND PROTECTION

- A. Remove any surface blemishes from installed surfaces using neutral cleaners and procedures as recommended by trowel-applied resilient flooring manufacturer.
 - 1. Protect installed flooring from damage by use of heavy kraft paper or other covering.
- B. Finishing: After completion of project and just prior to final inspection of work, thoroughly clean floors in accordance with manufacturer's instructions.

END OF SECTION 09700

SECTION 09900
PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of painting work indicated on drawings and schedules, and herein specified.
- B. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout Project, except as otherwise indicated.
 - 1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
 - 2. Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.
- C. "Paint" used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- D. Surfaces to be Painted; **New Construction:**
 - 1. Except where natural finish of material specifically noted as surface not painted, paint **ALL NEW** exposed surfaces whether or not colors designated in "schedules".
 - 2. Where items or surfaces not specifically mentioned, paint same as similar adjacent materials or areas.
 - 3. If color or finish not designated, Architect will select from standard colors or finishes available.
- E. Surfaces to be Painted; **Existing Construction:**
 - 1. It is the intent of these documents that **NEW** materials furnished under the execution of this contract receive a painters finish as described in paragraph "D" above.
 - 2. In areas indicated here-in, shown on finish schedule or called for on details or notes the contractor shall paint existing construction.
 - a. Where existing surfaces were previously painted, apply primer and two (2) coats of paint.
 - b. Primer to be compatible with existing paint and as recommended by paint manufacturer.
 - c. Finished coats to be as described below for materials listed.
 - 3. Where existing rooms or spaces are indicated to be painted the contractor shall paint existing previously painted surfaces including but not limited to:
 - a. Walls.
 - b. Doors, door frames, interior and exterior window frames; All sides.
 - c. Exposed structure, ceilings and other overhead elements.
 - d. Exposed conduit, piping, and mechanical equipment.
 - e. Millwork and casework; inside and out.
 - f. Chalk and Tack board frames and surfaces.
- F. Special Area Requirements:
 - 1. Gymnasium and adjacent areas without suspended ceilings:
 - a. Paint all exposed items within this space, including but not limited to: steel joists, girders, bracing, purlins, girts, bracing, basket ball back stop supports, miscellaneous steel, mechanical equipment, ductwork, and piping, electrical conduit, plumbing systems and other materials not containing factory applied finishes.
 - 2. Concrete Locker Bases:
 - a. Rub concrete to obtain a uniform, sand textured finish, free of irregularities, cracks, pits or other surface defects.
 - b. Paint concrete locker bases.

- G. Surfaces not to be field painted; Following categories of work not included as part of field-applied finish work.
1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing specified for such items as (but not limited to) follows:
 - a. Prefinished partition systems.
 - b. Acoustic materials
 - c. Architectural woodwork and casework.
 - d. Elevator entrance doors and frames.
 - e. Elevator equipment.
 - f. Finished mechanical and electrical equipment.
 - g. Light fixtures.
 - h. Switchgear and distribution cabinets.
 2. Concealed Surfaces: Unless otherwise indicated, painting not required on surfaces such as follows:
 - a. Walls or ceilings in concealed areas.
 - b. Generally inaccessible areas.
 - c. Foundation spaces.
 - d. Furred areas.
 - e. Utility tunnels.
 - f. Pipe spaces.
 - g. Duct shafts.
 - h. Elevator shafts.
 3. Finished Metal Surfaces: Unless otherwise indicated, similar finished metal surfaces listed below do not require painting:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper.
 - e. Bronze.
 - f. Brass.
 4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as follows, do not require painting:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
- H. Following categories of work included under other Sections.
1. Shop Primers: Unless otherwise specified, shop priming ferrous metal items included under various Sections for structural steel, metal fabrications, hollow metal work and similar items.
 2. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework and shop fabricated or factory-built mechanical and electrical equipment or accessories included under other Sections.
- I. Mechanical and Electrical Work:
1. Painting of mechanical and electrical work is work of this section, except that which is required for color coding, where such color coding is specified in Division 15 and/or 16.
- J. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
- K. Repair existing construction defaced/damaged as result of work under this Contract and provide new painting and finishing to restore existing back to original materials, color, texture, and uniformness to satisfaction of Owner.
- 1.03 QUALITY ASSURANCE
- A. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats; use only thinners approved by paint manufacturer, and use only within recommended limits.

- B. Coordination of Work:
 - 1. Review other Sections in which prime paints provided to ensure compatibility of total coatings system for various substrates.
 - 2. Upon request from other trades, furnish information/characteristics of finish materials provided for use, to ensure use of compatible prime coats.
- C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- D. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information including Paint label analysis and application instructions and MSDS sheets for each material used.
 - 1. Submit manufacturers written instructions for preparation of surfaces to be painted.
 - 2. Submit manufacturers written requirements pertaining to moisture content of surface being painted.
- B. Equivalent Materials: Products herein specified are based on the products of ICI. If manufacturer other than ICI submitted, manufacturer to provide, as part of submittal, complete cross reference guide showing both the specified product and equivalent proposed product.
- C. Color Samples: Upon award of contract, contractor shall submit complete Architectural Color Selectors of all available colors.
 - 1. Architect shall select colors for use in developing samples described below.
- D. Samples:
 - 1. Prior to beginning work, Architect will furnish color chips for surfaces to be painted.
 - 2. Use representative colors when preparing samples for review.
 - 3. Submit samples for Architect's review of color and texture only.
 - 4. Provide listing of material and application for each coat of each finish sample.
 - a. On 12" x 12" hardboard, provide two samples of each color and material, with texture to simulate actual conditions; resubmit samples requested by Architect until acceptable sheen, color, and texture achieved.
 - b. On actual wood surfaces, provide two 4" x 8" samples of natural and stained wood finish; label and identify each location and application.
 - c. On concrete masonry, provide two 4" square samples of masonry for each type of finish and color, defining filler, prime and finish coat.
 - d. On actual wall surfaces and other exterior and interior building components, duplicate painted finishes of prepared samples.
 - 1) Provide full-coat finish samples on min. 100 sq. ft. of surface, as directed, until required sheen, color and texture obtained.
 - 2) Simulate finished lighting conditions for review of in-place work.
 - 5. Final acceptance of colors from samples applied on job.

1.05 DELIVERY AND STORAGE

- A. Deliver materials to site in original, new and unopened packages and containers bearing manufacturer's label and following information:
 - 1. Name or title of material.
 - 2. Fed. Spec. number, if applicable.
 - 3. Manufacturer's stock number (lot number) and date of manufacture.
 - 4. Manufacturer's name.
 - 5. Contents by volume, for major pigment and vehicle constituents.
 - 6. Thinning and reducing instructions.
 - 7. Application instructions; including surface preparation requirements.
 - 8. Color name and number.
 - 9. Drying Time.
 - 10. Clean up requirements.
 - 11. Instructions for mixing.
- B. Store materials not in actual use in tightly covered containers.
 - 1. Maintain containers used for storage of paint in clean condition, free of foreign materials and residue.
 - 2. Protect from freezing where necessary.
 - 3. Keep storage area neat and orderly.
 - 4. Remove oily rags and waste daily.
 - 5. Take all precautions to ensure that workmen and work areas adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

1.06 COLOR SELECTION

- A. Cost: The cost for change in hue of paint, accent walls, stripes and graphics herein defined shall be included in the contractor's base bid.
- B. Architect will select colors from manufacturer's standard or custom formulations for shades and tints/hues required.
 - 1. Deep colors/hues shall be used on accent walls, stripes or graphics. Modify paint formulation as required to accept deep colors without separation, streaking or other surface imperfections.
- C. Individual elements may require change of hue or color at the discretion of Architect, without added cost to the contract. Individual element shall be defined as:
 - 1. Each different building element, to include but not strictly limited to, walls, columns, frames, doors, windows, wall and ceiling furrings, columns, purlins, girts, beams, joists and decking.
 - 2. Each change of building material within a space.
 - 3. Changes of level or plane of like or similar materials within a space.
- D. Accent Walls: Interior public or functional spaces shall have one or more walls as an "accent wall". For the purpose of this section the following spaces shall be considered as interior public and functional spaces: Lobbies, Commons, Corridors, Offices, Classrooms, Media Center, Gymnasium, and Lunchroom and other similar spaces normally accessible to the students, staff and/or public.
 - 1. Accent walls defined as change in color, tint or hue from that of other walls.
 - 2. Cut corners or other locations where change between colors occur, straight, true and even.
- E. Accent Stripes: Interior public or functional spaces shall be painted with accent stripes. For the purpose of this section the following spaces shall be considered as interior public and functional spaces: Lobbies, Commons, Corridors, Offices, Classrooms, Media Center, Gymnasium, Toilet Batteries, Dressing Rooms, Weight Rooms and Lunchroom
 - 1. Horizontal stripes continuous for the length of Corridors, interrupted only by openings.
 - 2. Color and layout of stripes to be determined during the shop drawings phase.
 - 3. For bidding purposes the contractor shall assume that where stripes are to be painted that three stripes will be required. Each stripe to be 8" to 12" wide. Each stripe to be a different color.

- F. Accent Graphics:
 - 1. Graphic designs, consisting of rectilinear patterns and/or striping to be provided in lobbies, corridors, lunchrooms, cafetorium, gymnasium, multi-purpose rooms, and media center facility.
 - 2. Design graphics for selected locations, size and design established by Architect at time of color selection, min of three, 500 s.f. each.
- G. Furred Gypsum Board Walls (Soffits)
 - 1. Generally it is the intent that high furred gypsum board walls be painted a color different than the primary wall color. Deep hue accent colors will be used in these locations.

1.07 FIRE CODE REQUIREMENTS:

- A. Corridor partitions, smoke partitions, fire walls, area separation partitions, horizontal exit partitions, exit enclosures and other fire partitions and ceiling fire rated assemblies and other areas as required by Fire Marshal (state and local) having jurisdiction, shall be effectively and permanently identified with signs or stenciling in manner acceptable to such authority.
 - 1. Paint such identification above decorative ceiling in concealed spaces.
 - 2. Frequency of signage shall be as required by the Fire Marshal, but shall be no greater than 10'-0" on center for full length of wall.
 - 3. Identification shall occur on both sides of partitions.
 - 4. Identification shall occur on exposed side of fire rated assemblies.
 - 5. Suggested wording:
 - a. Smoke Partition: "Smoke Barrier - Protect All Openings".
 - b. 1.0 Hour Partition: "1.0 Hour Fire Barrier - Protect All Openings".
 - c. 1.5 Hour Partition: "1.5 Hour Fire Barrier - Protect All Openings".
 - d. 2.0 Hour Partition: "Smoke and 2.0 Hour Fire Barrier - Protect All Openings".
 - e. 4.0 Hour Partition: "Smoke and 4.0 Hour Fire Barrier - Protect All Openings".

1.08 EXTRA MATERIALS

- A. Deliver extra materials to Owner.
- B. Furnish Owner list of all colors utilized on project along with manufacturer's name, product name and, if custom color, formulation.
- C. Furnish extra materials consisting of one full gallon of each paint product listed in paint schedule and utilized in Project, with lids sealed tightly for storage and identified with appropriate labels matching list of colors required above and including application instructions.

1.09 JOB CONDITIONS

- A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50°F (10°C) and 90°F (32°C), unless otherwise permitted by paint manufacturer's printed instructions.
- B. Apply solvent-thinned paints only when temperature of surfaces painted and surrounding air temperatures are between 45°F (7°C) and 95°F (35°C), unless otherwise permitted by paint manufacturer's printed instructions.
- C. Do not paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.
 - 1. Painting may be continued during inclement weather if areas and surfaces to be painted enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.
- D. Prior to commencing of painting contractor shall arrange to have tests of masonry performed to verify that moisture content is within manufacturers allowable ranges. DO NOT proceed with painting until moisture level is within the acceptable range.
 - 1. Contractor to pay for cost of testing.

- E. Painting of interior of building, including application of block filler, shall not begin until the following activities have been completed:
 - 1. Partitions have been laid, pointed-up and rubbed-down to form a smooth uniform surface.
 - 2. Roof system has been completely installed, including flashing and other components to ensure that building is water tight.
 - 3. Openings in exterior envelope of building enclosed and sealed.
 - 4. Moisture content of surface being painted is within allowable ranges.
 - 5. Other preparation activities have been completed.
- F. PROJECT CLOSEOUT
 - 1. Contractor to submit, as part of project closeout, a complete list of each type and color of paint utilized. List to include following information:
 - a. Paint Type
 - b. Paint Color; Name, Number and Formulation
 - c. Application and location of use.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following:
 - 1. ICI Paint Stores/Devoe Coatings
 - 2. Benjamin Moore and Co. (Moore).
 - 3. PPG Industries, Pittsburgh Paints (PPG).
 - 4. Porter Paints.
 - 5. Pratt and Lambert (P & L).
 - 6. The Sherwin-Williams Company (S-W).

2.02 MATERIALS

- A. Material Quality:
 - 1. Provide best quality grade of various types of coatings regularly manufactured by acceptable paint materials manufacturers.
 - 2. Materials not displaying manufacturer's identification as standard, best-grade product not acceptable.
- B. Material Types: Provide material types indicated below unless otherwise recommended by manufacturer.
 - 1. The paint manufacturer shall review the paint types specified for each type of application required. If product type specified is not suitable for conditions or application the manufacturer shall notify the architect in writing and provide recommendations for the type of product to be used.
- C. Proprietary names used to designate color or materials not intended to imply that products of named manufacturers required to exclusion of equivalent products of other manufacturers.
- D. Manufacturer's products which comply with coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, considered for use when acceptable to Architect; furnish material data and manufacturer's certificate of performance to Architect for proposed substitutions.
- E. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
- F. Lead content in pigment limited to contain not more than 0.06% lead, as lead metal based on total non-volatile (dry-film) of paint by weight.
 - 1. Limitation extended to interior surfaces and exterior surfaces, such as stairs, decks, porches, railings, windows, and doors readily accessible to children under seven years of age.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Paint manufacturer and paint applicator shall examine areas and conditions under which painting work applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work.
 - 1. Do not proceed with work until unsatisfactory conditions corrected in manner acceptable to Applicator.
 - 2. Starting of painting work construed as paint manufacturers and applicator's acceptance of surfaces and conditions within any particular area.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of durable paint film.

3.02 MASONRY

- A. Tooling, Pointing and Patching: Work of this section shall not commence until tooling, pointing and patching of masonry work completed.

3.03 SURFACE PREPARATION - NEW CONSTRUCTION

- A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and herein specified, for each particular substrate condition.
 - 1. Thoroughly clean, rinse and allow to dry surfaces to be painted before applying paint or surface treatments.
 - a. Remove finger prints, soil, oil, grease and other contaminants prior to mechanical cleaning.
 - b. Perform cleaning and painting so contaminants from cleaning process will not fall on wet, newly-painted surfaces.
 - 2. Provide barrier coats over incompatible primers or remove and reprime as required; notify Architect in writing of any anticipated problems in using specified coating systems with substrates primed by others.
 - 3. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish painted, or provide surface-applied protection prior to surface preparation and painting operations.
 - a. Remove, if necessary, for complete painting of items and adjacent surfaces.
 - b. Following completion of painting of each space or area, reinstall removed items.
- B. Cementitious Materials:
 - 1. Prepare cementitious surfaces of concrete, concrete block, cement plaster and mineral-fiber-reinforced cement panels for paint by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
 - 2. Determine alkalinity and moisture content of surfaces by performing appropriate tests.
 - 3. If surfaces found sufficiently alkaline to cause blistering and burning of finish paint, correct condition before application of paint.
 - 4. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
 - 5. Clean concrete floor surfaces scheduled with commercial solution or muriatic acid, or other etching cleaner before painting.
 - 6. Flush floor with clean water to neutralize acid, and allow to dry before painting.
- C. Wood:
 - 1. Clean wood surfaces of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required.
 - a. Sand smooth those finished surfaces exposed to view, and dust off.
 - b. Scrape and clean small, dry, seasoned knots and apply thin coat of white shellac or other recommended knot sealer, before application of priming coat.
 - c. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler.
 - d. Sand smooth when dried.

2. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job.
 - a. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.
 - b. When transparent finish required, use spar varnish for backpriming.
 - c. Backprime paneling on interior partitions only where masonry, plaster, or other wet wall construction occurs on backside.
 - d. Seal tops, bottoms, and cut-outs of wood doors with heavy coat of varnish or equivalent sealer immediately upon delivery to job. Where doors sanded, cut or other wise modified on the project site, apply additional coat of varnish to surfaces where sanded, cut or modified.
 - D. Ferrous Metals:
 1. Clean ferrous surfaces not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
 2. Touch-up shop-applied prime coats wherever damaged or bare, where required by other Sections; clean and touch-up with same type shop primer.
 - E. Galvanized Surfaces:
 1. Clean free of oil and surface contaminants with non-petroleum based solvent.
- 3.04 SURFACE PREPARATION - EXISTING CONSTRUCTION
- A. In addition to requirements contained herein, comply with requirements for surface preparation, new construction above.
 - B. Where existing surfaces are to be painted the contractor shall remove all loose and chipped paint prior to commencing painting operations.
 - C. Existing construction that has been defaced or damaged, in any way, as a result of work performed under this contract, shall be repaired and repainted to such an extent that the finish is restored to the original condition.
 1. Utilize materials, construction techniques, and finishing techniques to match existing.
 - D. Where existing construction is scheduled to receive new paint the contractor shall prepare surfaces to be painted by removing nails, screws and other material on face of wall, patching holes, caulking cracks, and removing loose or deteriorated paint.
 - E. Inspection: The painter and paint manufacturer shall jointly inspect the surfaces to be painted and conduct exploratory tests to:
 1. Determine the presence of excessive moisture.
 2. Determine locations of deteriorated painted surfaces.
 3. Determine the compatibility of new paints with the existing painted surface.
 - F. Testing: Upon the conclusion of the field visit the manufacturer shall provide written recommendations on the proper method of preparing the surfaces. The painter shall subsequently prepare "TEST" surfaces in accordance with manufacturers recommendations to verify the compatibility of paints. After the paint has been allowed to cure (minimum of 1 week) the surfaces will be viewed to verify that no peeling, blistering, flaking, or other adverse reaction has occurred.
 1. Test areas shall be a minimum of 2'-0" X 2'-0".
 - G. Notification: The painter shall notify the architect of any adverse conditions encountered.
 1. If recommended by the paint manufacturer, the prime coat specified may be changed as necessary to ensure compatibility of paints.
 - H. Manufacturers Recommendations: Upon completion of field inspection and testing the contractor shall have the paint manufacturer recommend appropriate primer for conditions encountered.
 1. Submit to architect a copy of written recommendation for primary.
 2. Provide recommended primer installed in accordance with manufacturers written recommendations.

- I. Commencement: The painter shall not commence painting until the above tests have been completed.
 - 1. The commencement of painting activities shall be considered as the painter's acceptance of the substrate.

3.05 MATERIALS PREPARATION

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
 - 1. Tinting of paint shall be done by paint supplier.
 - 2. Materials shall not be modified in any manner on the job.
 - 3. All materials to arrive on job site in original, factory labeled containers.
- B. Maintain containers used in mixing and application of paint in clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce mixture of uniform density, and stir as required during application.
 - 1. Do not stir surface film into material.
 - 2. Remove film and, if necessary, strain material before using.

3.06 APPLICATION

- A. General:
 - 1. Apply paint in accordance with manufacturer's directions; use applicators and techniques best suited for substrate and type of material being applied.
 - a. Paint colors, surface treatments, and finishes, indicated in schedules.
 - b. Provide finish coats compatible with prime paints used.
 - 2. Apply paint using applicators and techniques best suited for substrate and type of material being applied.
 - a. Apply paint using brush or roller only.
 - b. Paint applied to hollow metal frames to be applied with paint brush only.
 - c. Use of spray application acceptable only in areas where not accessible by brush or roller. Where spray application is used, apply each coat to provide the hiding equivalent of brush coats.
 - 3. Apply first finish coat with light tint of second finish coat color.
 - a. First finish coat must contrast with prime coat and second finish coat to identify it as such.
 - 4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.
 - a. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.
 - 5. Paint exposed ductwork.
 - 6. Paint interior surfaces of ducts, where visible through registers or grilles, with flat, non-specular black paint.
 - 7. Field paint factory primed HVAC grilles and registers.
 - 8. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
 - 9. In areas not scheduled to be painted, paint both sides of doors and frames.
 - 10. Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.
 - 11. Sand lightly between each succeeding paint or varnish coat.
 - 12. Omit first coat (primer) on shop primed metal surfaces and touch-up painted, unless otherwise indicated.
 - 13. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film of uniform finish, color and appearance.
 - a. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
 - b. Provide additional coats of paint required for adequate coverage and complete coverage where deep tints/hues selected.
- B. Painting of Areas Previously Painted: Where portions of the building previously painted indicated to be painted as part of this contract, the contractor shall repaint in accordance with provisions of this section. Provide a min. of three coats of paint as follows:
 - 1. Primer: Provide primer of type recommended by manufacturer.
 - 2. First Finished Coat: Provide first finished coat of type specified.
 - 3. Second Finished Coat: Provide second finished coat of type specified.
 - 4. Additional Finished Coat: Provide additional coats of paint necessary for coverage.

- C. Scheduling Painting:
1. Apply first-coat material to surfaces cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 2. Allow sufficient time between successive coatings to permit proper drying.
 3. Do not recoat until paint dried so it feels firm, and does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of undercoat.
- D. Minimum Coating Thickness:
1. Apply materials at not less than manufacturer's recommended spreading rate, to establish total dry film thickness indicated or, if not indicated, recommended by coating manufacturer.
- E. Doors and Frames: Field apply painters finish to doors and frames unless pre-finished. Where painters finish applied the following conditions shall be met:
1. Remove all rust and other surface imperfections by sanding.
 2. Repair doors and frames where damaged through installation or subsequent construction activities.
 3. Lightly sand surface prior to painting and between each coat to obtain a smooth uniform texture.
 4. Field paint all surfaces of doors and frames.
 - a. In areas not scheduled to be painted, paint both sides of doors and frames.
 - b. Finish doors on tops, bottoms and side edges same as faces, unless otherwise indicated.
 5. Apply paint using brush or spray application methods. Use of a roller or other methods resulting in a textured surface not acceptable.
 6. Finished surface shall be smooth in texture and free from brush marks.
- F. Exterior Items to be Painted Include, but are not limited to:
1. Items identified in this Section, elsewhere in these specifications, and on the drawings.
 2. Ferrous metals which are not specified to have factory applied finish coat.
 3. Types of ferrous metals to be painted, include but not limited to:
 - a. Pipe Bollards.
 - b. Downspout boots.
 - c. Trench Drains and Sand Traps.
 - d. Storm Drainage inlets, manhole covers and rings, etc.
 - e. Steel Lintels, miscellaneous steel and exposed structural steel.
 - f. Hollow metal doors and windows and frames
- G. Mechanical and Electrical Work:
1. Limit painting of mechanical and electrical work to; unless specifically noted otherwise:
 - a. Items exposed in occupied and non-occupied areas.
 - b. Items exposed in mechanical and electrical rooms, whether room is scheduled to be painted or not.
 - c. Items exposed at exterior of building.
 2. Paint mechanical (plumbing and Hvac) items including, but not limited to, following:
 - a. Building sprinkler system piping (Refer to Section 13930)
 - b. Exposed insulation on Hvac system piping
 - c. Piping, pipe hangers, and supports, exposed plumbing vent stacks.
 - d. Heat exchangers.
 - e. Tanks.
 - f. Ductwork, insulation.
 - g. Motor, mechanical equipment, and supports.
 - h. Accessory items.
 - i. Items addressed in mechanical drawings and specification.
 3. Paint electrical items including, but not limited to, following:
 - a. Conduit and fittings.
 - b. Switchgear.
 - c. Disconnects.
 - d. Items addressed in electrical drawings and specification.

- H. Prime Coats:
1. Apply prime coat to material required to be painted or finished, and not prime coated by others.
 2. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat, to assure finish coat with no burn through or other defects due to insufficient sealing.
 3. Concrete Block, Concrete and Cementitious Roof Deck:
 - a. Prime coat (block filler) on porous surfaces shall be spray applied and subsequently rolled.
 - b. Apply block filler in number of coats necessary and of thickness required to fill all pores and to fully conceal the natural color of the substrate.
 - c. Re-apply prime coat as necessary until natural color of substrate is no longer visible.
 - d. Re-apply prime coat until pores of substrate fully filled.
 - e. The color of the substrate shall be pure white (no grey bleed through) and the pores shall be filled prior to the application of finished coats of paint.
 - f. Finished coats shall not be applied until Architect has approved primer application.
- I. Pigmented (Opaque) Finishes:
1. Completely cover to provide opaque, smooth surface of uniform finish, color, appearance and coverage.
 2. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections not acceptable.
- J. Transparent (Clear) Finish:
1. Use multiple coats to produce glass-smooth surface film of even luster.
 2. Provide finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
 3. Provide satin finish for final coats, unless otherwise indicated.
- K. Completed Work:
1. Match approved samples for color, texture and coverage.
 2. Remove, refinish or repaint work not in compliance with specified requirements.

3.07 FIELD QUALITY CONTROL

- A. Owner reserves right to invoke following material testing procedure at any time, and any number of times during field painting:
1. Engage services of an independent testing laboratory to sample paint being used.
 2. Samples of materials delivered to project site taken, identified and sealed, and certified in presence of Contractor.
 3. Testing laboratory perform appropriate tests for any or all of following characteristics:
 - a. Abrasion resistance.
 - b. Adhesion
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.
 - h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Recoating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali resistance.
 - n. Quantitative materials analysis.

- B. If test results show material being used does not comply with specified requirements, Contractor directed to stop painting work, and:
 - 1. Remove non-complying paint.
 - 2. Pay for testing.
 - 3. Repaint surfaces coated with rejected paint.
 - 4. Remove rejected paint from previously painted surfaces if, upon repainting with specified paint, two coatings are non-compatible.
- C. All coats of paint shall be viewed and accepted by the Architect prior to the succeeding coat being installed.
 - 1. Contractor Shall notify Architect 48 hours in advance of the time at which the coat of paint is to be viewed.
 - a. Coats viewed and found to be unacceptable shall be repainted to the satisfaction of the Architect prior to proceeding the succeeding coat.
 - b. The contractor will not receive credit for coats of paint not viewed and accepted by Architect.

3.08 CLEAN-UP AND PROTECTION

- A. Clean-Up:
 - 1. As work Progresses, remove discarded paint materials, rubbish, cans and rags from site at end of each work day.
 - 2. Upon completion of painting work, clean window glass and other paint spattered surfaces.
 - 3. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- B. Protection:
 - 1. Protect work of other trades, whether to be painted or not, against damage by painting and finishing work.
 - 2. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
 - 3. Provide "Wet Paint" signs as required to protect newly-painted finishes.
 - 4. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
 - 5. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.09 EXTERIOR PAINT SCHEDULE

- A. General: Provide the following Paint systems for the various substrates, as indicated.
- B. Wood:
 - 1. Gloss Alkyd Finish: 2 finish coats over primer with min. total dry film thickness of 3.5 mils.
 - a. Primer: Exterior Primer Coating.
 - 1) ICI: 2110 Ultra-Hide Alkyd Wood Primer
 - b. First and Second Coats: Exterior Alkyd Enamel.
 - 1) ICI: 4328 Devshield Alkyd-Urethane Gloss Enamel
- C. Wood Trim:
 - 1. Deep Color, High-Gloss Alkyd Finish: 2 finish coats over primer.
 - a. Primer: Exterior Primer Coating.
 - 1) ICI: 2110 Ultra-Hide Alkyd Wood Primer
 - b. First and Second Finish Coats: Deep Color, High Gloss, Alkyd Resin Trim Paint.
 - 1) ICI: 2518 Ultra-Hide Alkyd Gloss House & Trim Paint
- D. Ferrous Metal: Primer not required on shop-primed items.
 - 1. Full Gloss Alkyd Enamel: 2 finish coats over primer.
 - a. Primer: Synthetic Rust-Inhibitive Primer.
 - 1) ICI 4100 Dev-Guard Alkyd Metal Primer
 - b. First and Second Coats: Gloss Alkyd Enamel.
 - 1) ICI: 4328 Devshield Alkyd-Urethane Gloss Enamel

2. Deep Color, High-Gloss Alkyd Trim Enamel: 2 finish coats over primer.
 - a. Primer: Alkyd-type primer.
 - 1) ICI 4100 Dev-Guard Alkyd Metal Primer
 - b. First and Second Coats: Deep Color, Exterior, Alkyd Resin Trim Paint.
 - 1) ICI 2518 Ultra-Hide Alkyd Gloss House & Trim
 - E. Zinc-Coated Metal: Primer not required on shop-primed items.
 1. High Gloss Alkyd Enamel: 2 finish coats over primer.
 - a. Primer: Galvanized Metal Primer.
 - 1) ICI 4120 Dev-Guard Galvanized Metal Primer
 - b. First and Second Coats: High Gloss Alkyd Enamel.
 - 1) ICI: 4328 Devshield Alkyd-Urethane Gloss Enamel
 - F. Aluminum:
 1. High Gloss Alkyd Enamel: 2 finish coats over primer.
 - a. Primer: Alkyd-Type Primer.
 - 1) ICI 4100 Dev-Guard Alkyd Metal Primer
 - b. First and Second Coats: High Gloss Alkyd Enamel.
 - 1) ICI: 4328 Devshield Alkyd-Urethane Gloss Enamel
 - G. Exposed Rubber Pipe Insulation:
 1. High Gloss Alkyd Enamel: 2 finish coats over primer.
 - a. Primer: Vinyl Acrylic Latex Primer.
 - 1) ICI 1030 Ultra-Hide P.V.A. Primer - Sealer
 - b. First and Second Coats: High Gloss Alkyd Enamel.
 - 1) ICI: 4328 Devshield Alkyd-Urethane Gloss Enamel
- 3.010 INTERIOR PAINT SCHEDULE
- A. General: Provide the following paint systems for the various substrates, as indicated.
 - B. Concrete and Masonry: (Other than concrete masonry units).
 1. Semigloss Enamel Finish: 2 coats over filler surface:
 - a. Primer: Interior, Flat, Latex-Based Paint.
 - 1) ICI: 1030 Ultra-Hide Acrylic Primer Sealer min. dry film thickness of 8.5 mil.
 - b. Finish and Second Coat: Interior, Semigloss, Odorless, Alkyd Enamel.
 - 1) ICI: 1516 Ultra-Hide Alkyd Semigloss enamel; min. dry film thickness of 1.8 mils per coat.
 - C. Concrete:
 1. Stained Concrete: Two coats solvent based acrylic enamel concrete stain over prepared concrete placed a maximum coverage rate of 200 square feet per gallon per coat.
 - a. Preparation: As described above and in strict conformance with manufacturers written recommendations.
 - b. First and Second Coats: Acrylic Enamel Concrete Stain.
 - 1) Anvil: 1900 Series, Semi-gloss.
 - c. Colors: Provide a min. of 19 colors from which Architect may select.
 2. Interior Polyamide Epoxy in Gloss or Semigloss Finish: 3 coats with min. total dry film thickness of 4.0 mils.
 - a. Primer: Interior Latex Emulsion.
 - 1) ICI: 3210 Gripper Acrylic Primer Sealer
 - b. First and Second Coats: Polyester Epoxy.
 - 1) ICI: 4408 Tru-glaze WB Polyamid Gloss Epoxy

- D. Concrete Masonry Units:
1. Semigloss Alkyd Enamel Finish: 2 coats over filled surface.
 - a. Block Filler: High-Performance Latex Block Filler. Apply filler coat at a rate to ensure complete coverage with pores filled.
 - 1) ICI: 3010 Ultra-Hide Acrylic Latex Block Filler; min. dry film thickness of 8.5 mil.
 - b. Finish and Second Coat: Interior, Semigloss, Odorless, Alkyd Enamel.
 - 1) ICI: 1516 Ultra-Hide Alkyd Semigloss enamel; min. dry film thickness of 2.2 mils per coat.
 2. High-Gloss Polyester Epoxy: Two coat high-gloss polyamide epoxy coating filled surface.
 - a. Filler: Pigmented sealers over concrete under high performance polyester epoxy coatings:
 - 1) ICI: 4508 Tru-Glaze Polyamide Gloss Epoxy; min. dry film thickness of 8.5 mil.
 - b. First and Second Coat: High-Gloss Polyester Epoxy.
 - 1) ICI: 4408 Tru-Glaze WB Polyamide Gloss Epoxy; min. dry film thickness of 4 mils per coat.
- E. Gypsum Drywall Systems:
1. Odorless Eggshell Alkyd Enamel Finish: 3 coats with min. total dry film thickness of 2.5 mils.
 - a. Primer: White, Interior, Latex-Based Primer.
 - 1) ICI: 1030 Ultra-Hide PVA Primer-Sealer
 - b. First and Second Coats: Interior, Eggshell, Odorless, Alkyd Enamel.
 - 1) ICI: 1512 Ultra-Hide Alkyd Eggshell Enamel
 2. Odorless Semigloss Alkyd Enamel Finish: 3 coats with min. total dry film thickness of 2.5 mils.
 - a. Primer: White, Interior, Latex-Based Primer.
 - 1) ICI: 1030 Ultra-Hide PVA Primer-Sealer.
 - b. First and Second Coats: Interior, Semigloss, Odorless, Alkyd Enamel.
 - 1) ICI: 1516 Ultra-Hide Alkyd Semigloss enamel.
- F. Plaster
1. Semigloss Enamel Finish: 3 coats with min. total dry film thickness of 2.5 mils.
 - a. Primer: Interior, Flat, Latex-Based Paint.
 - 1) ICI: 1030 Ultra-Hide PVA Primer-Sealer
 - b. First and Second Coat: Interior, Semigloss, Odorless, Alkyd Enamel.
 - 1) ICI: 1516 Ultra-Hide Alkyd Semigloss enamel.
- G. Woodwork and Hardboard:
1. Full Gloss Enamel: Finish: 3 coats.
 - a. Undercoat: Interior Enamel Undercoat.
 - 1) ICI: 1120 Ultra-Hide Alkyd Enamel Undercoat
 - b. First and Second Coats: Gloss Alkyd Enamel.
 - 1) ICI: 4308 Devguard Alkyd Gloss Enamel.
- H. Stained Woodwork:
1. Stained - Varnish Rubbed Finish: 3 finish coats over stain plus filler on open grain wood. Wipe filler before applying first varnish coat.
 - a. Stain Coat: Oil-Type Interior Wood Stain.
 - 1) ICI: 1700 Wood Pride Oil Stain
 - b. First Coat: Cut Shellac.
 - 1) ICI: 1916 Wood pride Sand and Seal
 - c. Second and Third Coats: Urethane Varnish.
 - 1) ICI: 1902 Wood Pride Satin Polyurethane Finish
- I. Wood Fiber Roof Deck:
1. Lusterless (Flat) Latex Finish: 2 coats.
 - a. First and Second Coats: Interior, Flat, Latex-Based Paint.
 - 1) ICI: 1210 Ultra-Hide Acrylic Latex Flat Wall Paint.

- J. Ferrous Metal: Primer not required on shop-primed items.
 - 1. Full Gloss Enamel Finish: 2 coats over primer with min. total dry film thickness of 2.5 mils.
 - a. Primer: Synthetic, Quick-Drying, Rust Inhibitive Primer.
 - 1) ICI: 4100 Dev-Guard Alkyd Metal Primer
 - b. First and Second Coat: Exterior, Gloss, Alkyd Enamel.
 - 1) ICI: 4308 Dev-Guard Alkyd Gloss Industrial Enamel
- K. Zinc-Coated Metal: Primer not required on shop-primed items.
 - 1. Full Gloss Enamel Finish: 2 coats over primer with min. total dry film thickness of 2.5 mils.
 - a. Primer: Galvanized Metal Primer.
 - 1) ICI: 4120 Dev-Guard Galvanized Metal Primer
 - b. First and Second Coat: Exterior, Gloss, Alkyd Enamel.
 - 1) ICI: 4308 Dev-Guard Alkyd Gloss Industrial Enamel
- L. Exposed Rubber Pipe Insulation:
 - 1. High Gloss Alkyd Enamel: 2 finish coats over primer.
 - a. Primer: Vinyl Acrylic Latex Primer.
 - 1) ICI: 3210 Gripper Acrylic Primer & Sealer
 - b. First and Second Coats: High Gloss Alkyd Enamel.
 - 1) ICI: 4308 Devguard Alkyd Gloss Enamel
- M. Cotton or Canvas Covering over Insulation:
 - 1. Flat Latex Emulsion Size: 2 coats. Add Fungicidal agent to render fabric mildewproof.
 - a. First and Second Coats: Interior, Flat, Latex-Based Paint.
 - 1) ICI: 1210 Ultra-Hide Acrylic Latex Flat Wall Paint

END OF SECTION 09900

**SECTION 10100
VISUAL DISPLAY BOARDS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of visual display boards indicated on drawings and herein.
- B. Types of visual display boards specified in Section include following:
 - 1. Porcelain enamel markerboards.
 - 2. Natural cork tackboards.
 - 3. Tack strip and frame.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Furnish all visual display boards by single manufacturer for entire project.
- B. Surface Burning Characteristics:
 - 1. Use only tackboards and vinyl faced rolled cork labeled and listed by testing and inspection agency acceptable to authorities having jurisdiction.
 - 2. Provide tackboard and vinyl faced rolled cork surfaces identical in composition to those with surface burning characteristics indicated below, determined by testing in compliance with ASTM E 84.
 - a. Flame Spread: Not more than 25.
 - b. Smoke Developed: Not more than 25.

1.04 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit shop drawings for each type visual display board.
 - 2. Include sections of typical trim members and dimensioned elevations.
 - 3. Show anchors, grounds, reinforcement, accessories, layout and installation details.
- B. Product Data: Submit manufacturer's technical data and installation instructions for each material and component part, including data substantiating that materials comply with requirements.
- C. Samples:
 - 1. Submit full range of color samples for each type of visual display board and trim and accessories required.
 - 2. Provide 12" square samples of sheet materials and 12" lengths of trim members for color verification after selections made.
 - 3. Provide min. of one (1) sample, size required to be representative of actual product herein specified to be installed, of each of the following:
 - a. Standard marker board, fully assembled, complete with trim, trough, and tack strips.
 - b. Specialty marker board with grid layout, fully assembled, complete with trim, trough and tack strips.
 - c. Tack strip complete with end caps.

1.05 CERTIFICATIONS

- A. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

- B. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.06 SPECIAL PROJECT WARRANTY

- A. Porcelain Enamel Markerboard Warranty:
 - 1. Furnish manufacturer's written warranty, agreeing to replace, for lifetime of building, porcelain enamel markerboards which do not retain **original** writing and erasing qualities, become slick and shiny, or fail to erase completely, or exhibit crazing, cracking or flaking; provided manufacturer's instructions with regard to handling, installation, protection and maintenance followed.
 - 2. Replacement limited to material replacement only; labor for removal and reinstallation not included.
- B. Provide one year warranty covering board components; including, but not limited to: trim, chalk/marker tray, map rail, map hooks, and anchors.

1.07 DELIVERY AND STORAGE

- A. Adequately package and protect materials during shipment.
 - 1. Upon arrival at jobsite, Contractor inspect materials for damage and stains.
 - 2. Remove damaged or permanently stained materials from site and replaced at no cost to Owner.
- B. Store materials in dry ventilated areas until immediately before installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following:
 - 1. Manufacturers of Porcelain Enamel Markerboards:
 - a. Alliancewall Corp.
 - b. American Chalkboard, Inc.
 - c. American Visual Display Products, LLC.
 - d. Best-Rite Chalkboard Co.
 - e. Carolina Chalkboard Co.
 - f. Claridge Products and Equipment, Inc.
 - g. Greensteel Inc.
 - h. Lemco Corp.
 - i. Nelson-Adams Co.
 - j. Newline Products, Inc
 - k. Penninsular Slate Co.
 - l. Platinum Visual Systems
 - m. Weber Costello Co.
 - 2. Manufacturers of Tackboards:
 - a. American Chalkboard, Inc.
 - b. American Visual Display Products, LLC.
 - c. Best-Rite Chalkboard Co.
 - d. Carolina Chalkboard Co.
 - e. Claridge Products and Equipment, Inc.
 - f. Greensteel, Inc.
 - g. Lemco Corp.
 - h. Nelson-Adams Co.
 - i. Newline Products, Inc
 - j. Peninsular Slate Co.
 - k. Weber Costello Co.

3. Manufacturers of Tackstrips:
 - a. American Chalkboard, Inc.
 - b. American Visual Display Products, LLC.
 - c. Best-Rite Chalkboard Co.
 - d. Carolina Chalkboard Co.
 - e. Claridge Products and Equipment, Inc.
 - f. Greensteel, Inc.
 - g. Lemco Corp.
 - h. Nelson-Adams Co.
 - i. Peninsular Slate Co.
 - j. Weber Costello Co.

2.02 GENERAL

- A. The following designations are utilized to refer to materials specified in this Section:
 1. Markerboards: M.B., MB, D.M.B., DMB, Markerboard, Dry Markerboard.
 2. Tackboard: T.B., TB, Tackboard.
 3. Tackstrip: T.S., TS, Tackstrip.
- B. Refer to plans for locations of Markerboards, Tackboards, and Tackstrips. Unless specifically noted otherwise each classroom and specialty classroom to receive, as a minimum:
 1. Markerboard: 4'-0" X 16'-0".
 2. Tackboard: 4'-0" X 16'-0".
- C. Specialty Markerboards to be provided where indicated. Provide as a minimum the following specialty boards:
 1. Choral Room(s): Same as standard board except one half of board to have pre-printed "Music Staff" printed on surface of board.
 - a. Staff to consist of permanently fused lines in face of board, run straight and true.
 - b. Layout of Music Staff to be selected during shop drawing phase of project.
 2. Math Classroom(s): Same as standard board except:
 - 1) Grid to consist of permanently fused lines in face of board, run straight and true.
 - 2) Layout and location of grid to be selected during shop drawing phase of project.
 - b. Equip board with rolling extruded aluminum "T" and 30" long plastic ruler / protractor.
- D. Unless specifically noted otherwise, or required due to space limitations all boards shall be of size listed above or indicated on drawings.
 1. Where scheduled board will not fit in allocated space, contractor shall propose alternative size(s) for Architect's consideration and approval. The total cumulative length of the board surface shall be no less than specified.
 2. Revisions in board size shall not affect contract cost, provided the lineal footage of boards remains unchanged.

2.03 MARKERBOARDS

- A. Porcelain Enamel Markerboards: Balanced, high pressure laminated porcelain enamel markerboards of 3-ply construction consisting of facing sheet, core material and backing.
- B. Facing Sheet:
 1. 24-gage enameling grade steel sheet especially processed for temperatures used in coating porcelain on steel.
 2. Coat exposed face with 3-coat process consisting of primer, ground coat and color cover coat, and concealed face with 2-coat process consisting of primer and ground coat.
 3. Fuse cover and ground coats to steel at manufacturer's standard firing temperatures, but min. 1,200°F (649°C).
 4. Facing Sheet to be equal to Polyvision's P3 Ceramicsteel.

- C. Optional Proprietary Facing Sheet:
 - 1. Contractor's option to provide 24-gage "Vitracite", porcelain enamel clad, type 1 stretcher-leveled aluminized steel facing sheet, manufactured by Claridge Products and Equipment, Inc. in lieu of facing sheet construction specified above.
 - 2. Fuse porcelain enamel coating to sheet facing steel at approximately 1,000°F (538°C).
 - D. Cover Coat: Manufacturer's standard gloss finish cover coat which will for liquid felt tipped markers, color selected by Architect from manufacturer's standards.
 - 1. Provide factory applied painted music staff of design selected by Architect in indicated rooms.
 - 2. Provide factory applied painted polar or rectangular coordinates of design selected by Architect in indicated rooms.
 - E. Core: Manufacturer's standard 3/8" thick particle board core material, ANSI A208.1, Grade 1-M-1.
 - F. Backing Sheet: Manufacturer's standard 0.005" thick aluminum sheet backing.
 - G. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type adhesive.
 - H. Markertray: Furnish manufacturer's continuous box "Architectural" type aluminum Markertray with slanted front and cast aluminum end closures for each markerboard.
 - I. Map Rail: Furnish map rail at top of each unit, complete with following accessories:
 - 1. Display Rail: Provide continuous cork display rail approximately 2" wide, as indicated, integral with map rail.
 - 2. End Stops: Provide one end stop at each end of map rail.
 - 3. Map Hooks: Provide 2 map hooks with flexible metal clips for each 4' of map rail or fraction thereof.
 - 4. Flagholder: Provide one flagholder for each room.
 - J. Color:
 - 1. Equal to Polyvision 6100H, White
- 2.04 TACKBOARDS
- A. Natural Cork Tackboards: Single layer 1/4" thick seamless, compressed fine grain bulletin board quality natural cork sheet, face sanded for natural finish, natural tan color, complying with MS MIL-C15116, Type II.
 - B. Backing: Make panels rigid by factory laminating cork face sheet under pressure to 1/4" thick hardboard backing.
- 2.05 TACK STRIPS
- A. Tackstrips shall be a minimum of 2" wide extruded aluminum rail complete with 1-3/8" dense, fine grained, colored cork inserts, end closure caps, with combination paper clips and map hooks.
 - 1. Provide one map hook for each 6" of running foot of tack strip.
 - 2. End closure cap to be of extruded aluminum to match rail. End closure to completely enclose end of rail and cork in a manner to eliminate all sharp edges.
- 2.06 METAL TRIM AND ACCESSORIES
- A. Fabricate frames and trim of min. 0.062" thick aluminum alloy, size and shape indicated, to suit type of installation.
 - 1. Provide straight, single length units wherever possible; keep joints to min.
 - 2. Miter corners to neat, hairline closure.
 - 3. Where size of boards or other conditions exist which require support in addition to normal trim, provide structural supports or modify trim as indicated, or as selected by Architect from manufacturer's standard structural support accessories to suit condition indicated.

- B. Finish; Clear Anodized Finish:
 - 1. Exposed aluminum trim, accessories and fasteners with manufacturer's standard satin anodized finish with clear anodic coating complying with AA requirements for Class II Architectural Coating (AA-A31).

2.07 FABRICATION

- A. Porcelain Enamel Markerboards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.
- B. Assembly: Provide factory-assembled markerboard and tackboard units, except where field-assembled units required.
 - 1. Provide 4'-0" high units except as otherwise indicated.
 - 2. Make joints only where total length exceeds max. manufactured length.
 - 3. Fabricate with min. number of joints, balanced around center of board, as acceptable to Architect.
 - 4. Provide manufacturer's standard vertical joint system between abutting sections of markerboard.
 - 5. Provide manufacturer's standard mullion trim at joints between markerboard and tackboard.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work.
 - 1. Allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.
- B. Furnish boards in locations shown on drawings:
 - 1. If not shown on plans or if partially shown, provide a minimum of one marker board and one tackboard in each classroom including specialty classrooms and labs.
- C. Refer to drawings for schedule of mounting heights.
 - 1. Where tack board are located adjacent to marker board, install tack boards to align with top of marker board.
- D. Verify location of installation.
 - 1. Verify that light switches, thermostats, etc. are located properly to avoid conflicts with boards. Relocate as necessary.

3.02 INSTALLATION

- A. Deliver factory-built units completely assembled in one piece without joints, whenever possible.
 - 1. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect.
 - 2. When overall dimensions require delivery in separate units, prefit components at factory, disassemble for delivery, and make final joints at site.
 - 3. Use splines at joints to maintain surface alignment.
- B. Install units in locations and mounting heights indicated and in accordance with manufacturer's instructions.
 - 1. Keep perimeter lines straight, plumb, and level.
 - 2. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim and accessories necessary for complete installation.
- C. Coordinate job-site assembled units with grounds, trim, and accessories.
 - 1. Join all parts with neat, precision fit.

- D. Install boards in accordance with manufacturer's written instructions and the following:
 - 1. Unless dimensioned otherwise, center board on wall.
 - 2. Keep perimeter lines plumb, level, and square.
 - 3. In addition to mechanically fastening boards to walls with specified trim, adhere backs of boards uniformly to walls with glue recommended by board manufacturer; brace boards adequately tight against wall, without damaging board, for time as required to allow glue to set. Bubbles or loose spots prohibited.
 - 4. Coordinated location of light switches, electrical outlets, thermostats, clocks, etc. with location of boards to provide a minimum of 3" clearance between such items.
 - a. Relocate devices not coordinated, without added cost to the contract.
- E. Install tack strips in accordance with manufacturer's written instructions and the following:
 - 1. Tack strips shall be mechanically fastened to wall using concealed fasteners at a maximum of 2'-0" on center.
 - 2. Secure cork tack strip in place using adhesive.
 - 3. Install end caps at each end of the tack strips.
 - a. Securely Mechanically attach end caps using exposed screws.
 - b. End cap shall fully cover end of cork and rail to hold cork in place and conceal edges of metal rail.
 - 4. Tack strips to be installed at heights scheduled. If not scheduled mount at 48" above finished floor.
 - 5. Tack strips to be level to within 1/8" in 12'-0".

3.03 PROTECTION

- A. Protect boards from damage or stains during and after installation. Protection shall consist of, as a minimum, covering of entire board surface with polyethylene sheathing.
- B. Remove and replace damaged or stained boards without additional cost to Owner.

3.04 ADJUST AND CLEAN

- A. Verify that accessories required for each unit properly installed and operating units function properly.
- B. Upon completed installation thoroughly clean all surfaces, including but not limited to, walls, trim, and board surfaces.
 - 1. Material used for cleaning shall be in accordance with manufacturer's recommendations so as not to damage board surfaces.
 - 2. Remove excess adhesive from board trim and surface and face of wall.
 - 3. Remove chalk lines from face of wall.
- C. Clean units in accordance with manufacturer's instructions.
 - 1. Contractor shall break-in markerboard writing surfaces as recommended by manufacturer.

END OF SECTION 10100

**SECTION 10160
TOILET PARTITIONS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of toilet partitions is indicated on drawings.
- B. Types of toilet compartments include:
 - 1. Solid plastic, homogenous color.
- C. Styles of toilet compartments include:
 - 1. Floor-anchored, overhead braced.
- D. Styles of urinal screens include:
 - 1. Floor-anchored, overhead braced.
- E. Toilet accessories, such as toilet paper holders, grab bars, purse shelves, specified elsewhere in Division 10.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of toilet partition assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.
 - 1. Provide plan layout of all stalls scheduled to receive partitions.
 - 2. Provide elevations and sections through each type of partition.
 - 3. Clearly indicate the type of support bracket to provided at each point of connection.
- C. Samples:
 - 1. Submit full range of color samples for each type of unit required. Architect shall be permitted to select a different color for each toilet room; only one color per toilet room will be selected.
 - 2. Submit 6" square samples of each color and finish on same substrate used in work, for color verification after selections made.
 - 3. Submit one (1) sample each of following:
 - a. Hardware (Complete)
 - b. Pilaster (12" x 12")
 - c. Divider panel (12" x 12")
 - d. Full High Aluminum Mounting Bracket (57.5")
 - e. Continuous Full High Aluminum Hinge (57.5")

1.04 DELIVERY AND STORAGE

- A. Adequately package and protect materials during shipment.
 - 1. Upon arrival at jobsite, Contractor inspect materials for damage and stains.
 - 2. Remove damaged or permanently stained materials from site and replace at no cost to Owner.
- B. Store materials in dry ventilated areas until installation.

1.05 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work.
 - 1. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay work.
- B. Coordination: Furnish inserts and anchorages to be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.
- C. Finish Schedule: Refer to and coordinate with finishes indicated to be installed as designated by finish schedule; make allowances for ceramic wall tile and tile wainscots where they exist.

1.06 FIRE CODE COMPLIANCE

- A. Submit certification that products specified herein meet or exceed the requirements for a class B, flame spread rating, calculated according to ASTM E-84-91a.

1.07 CERTIFICATIONS

- A. As part of shop drawing submittals, provide certification from manufacturer of product that materials provided under this Section comply with the technical provisions contained herein.
 - 1. Deviations from technical specifications shall be specifically noted.
- B. Producer's Statement of Applicability:
 - 1. Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 2. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 3. Statement also state that proposed application of product on project is suitable and proper.

1.08 WARRANTY

- A. Provide manufacturer's written Twelve (12) year warranty against breakage, corrosion, and delamination of the entire toilet partition including hardware. Replace materials without cost to the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide one of following:
 - 1. Accurate Partitions Div., United States Gypsum Co.
 - 2. AmproProducts, Inc.
 - 3. American Sanitary Partition Corp.
 - 4. Bobrick Washroom Equipment, Inc.
 - 5. Columbia Partitions, Inc.
 - 6. Global Steel Products Corp.
 - 7. Metpar Steel Products Corp.
 - 8. Rockville Partitions, Inc.
 - 9. Santana Products Co.
 - 10. Sanymetal Products Co.

2.02 MATERIALS

- A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.

- B. Material: Solid Plastic:
 - 1. High density, solid polyethylene with homogenous color throughout.
 - 2. Provide material min. 1" thick, seamless construction with edges eased.
- C. Pilaster Shoes: ASTM A 167, Type 302/304 stainless steel, min. 4" high, 18 gage, finished to match hardware; attached with stainless steel through bolts.
- D. Continuous Brackets: Full height (57.5") .125" thick extruded aluminum 6063-T5, satin anodized finish, min. 1.685 lbs./l.f. of size (thickness) to match doors, pilasters and/or panel.
 - 1. Provide continuous brackets for each pilaster to wall connections, pilaster to partitions and partitions to walls.
 - 2. Pre-drill wall brackets with holes **8" o.c.** along full length of bracket, no hole less than 4" from end of bracket.
 - 3. Furnish brackets of type and style indicated:
 - a. Partition To Wall: Use double flanged shaped bracket.
 - b. Partition to Pilaster: Use double flanged shaped bracket except where use of 'U' shaped bracket required due to space limitations.
 - 4. Pre-drill brackets for through-bolts. Attach at partitions and pilasters using stainless steel through-bolt type tamper proof bolts spaced at a **maximum of 8"** on center.
- E. Continuous Hinge: Continuous full height (57.5") contact "Piano Type" door hinge made of extruded aluminum 6063-T5, satin anodized finish, weighing no less than 1.5 pound per foot. Hinge shall be designed for surface attachment (not door edge attachment).
 - 1. Hinge to be 3" wide with five stainless steel wire springs for self closing action.
 - 2. Pivot pin shall be 0.25" diameter, Type 302/304 stainless steel.
 - 3. Knuckles shall have nylon separators; pivot pin shall be 1/4" Type 304 Stainless Steel.
 - 4. Hinges shall provide emergency access by lifting door.
 - 5. Pre-drill hinge for through-bolts. Attach hinges to doors and pilasters using stainless steel through-bolt type tamper proof bolts spaced at a maximum of 8" on center.
 - 6. Fasteners shall be concealed beneath snap on cover. Cover shall be attached at top and bottom with theft proof fasteners.
- F. Overhead Brace: Continuous, clear anodized, heavy duty, extruded aluminum head rail with anti-grip profile and integral reinforcing channel and curtain track. Minimum height of overhead rail to be **3"**.
 - 1. Furnish Continuously across front of all partitions and end of last partition and handicapped stall.
 - 2. Furnish at mid point of handicapped stall where necessary to provide lateral bracing.
- G. Strike: Heavy duty, cast stainless steel; surface mounted with integral rubber bumper door stop.
 - 1. Strike to be surface mounted on exterior face of pilaster at standard partitions and on interior face of pilasters at handicapped partitions.
 - 2. Furnish one strike at top and bottom of each partition.
- H. Combination latch / strike: Heavy duty, cast stainless steel; surface mounted, slide type.
 - 1. Strike to be surface mounted on exterior face of pilaster at standard partitions and on interior of handicapped partitions..
 - 2. Furnish one strike at latch for each partition.
- I. Combination Coat hook / Door Stop: Heavy duty, cast stainless steel; maximum projection of 1-1/8".
 - 1. Furnish one per door.
- J. Door Stop: Heavy duty; cast stainless steel.
 - 1. Provide separate door stop for out-swinging handicapped toilet partition doors.
- K. Toilet Tissue Dispensers: Specified in Section 10800 - Toilet and Bath Accessories.
- L. Anchorages and Fasteners:
 - 1. Fasteners shall be stainless steel with theft-resistant type heads; thru-bolted unless noted otherwise.

2.03 FABRICATION

- A. General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system, complete with all accessories and hardware listed above and as required for installation of fully functional system, unless otherwise indicated.
1. Furnish units with cutouts and drilled holes to receive partition-mounted hardware, accessories, and grab bars, as indicated.
- B. Compartment and Door Sizes: Furnish compartments and doors of sizes indicated unless greater dimension shown on drawings.
1. Urinal Screens:
 - a. Width: Minimum 30" Clear
 - b. Depth: 18"
 - c. Height of Divider Panel: To match toilet stalls.
 2. Toilet Partitions:
 - a. Non-Handicapped:
 - 1) Width: 2'-8"; minimum
 - 2) Depth: 5'-0" inside clear
 - 3) Doors: 2'-0"; in-swinging
 - b. Handicapped:
 - 1) Width: 5'-0" wide, inside clear
 - 2) Depth: 5'-0" deep; inside clear
 - 3) Doors: 3'-0" Minimum (Minimum 32" clear); out-swinging
 - c. Ambulatory Handicapped:
 - 1) Width: 3'-0" wide (Exactly)
 - 2) Depth: 6'-0" deep; inside clear
 - 3) Doors: 2'-10" (minimum 32" clear); out-swinging
- C. Overhead-Braced / Floor Supported Partitions:
1. Furnish heavy duty 3/8" X 1" aluminum leveling bars, complete with threaded rods, lock washers, and leveling adjusting nuts at pilasters, to permit structural connection at floor.
 2. Make provisions for setting and securing continuous extruded aluminum anti-grip overhead-bracing at top of each pilaster.
 3. Furnish shoe at each pilaster to conceal supports and leveling mechanism.
- D. Overhead-braced / Floor-Supported Urinal Screens:
1. Furnish pilasters min. 1" thick, panels and pilasters of same construction and finish as toilet partitions.
 2. Furnish heavy duty 3/8" X 1" aluminum leveling bar, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit structural connection to floor.
 3. Furnish shoe at each pilaster to conceal anchorage.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
1. Comply with manufacturer's recommended procedures and installation sequence.
 2. Install partitions rigid, straight, plumb, and level.
 3. Thru-bolt brackets to pilasters, brackets to doors, brackets to partitions, and brackets to walls with one-way sex bolts.

3.02 PARTITIONS

- A. General: Except at handicapped stalls, or where noted or detailed otherwise, partitions to be centered on plumbing fixture.
- B. Overhead-Braced / Floor Supported Partitions:
 - 1. Secure pilasters to floor, and level, plumb, and tighten installation with devices furnished.
 - 2. Secure pilaster units to floor with 3/8" X 1" aluminum leveling bar, with anchorages of minimum 3/8" in diameter, having min. of 2" penetration into structural floor, unless more stringent requirements recommended by partition manufacturer.
 - 3. Secure overhead-brace to each pilaster with min. of two fasteners.
 - 4. Install pilasters with minimum 1" clearance between wall and pilaster in order to clear cove base.
 - 5. Secure overhead-brace to wall at each point of intersection.
 - 6. Hang doors and adjust so tops of doors parallel with overhead-brace and so tops of doors level with tops of pilasters when doors in closed position.
 - 7. Attach stainless steel base to pilaster with stainless steel through bolts.
 - 8. Install door using continuous hinge secured to door and pilaster at 8" on center.
- C. Overhead-Braces / Floor Supported Urinal Screens:
 - 1. Comply with requirements for overhead braced; floor supported partitions as described above.
 - 2. Attach with concealed anchoring devices, recommended by manufacturer to suit supporting structure.
 - 3. Set units to provide support and to resist lateral impact.
 - 4. At handicapped stall provide a minimum clear width of 32".

3.03 HARDWARE

- A. General: Install hardware noted in accordance with manufacturers written instructions and the following:
 - 1. Use theft-proof fasteners unless noted.
 - 2. Use stainless steel through-bolt (sex-nut) type fasteners unless noted.
- B. Continuous Bracket attachment to wall; Install continuous bracket at each point of connection between pilaster and wall; pilaster and panel (partition); and panel (partition) and wall as follows:
 - 1. Thru-bolt brackets to pilasters with one-way sex bolts.
 - 2. Secure bracket to partition, pilaster, door and wall using all available holes.
 - 3. At hollow masonry Toggle bolts directly behind vertical edge of pilaster, spaced 6" o.c. along full length of bracket.
 - 4. At solid masonry where thru bolts cannot be used, use No. 5 plastic anchors and No. 14 x 1-1/2" stainless steel phillips head screws at each 8" interval alternately spaced between toggle bolt connections.
 - 5. At solid masonry where thru bolts can be used attach brackets thru masonry pilaster using 3/8" stainless steel sex nut bolts at 8" on center.
- C. Continuous Hinge:
 - 1. Secure hinge to pilaster and door using all available holes.
 - 2. Adjust spring for proper operation.
- D. Overhead Brace:
 - 1. Secure brace to each pilaster using a minimum of two fasteners.
 - 2. Secure brace to wall at each point of intersection.
- E. Strike:
 - 1. Strike to be surface mounted on exterior face of pilaster at standard partitions and on interior face on handicapped partitions.
 - 2. Place one strike at 6" from top and the other at 6" from bottom of each door.
 - 3. Secure with through-bolts.

- F. Combination latch / strike:
 - 1. Strike to be surface mounted on exterior face of pilaster at standard partitions and on interior of handicapped partitions..
 - 2. Install at height recommended by manufacturer.
 - G. Combination Coat hook / Door Stop:
 - 1. Mount on interior of in-swing doors approximately 3" from top edge of door and 6" from strike edge of door or as necessary to ensure coat hook functions as a door stop.
 - 2. Mount on interior of out-swinging doors 6" from top edge of door; centered on door.
 - H. Door Stop: Heavy duty; cast stainless steel.
 - 1. Provide separate door stop for out-swinging handicapped toilet partition doors.
 - 2. Mount on exterior of out-swinging doors approximately 3" from top edge of door and 6" from strike edge of door or as necessary to ensure coat hook functions as a door stop.
 - I. Shower Seat:
 - 1. Provide solid phenolic core shower seat at each 'dressing' compartment.
 - 2. Mount at height and method recommended by manufacturer.
- 3.04. TOLERANCE
- A. Toilet partitions and pilasters shall be installed in a neat, workmanship fashion, plumb, level, square and true.
 - B. Partitions shall be installed to within the following clearances.
 - 1. Partitions shall be plumb to within 1/16" in length of pilaster.
 - 2. Partitions shall be set squarely in space to within 1/8" of true square across length of partition.
 - 3. Provide uniform clearance of vertical edges of doors from top to bottom, max. 3/16".
- 3.05 ADJUST AND CLEAN
- A. Hardware Adjustment:
 - 1. Adjust and lubricate hardware for proper operation.
 - 2. Set hinges on doors to return to fully closed position.
 - B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection necessary to prevent damage during remainder of construction period.
 - C. Upon completion of toilet partition installation remove all labels, lubricate moving parts, and clean all faces of partitions and hardware.
 - 1. Remove all markings from face of partitions.
- 3.06 DAMAGED MATERIALS
- A. Material damaged as a result of work performed under this contract shall be replaced at no cost to the contract.
 - 1. Partitions with chipped or cracked plastic veneer shall be replaced with new.

END OF SECTION 10160

SECTION 10260
WALL AND CORNER GUARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of corner guards, closures and accessories, is indicated on Drawings.
- B. Types of corner guards specified in this section include following:
 - 1. Rigid Vinyl corner guards

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of wall and corner protection required.
- B. Shop Drawings: Submit shop drawings showing details of construction and installation.
 - 1. Dimensions: Include dimensional relationships to adjoining work installation tolerances.
 - 2. Include details, with descriptive notes indicating materials, finishes, fasteners, typical and special end conditions, accessories, and other data to permit full evaluation of system.
- C. Samples: Submit samples of each exposed metal finish and each type and color of wall or corner protection surface.
 - 1. Submit one (1) 12" long sample of assembly showing attachment features and accessories.
 - 2. Submit manufacturer's full line of standard colors for selection by Architect.

1.04 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide components identical to those tested for following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Surface Burning Characteristics: As follows, tested per ASTM E 84.
 - a. Class 'A' fire rating
 - b. Flame Spread: 25 or less.
 - c. Smoke Developed: 50 or less.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver components in original, unopened packages, clearly labeled with manufacturer's name and item description.
- B. Handle and store packages in manner to protect them until ready for installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of following:
 - 1. Manufacturers of Rigid Vinyl Corner Guards:
 - a. American Floor Products, Inc.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. K. J. Miller Corp.
 - e. A. R. Nelson Co., Inc.
 - f. Inpro Corporation, IPC Door and Wall Protection
 - g. Pawling Corp.

2.02 CORNER GUARDS

- A. General: Provide corner guards at each exposed corner indicated as CG (corner guard) or AG (angle guard).
- B. Materials:
 - 1. Vinyl: Rigid .078" or thicker high impact polyvinylchloride (PVC).
 - 2. Retainer: Continuous .063" extruded aluminum.
 - 3. Size: 42" high
 - 4. Fasteners: Stainless steel screws, bolts as recommended by manufacturer for specific substrate condition.
- C. Colors: Selected by Architect from manufacturer's standard line.

2.03 ACCESSORIES

- A. Provide all necessary accessories such as end caps, top and bottom fittings, etc. as required for complete and finished installation.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting of work; otherwise, indicate final measurements on shop drawings.
- B. Verify that substrate material, backing, and supports for work of this Section is in place before proceeding with installation.

3.02 APPLICATION

- A. Install corner guards on each outside corner of all new gypsum board partitions in new classroom wing.

3.03 INSTALLATION

- A. Set retainer plumb, true and square and anchor 18" o.c. using manufacturer's recommended fasteners, in accordance with manufacturer's written instructions.
- B. Snap corner guard cover into place.
- C. Install bottom and top caps in accordance with manufacturer's instructions.

3.04 CLEANING AND PROTECTION

- A. After completion of installation, clean surfaces and adjacent finishes and cover with paper or other acceptable protective covering.
- B. Maintain and repair damages to protective covering until directed to be removed by Architect.
- C. Replace cut, chipped, broken, stained, scratched or otherwise damaged components, that do not conform to specified requirements.

END OF SECTION 10260

**SECTION 10440
SPECIALTY SIGNS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of specialty signs indicated herein.
- B. Forms of specialty signs required include following:
 - 1. Un-Framed Panel signs.
 - 2. Metal Parking Signs and Posts.
- C. Exterior freestanding signs specified in Division-2 section.
- D. Illuminated exit signs specified in Division-16 section.

1.03 QUALITY ASSURANCE

- A. Uniformity of Manufacturer: For each sign form and graphic image process indicated, furnish products of single manufacturer.
- B. UL Compliance: Provide UL-labeled and listed lighting fixtures and electrical components.
- C. ADA Compliance: Signage to comply with applicable provisions of ADA (Americans with Disabilities Act). Manufacturer shall submit, as part of shop drawing submittal, a certificate stating that signage furnished under this Section complies with applicable provisions of ADA.
- D. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- E. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.04 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit shop drawings for fabrication and erection of specialty signs.
 - 2. Include plans, elevations, and large scale details of sign wording and lettering layout.
 - 3. Show anchorages and accessory items.
 - 4. Furnish location template drawings for items supported or anchored to permanent construction.
- B. Sign Schedule: Submit min. Five (5) copies of complete list itemizing all rooms showing room name and number, including disabled accessibility signs.
 - 1. Indicate door number where sign located or other identifying designation.
 - 2. Indicated number of lines and size of sign required for text required.
 - 3. Utilize room names and numbers shown on drawings for initial submittal.
 - 4. After review of initial submittal by Architect and Owner, submit final list for review and approval.

- C. Product Data: Submit manufacturer's technical data and installation instructions for each type of sign required.
 - D. Samples: Submit samples of each sign form and material showing finishes, colors, surface textures and qualities of manufacturer and design of each sign component including graphics. Submit full-size sample units of each type of sign, including but not limited to:
 - 1. Typical Door Plaque (sign)
 - 2. Handicapped Toilet Plaque
 - 3. Handicapped Entrance Plaque.
 - 4. Maximum Occupancy Plaque.
 - 5. Exterior Parking Sign.
 - E. Colors: Submit manufacturers standard colors for each type of sign for selection purposes.
 - 1. Submit only those colors from which the Architect may select.
- 1.05 REFERENCE STANDARDS
- A. Meet applicable requirements of NFPA 101, Current Edition.
 - B. Meet applicable requirements Southern Building Code, Current Edition.
 - C. Meet requirements of ANSI A117.1 and provisions of Americans with Disabilities Act (ADA) as applicable.
 - D. Georgia Department of Transportation (DOT) Standard Specifications Roads and Bridges, latest edition.
 - E. U. S. Department of Transportation (USDOT) "Manual on Uniform Traffic Control Devices", latest edition.
- 1.06 WARRANTY:
- A. Provide one year warranty for signage against defects in materials and workmanship, including welding of acrylic letters, numbers and pictograms to sign panel. Warranty shall extend from date of final acceptance.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following:
 - 1. Manufacturers of Panel Signs:
 - a. Allenite, A Division of Allen Marking Products, Inc.
 - b. Andco Industries Corp.
 - c. Amerson Engraving
 - d. Architectural Graphics, Inc.
 - e. Architectural Sign Systems, Inc.
 - f. ASI Sign Systems, Inc.
 - g. Best Manufacturing Co.
 - h. Inpro Corporation, Sign Scape
 - i. Mohawk Sign Systems.
 - j. Multi-Graphics, Inc.
 - k. N-Tact, Inc, Birmingham, Alabama

2.02 MATERIALS

- A. Modified Acrylic Sheet: Non-glare, shatterproof, mar-resistant modified acrylic sheet with matte finish, in sizes and thicknesses indicated; with minimum flexural strength of 16,000 psi per ASTM D 790, min. allowable continuous service temperature of 176 degrees F (80 Degrees C), and of following general types:
 - 1. Transparent Sheet: Where sheet material indicated "clear"; colorless sheet, matte finish, light transmittance of 92%, when tested per ASTM D 1003.
 - 2. Opaque Sheets: Where sheet material indicated "opaque"; colored opaque modified acrylic sheet in colors and finishes indicated, or if not indicated, selected by Architect from manufacturer's standards.

- B. Aluminum Sheet: Alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, min. strength and durability properties specified in ASTM B 209 for 5005-H15.
 - C. Fasteners: Unless otherwise indicated, vandal resistant fasteners fabricated from metals non-corrosive to either sign material or mounting surface.
 - 1. Material: Stainless steel; pre painted to match color of sign
 - D. Anchors and Inserts:
 - 1. Non-ferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance.
 - 2. Toothed steel or lead expansion bolt devices for drilled-in-place anchors.
 - 3. Inserts, as required, set into concrete or masonry work.
 - E. Posts:
 - 1. Steel: ASTM A 615, grade 60, with ASTM A 123 galvanizing; drive type, min. 1-3/8" wide, "U" or hat shaped, punched with 3/8" holes 1" o.c.
 - 2. Steel: ASTM A 615, grade 60, with ASTM A 123 galvanizing; 3" x 3" x 1/4" tube.
 - F. Reflective Coatings: Georgia DOT Specification Section 913.01
 - G. Silicone Adhesive: Silicone adhesive (not caulking) manufactured by GE or Dow Corning Corporation.
 - H. Brackets:
 - 1. Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit sign panel construction and mounting conditions indicated.
 - 2. Factory paint brackets in color matching background color of sign panel.
- 2.03 PANEL SIGNS
- A. Fabricate panel signs to comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes and details of construction.
 - B. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed condition within tolerance of $\pm 1/16$ " measured diagonally.
 - C. Laminated Sign Panels: Permanently laminate face panels to backing sheets of material and thickness indicated using manufacturer's standard process.
 - D. Sign Size: Sign shall be either a single or multiple units as determined by the Architect during shop drawing phase. Signs sizes indicated are minimums. Provide size required to maintain 1/2" boarder between text and edge of sign.
 - 1. Type #1: Unframed Panel Signs without Name Slot; Interior: Min. 6" X 9" for single line of text and 7" X 9" for two lines of text..
 - 2. Type #2: Unframed Panel Signs with Name Slot; Interior: Min. 6" X 9".
 - E. Type #1: Unframed Panel Signs without Name Slot; Interior: Fabricate of single ply integrally colored, non-glare matte finished opaque acrylic sheets, 1/8" thick with edges mechanically and smoothly cut and finished to conform with following requirements:
 - 1. Edge Condition: Square Cut.
 - 2. Edge Color: Same as background.
 - 3. Corner Condition: Rounded to radius indicated; or if not indicated 1/2".
 - 4. Application: Spaces other than those defined for Type #2.

- F. Type #2: Unframed Panel Signs with Name Slot; Interior: Fabricate of three ply integrally colored, non-glare matte finished opaque acrylic sheets, 1/16" thick for a total thickness of 3/16". Center ply to be of size to match other two plys and to serve as space for name slot. Fabricate with edges mechanically and smoothly cut and finished to conform with following requirements:
1. Edge Condition: Square Cut.
 2. Edge Color: Same as background.
 3. Corner Condition: Rounded to radius indicated; or if not indicated 1/2".
 4. Application: Instructional spaces (classrooms), including art, music, science, special education, vocational and technology classrooms and labs, gymnasium, and media center.
- G. Type #3: Not Used
- H. Type #4: Unframed Panel Sign; Exterior: Fabricate exterior handicapped entrance signs, parking and traffic control signs of 0.080" aluminum, 12" X 18" in size with baked enamel reflective surface coating and as follows:
1. Traffic Control and Parking signs to comply with: Georgia DOT Specifications.
 2. Handicapped Entrance Signs to comply with requirements of State and Local Fire Marshal, ANSI A117.1; Current Edition, and Americans with Disabilities Act (ADA).
- I. Raised Copy: Computer assisted machine-cut copy characters from single ply 1/16" thick integrally colored matte-finish opaque acrylic sheets of color selected by Architect and installed in a manner to provide 1/32" raised letters and numbers.
1. Produce precisely-formed characters with square cut edges free from burrs and cut marks.
 2. Characters to be inlaid into face of panel sign 1/32".
 3. Chemically weld characters to face of panel sign with material recommended by panel manufacturer to form a single panel face capable of resisting removal of letters from sign backing.
 - a. The use of double sided tape or adhesive not considered acceptable substitute for chemically welding.
 - b. Signs on which letters can be removed from sign backing without damaging sign backing to be rejected and replaced by contractor at no expense to contract.
 4. Braille: Convert text to Grade 2 braille engraved in face of panel sign to produce 1/32" raised braille. Tape or other applied braille not acceptable.
- J. Characters: Meet ADA requirements for proportion of height and width and height and stroke width.
1. Characters to be "Helvetica" Medium C, all same height as indicated:
 2. Unframed Paneled Signs: 1"; unless indicated otherwise.
- K. Name Slots: Provide name slot window of clear plastic over slot for insertion of plastic strip containing copy by owner.
1. Size: 1" clear height, 3/4" viewing height by 1" less than sign width.
 2. Provide back-coated 0.020" thick vinyl insert 1/6" less than height of slot by full width of slot.
 3. Application: Required for staff and student occupied spaces only.
- L. Pictograms: All pictograms based on international symbols and those developed by U. S. Department of Transportation.
1. Accompany by verbal and braille description below pictogram.
 2. Required Pictograms:
 - a. Handicapped Accessibility Symbol.
 - b. Toilet Accessibility Symbol.
 - c. Volume Control Telephones; Assistive Listening Systems.
 - d. Handicapped Parking; Van Accessible Handicapped Parking.
 3. Pictogram plaques same as interior door plaques.
- M. Copy Content:
1. Room Identification Signs:
 - a. Room name, characters and braille
 - b. Room number, characters and braille
 - c. Name slot where indicated.

2. Disabled Accessible Toilet Signs:
 - a. Accessibility symbol
 - b. Text "MEN", "WOMEN", "BOYS", "GIRLS" or "TOILET" as applicable, characters and braille
 - c. See drawing at end of this Section.
3. Disabled Accessible Entrance Signs:
 - a. Accessibility symbol
 - b. Text "ENTRANCE", characters and braille
 - c. See drawing at end of this Section.
4. Disabled Accessible Parking Signs:
 - a. Accessibility symbol
 - b. If van access, add text "VAN ACCESSIBLE" below symbol
5. Occupancy Capacity:
 - a. Text "MAXIMUM CAPACITY FOR THIS ROOM IS (number stated on drawings)", characters and braille
6. Fire Doors:
 - a. Text "KEEP DOOR CLOSED AT ALL TIMES", characters and braille

2.04 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by Architect from manufacturer's standards.
- B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations.
 1. Aluminum Finishes:
 - a. Baked Enamel Finish: AA-M4xC12C42R1x (manufacturer's standard non-directional mechanical finish including sanding and filing, cleaning with inhibited chemicals, conversion coated with acidchromate-fluoride-phosphate treatment; and painted with organic coating specified below).

PART 3 - EXECUTION

3.01 LOCATIONS

- A. Room Identification:
 1. Provide one unframed sign for every interior door location except disabled accessible toilets. Signs required for each of the following locations:
 - a. As part of new construction at each new interior door.
 - b. As part of existing construction at each new interior door.
 - c. As part of existing construction at existing interior doors where space is to be renovated.modified.
 2. Install signs on wall at latch side of doors outside of space identified, centered 60" above finished floor. Adjust location, horizontally and vertically, as necessary so that edge of sign occurs on block and not over mortar joint.
- B. Disabled Accessible Toilets:
 1. Provide one sign for every battery or individual toilet room containing provisions for disabled.
 2. Install signs on wall at push/pull or latch side of door outside of toilet, centered 60" above finished floor.
- C. Disabled Accessible Entrances:
 1. Provide one sign for every entrance to building from exterior except mechanical and electrical rooms, storage rooms, individual classrooms, and similar spaces.
 2. Install signs on exterior wall near entrance doors as directed by Architect, centered 60" above finished floor.

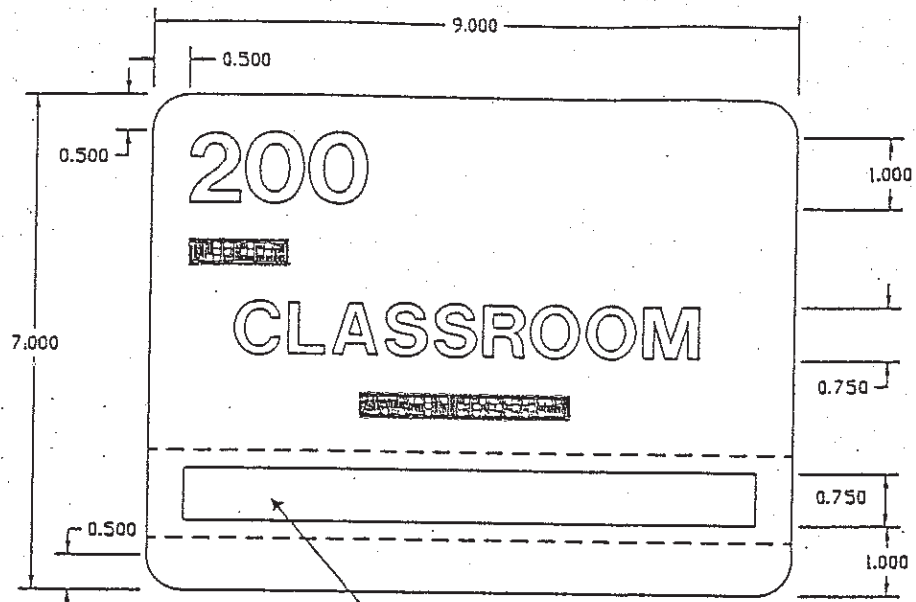
- D. Disabled Accessible Parking:
 - 1. Provide one sign for every disabled accessible parking space as indicated on drawings.
 - 2. Bolt signs on steel post centered on space, mounted 5'-0" to bottom of sign above grade.
 - 3. Embed post in concrete footing (collar), 1'4" diameter by 3'-0" deep. Slope concrete uniformly away from post to drain water.
 - 4. Set sign 2'-0" behind back of curb or edge of paving, or if sidewalk occurs behind curb, 1'-0" behind back walk edge.
 - 5. Field paint post, color selected by Architect.
- E. Van Accessible Parking:
 - 1. In addition to Disabled Accessible Parking Sign, provide Van Accessible Parking sign for every parking space designated as Van Accessible.
 - 2. Place handicapped sign at height that will not permit sign to be obstructed by a vehicle when parked in space.
 - 3. Place immediately below Disabled Accessible Parking Sign.
- F. Occupancy Capacity:
 - 1. Provide signs in the following spaces:
 - a. Lunchroom
 - b. Chorus
 - c. Drama
 - d. Multipurpose Rooms
 - e. Gymnasium
 - 2. Mount signs near primary entrances to space as directed by Architect, 60" above finished floor.
- G. Fire Doors:
 - 1. Provide one sign for each leaf of each opening providing egress through a fire rated partition of 2-hours or more, not having electromagnetic hold open devices.
 - 2. Provide one sign for each door fire rated for more than 20-minutes accessing mechanical and electrical rooms, storage rooms or vaults.
 - 3. Mount sign on door. Sign to be centered on door 60" above finished floor, or if glazing interferes at this point, mount directly under glazed opening.

3.02 INSTALLATION

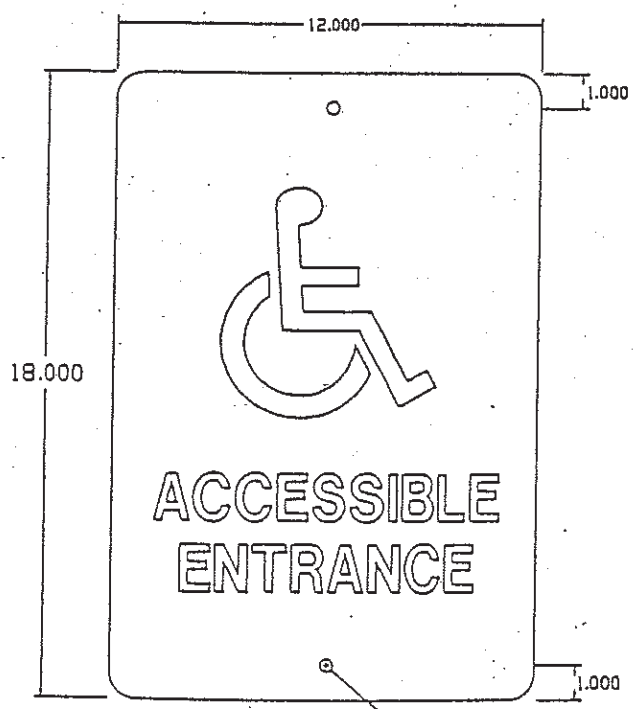
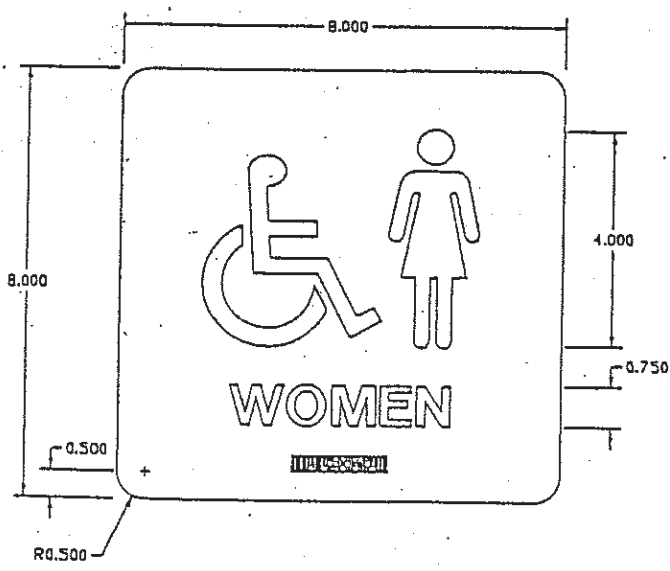
- A. General: Use mounting methods of type described and in compliance with manufacturer's instructions, unless otherwise indicated.
- B. Install sign units level, plumb and at height indicated, with sign surfaces free from distortion or other defects of appearance.
- C. Wall-Mounted Unframed Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
 - 1. Mechanical Fasteners:
 - a. Provide screws and plastic shields or similar devices, size and type recommended by manufacturer.
 - b. Color of exposed portion of fasteners to match sign surface it penetrates.
 - c. If exposed fasteners used, color of exposed portion of fastener to match plaque and provide neat and uniform appearance.
 - d. Attach sign to wall using a minimum of four (4) fasteners
- D. Glass-Mounted Panel Signs: Attach panel signs to glass surfaces using method indicated below:
 - 1. Vinyl Tape Mounting:
 - a. Double-sided foam tape to mount signs to smooth non-porous surfaces.
 - b. Do not use this method for vinyl-covered or rough surfaces.
 - 2. Provide back plate of same color as sign's face plate; mount to inside face of glass with vinyl foam tape, fitting exactly to cover back of sign.

- E. Bracket-Mounted Framed Units:
 - 1. Provide manufacturer's standard brackets, fittings and hardware as appropriate for mounting signs which project at right angles from walls and ceilings.
 - 2. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer's directions.
- 3.03 CLEANING AND PROTECTION
 - A. At completion of installation, clean soiled sign surfaces in accordance with manufacturer's instructions.
 - 1. Protect units from damage until acceptance by Owner.

END OF SECTION 10440



Sub-surface message window with matte finish clear Acrylic cover



Reflective sheeting on .080 Aluminum

**SECTION 10500
METAL LOCKERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Types of products in this Section include following:
 - 1. Standard wardrobe (student) lockers.
 - a. Double-tier lockers.

1.03 QUALITY ASSURANCE

- A. Uniformity: Provide each type metal locker produced by single manufacturer, including necessary mounting accessories, fittings, and fastenings.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for metal locker units.
- B. Shop Drawings:
 - 1. Submit shop drawings, verifying dimensions affecting locker installations.
 - 2. Show lockers in detail, method of installation, fillers, trim, base, and accessories.
 - 3. Include locker numbering sequence information.
- C. Combination Listing: Submit listings for combination locks and their respective locker numbers; coordinate with shop drawings submittal.

1.05 SAMPLES:

- A. Colors: Submit color samples on squares of same metal used for fabrication of lockers.
- B. Product:
 - 1. Prior to the award of the contract the apparent low bidder and second low bidder shall submit samples of each specified locker for the Architect's review, consideration and approval.
 - 2. The contract shall be awarded to the bidder furnishing the best quality lockers within the owner's budget. Decisions regarding award of contract are final.

1.06 JOB CONDITIONS

- A. Do not deliver metal lockers until building enclosed and ready for locker installation.
- B. Protect from damage during delivery, handling, storage, and installation.
- C. Field verify, prior to ordering lockers, existing dimensions and conditions which affect quantity, arrangement and installation of lockers.
 - 1) Notify Architect, in writing, of any conditions detected which are different from those shown on the contract drawings.
 - 2) Provide trim and filler units and other accessories necessary or required to provide a uniform, high quality installation.

1.07 WARRANTY

- A. Provide 1 year warranty coverage on lockers furnished under this Section.
 - 1. Warranty shall cover full replacement cost of materials or labor found to be defective during the five year period.
 - 2. Warranty shall cover all components of lockers.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following:
 - 1. Art Metal Products Co.
 - 2. Interior Steel Equipment Co.
 - 3. List Industries, Inc.
 - 4. Lyon Metal Products, Inc.
 - 5. Medart, Inc.
 - 6. Penco Products, Inc.
 - 7. Republic Storage Systems.

2.02 MATERIALS

- A. Sheet Steel: Mild cold-rolled and leveled steel, free from buckle, scale, and surface imperfections.
- B. Expanded Metal: 3/4" mesh flattened carbon steel, 13-ga. min.
- C. Fasteners: Cadmium, zinc, or nickel plated steel; exposed bolt heads, slotless type; self-locking nuts or locker washers for nuts on moving parts.
- D. Equipment: Hooks and hang rods of cadmium-plated steel or zinc-plated steel or cast aluminum.

2.03 FABRICATION, GENERAL

- A. Construction:
 - 1. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion.
 - 2. Make all exposed metal edges safe to touch.
 - 3. Weld frame members together to form rigid, one-piece structure.
 - 4. Weld, bolt, or rivet other joints and connections as standard with manufacturer.
 - 5. Grind exposed welds flush.
 - 6. Do not expose bolts or rivet heads on fronts of locker doors or frames.
- B. Frames: Fabricate of 16-ga. channels or 12-ga. angles min., with continuous stop/strike formed on vertical members.
- C. Finishing: Chemically pretreat metal with degreasing and 100% Zinc/Iron phosphatizing process.
 - 1. Apply baked-on enamel finish to all surfaces, exposed and concealed, except plates and non-ferrous metal.
- D. Color: Provide locker units in color(s) as selected by Architect from Manufacturers Standard Colors.
 - 1. Unless otherwise indicated, concealed parts may be manufacturer's standard neutral color.

2.04 WARDROBE (STUDENT) LOCKERS

- A. General:
 - 1. Wardrobe units to be Double Tier Lockers consisting of Two (2) each 12" X 12" X 42" high lockers unless noted otherwise.
 - 2. Wardrobe units to be of bolted construction.

- B. Base:
 - 1. Lockers to be installed on concrete block base.
 - 2. Unless noted otherwise, integral metal locker base not required.
- C. Body:
 - 1. Fabricate back and sides of min. 24-ga. steel, with double-flanged connections extending full height.
 - 2. Form top and bottom of not less than 24-ga. steel, with flanged edges.
 - 3. Form exposed ends of non-recessed lockers of min. 16-ga. steel, of finish to match face of lockers.
- D. Door; General:
 - 1. One-piece, min. 16-ga. sheet steel, flanged at all edges, constructed to prevent springing when opening or closing.
 - 2. Fabricate to swing 180°.
 - 3. Reinforcing: Provide extra bracing or reinforcing on inside of doors over 15" wide.
- E. Door; Hinges:
 - 1. Heavy-duty, min. 0.050" thick steel, full-loop, 5-knuckle, tight pin, 2" high.
 - 2. Weld to inside of frame and secure to door with min. 2 factory installed fasteners completely concealed and tamperproof when door closed.
 - 3. Min. 3 hinges each door over 42" high; min. 2 hinges each door 42" high or less.
- F. Door; Recessed Handle and Latch:
 - 1. Manufacturer's standard design consisting of housing to form recess for latch lifter and locking devices; non-protruding latch lifter containing strike and eye for padlock; and automatic, prelocking, pry-resistant latch mechanism with latching action as follows:
 - 2. Double-tier lockers: Minimum 2-point latching.
- G. Door; Acoustical Treatment:
 - 1. Provide construction treatment designed to significantly reduce noise of locker operation, including protected sound-absorbing material within door, nylon or plastic coatings on operating components to prevent metal-to-metal contact, and latching mechanism designed to operate without rattling.
 - 2. Provide rubber/neoprene door bumpers/silencers.

2.05 LOCKER ACCESSORIES

- A. Built-In Locking: Provide and fabricate lockers to receive following locking devices:
 - 1. Built-In Combination Lock:
 - a. Key-controlled, 3-number dialing combination lock, with combination change made automatically by use of control key; minimum of 5 combinations.
 - b. Bolt Operation: Spring bolt or Automatic dead-bolt action, as recommended by manufacturer.
- B. Equipment: Furnish each locker with following items, unless otherwise shown:
 - 1. Double-Tier Units:
 - a. One double-prong hook.
 - b. Min. 2 single-prong wall hooks.
- C. Number Plates: Furnish Number Plates on each locker as follows:
 - 1. Manufacturer's standard etched, embossed, or stamped, non-ferrous metal number plates with numerals min. 3/8" high.
 - 2. Number lockers in sequence as directed by Architect.
 - 3. Attach plates to each locker door, near top, centered, with min. 2 fasteners (rivets) of same finish as number plate.
- D. Separators: Provide Horizontal Separators between adjacent lockers as follows:
 - 1. Horizontal dividers of min. 16-gage sheet steel between doors of multiple-tier lockers, to ensure rigidity.

- E. Trim:
 - 1. Provide trim at jambs of recessed lockers, consisting of min. 18-ga. cold-rolled steel, 2" or 3" wide or as necessary.
 - 2. Provide trim at sill of lockers where detailed or required. Trim shall consist of min. 18-ga. cold-rolled steel, 2" or 3" wide as necessary.
 - 3. Factory-finish trim to match lockers.
 - 4. Secure trim to lockers with concealed fastening clips.
- F. Filler Panels: Provide filler panels where indicated or required, of min. 18-gage steel sheet, factory-fabricated and finished to match locker units.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Field Measurements:
 - 1. Take field measurements prior to preparation of shop drawings and fabrication of special components, when possible, to ensure proper fitting of work.
 - 2. Allow for adjustment and fitting of trim and filler panels wherever taking of field measurements before fabrication might delay work.

3.02 INSTALLATION

- A. Install metal lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid, and flush installation. Lockers shall be centered within available space.
- B. Securely attach lockers to the wall, to the base and to each other. Level lockers with metal shims where necessary to insure true, straight, plumb installation.
- C. Space fastenings about 48" o.c., unless otherwise recommended by manufacturer, and apply through back-up reinforcing plates where necessary to avoid metal distortion; conceal fasteners insofar as possible.
 - 1. Conceal all fasteners where ever possible.
- D. Install trim, sloping top units, and metal filler panels where required, using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

3.03 ADJUST AND CLEAN

- A. Adjust doors and latches to operate easily without binding; verify that integral locking devices operate properly.
- B. Touch-up marred finishes.
 - 1. Replace units which cannot be restored to factory-finished appearance.
 - 2. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10500

SECTION 10522
FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of fire extinguishers, cabinets and accessories indicated on drawings.
- B. Definition: "Fire extinguishers" used in this Section refers to handcarried units as opposed to those equipped with wheels or to fixed fire extinguishing systems.
- C. Work to be provided by contractor: The contractor shall provide and install the following:
 - 1. Fire extinguisher cabinets
- D. Work to be provided by Owner: The Owner will provide and install the following items:
 - 1. Fire extinguishers.
 - 2. Mounting brackets.
- E. Fixed fire protection systems specified in Division-15 sections.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain products in this Section from one manufacturer.
- B. UL-Listed Products: Provide new portable fire extinguishers which are UL- listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.
- C. FM Listed Products: Provide new portable fire extinguishers approved by Factory Mutual Research Corporation for type, rating and classification of extinguisher indicated and carry appropriate FM marking.
- D. Life Safety Code: Products and Installation of products herein specified to comply with provisions of NFPA 10, Portable Fire Extinguishers.
- E. Handicapped Code Compliance: Fire extinguisher, cabinets and installations to comply with applicable section of ADA (Americans with Disabilities) and ANSI A117.1; Current editions.
- F. Licensed Installer: Extinguishers installed by individual licensed by State Fire Marshal in accordance with Georgia Statutes.
- G. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- H. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.04 DRAWING TYPE DESIGNATIONS

- A. Following defines types indicated on drawings:
1. Type "A": Specified extinguisher contained in specified cabinet.
 2. Type "A-F": Specified extinguisher contained in specified fire rated cabinet.
 3. Type "B": Specified extinguisher supported by specified bracket.

1.05 SUBMITTALS

- A. Product Data:
1. Submit product data for each type of product included in this Section.
 2. For fire extinguisher cabinets include roughing-in dimensions and details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, and panel style and materials.
- B. Samples:
1. Submit for verification purposes, samples of each required finish.
 2. Prepare samples on metal of same gage as used for actual production run.
 3. Where normal color variations expected, include 2 or more units in each sample set showing limits of such variations.
 4. For initial selection of colors and finishes, submit manufacturer's color cards showing full range of standard colors available.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following:
1. J. L. Industries.
 2. Larsen's Mfg. Co.
 3. Potter-Roemer, Inc.
 4. Modern Metal Products Div., Technico
 5. Watrous, Inc.

2.02 FIRE EXTINGUISHERS

- A. General:
1. Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.
 2. Install extinguishers fully charged and operable to comply with requirements of governing authorities and manufacturer's requirement.
 3. Abbreviations indicated below to identify extinguisher types relate to UL classification and rating system and not, necessarily, to type and amount of extinguishing material contained in extinguisher.
- B. Extinguishers Type and Application:
1. Dry Chemical Type: Multi-Purpose Dry Chemical Type: UL-rated 4-A:60-B: C 10 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.
 - a. Applications: All applications except where noted otherwise
 2. Wet Chemical Type: Fire extinguishers provided for the protection of cooking appliances that use combustible cooking media (vegetable or animal oils or fats), listed and labeled for Class K, Labeled for Class B and Class C Fires, as required by current addition of NFPA 10.
 - a. Application: Kitchens and other areas where cooking performed.

2.03 FIRE EXTINGUISHER CABINETS

- A. General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.
- B. Construction:
 - 1. Manufacturer's standard enameled steel box, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated.
 - 2. Weld all joints and grind smooth.
 - 3. Miter and weld perimeter door frames.
- C. Cabinet Type:
 - 1. Mounting: Suitable for mounting conditions indicated, of following types:
 - a. Recessed: Cabinet box (tub) fully recessed in walls of sufficient depth to suit style of trim indicated.
 - b. Semi-Recessed: Cabinet box (tub) partially recessed in walls of shallow depth.
 - 2. Fire rated cabinets: Where cabinet occurs in fire rated wall, provide manufacturer's standard double wall enclosure with core of fire rated material achieving assembly rated at 2-hour resistance.
- D. Trim Style: Fabricate trim in one piece with corners mitered, welded and ground smooth.
 - 1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - a. Fully Recessed Units:
 - 1) Square-Edge Trim: Square edges with backbend depths of 1/4" to 5/16".
 - b. Semi Recessed Units:
 - 1) Rolled-Edge Trim: Rounded edges with backbend depth of 2-1/2".
- E. Trim Metal: Of same metal as door.
- F. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
 - 1. Aluminum: Manufacturer's standard flush, hollow aluminum door construction.
- G. Door Glazing: Tempered float glass, complying with FS DD-G-1403, grade B, style I, type I, quality q3, class as indicated below:
 - 1. Clear glass, class 1 (transparent).
- H. Door Style: Manufacturer's standard design as indicated below and on drawing.
 - 1. Vertical Duo-Panel: Tempered float glass, 1/8" thick, unless otherwise indicated.
 - a. Provide silk screen lettering or design and color indicated.
- I. Door Hardware:
 - 1. Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 2. Provide either lever handle with cam action latch, or door pull, exposed or concealed, and friction latch.
 - 3. Provide concealed or continuous type hinge permitting door to open 180°.

2.04 FACTORY FINISHING OF FIRE EXTINGUISHER CABINETS

- A. General:
 - 1. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations except as otherwise indicated.
 - 2. Apply finishes in factory after products are assembled.
 - 3. Protect cabinets with plastic or paper covering, prior to shipment.
- B. Painted Finishes:
 - 1. Provide painted finish to comply with requirements indicated below for extent, preparation and type:
 - a. Extent of Painted Finish: Apply painted finish to both concealed and exposed surfaces of cabinet components except where other than painted finish indicated.
 - b. Color: White.
 - c. Preparation: Clean surfaces of dirt, grease, and loose rust or mill scale.

- C. Anodized Aluminum Finishes: Provide architectural anodic coatings complying with following requirements:
 - 1. Class II Clear (Natural) Anodized Finish: AA-M12C22A31 (mechanical finish, non-specular as fabricated; chemical etch, medium matte; 0.4 mil min. thick clear anodic coating).

2.05 MOUNTING BRACKETS

- A. Provide manufacturer's standard bracket designed to prevent accidental dislodgment of extinguisher, of sizes required for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.
 - 1. Provide brackets for extinguishers not located in cabinets and for those located in cabinets.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install items included in this Section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
 - 1. Top of fire extinguisher having a gross weight of less than 40 lbs. shall be no more than 5'-0" above floor. Where extinguishers have weights greater than 40 lbs. the top of the extinguisher shall be mounted at a height no greater than 3-1/2 feet above finished floor.
 - 2. Mount cabinet with centerline of door handle maximum of 48" above floor.
 - 3. Where extinguishers in cabinets, the bottom of extinguisher cabinet to be placed at 32" A.F.F.
 - 4. Where extinguishers not in cabinets, the bottom of extinguisher to be placed at 32" A.F.F.
- B. Install Type "A" Cabinet-Extinguisher where indicated and as noted herein.
 - 1. In corridors install on cabinet type fire extinguisher in locations necessary to ensure that the maximum travel distance at any point within the building to a fire extinguisher does not exceed 75'-0".
- C. Install Type "B" Bracket-Extinguisher in locations shown **AND** as follows:
 - 1. Mechanical Rooms: One (1) Each; locate adjacent to entrance door.
 - 2. Electrical Rooms: One (1) Each; locate adjacent to entrance door.
 - 3. Kitchen: Two (2) Each; locate within thirty (30) feet travel distance of each cooking equipment.
- D. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
- E. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
- F. Where exact location of cabinets and bracket-mounted fire extinguishers not indicated, locate as directed by Architect.

3.02 INSPECTING, TESTING AND CERTIFYING

- A. Immediately prior to final inspection, have fire extinguishers, inspected, tested, and certified by a recognized, independent agency acceptable to fire marshal. Place full executed, current inspection tag on each extinguisher.
- B. Install pre-printed service tag of style, text and color complying with NFPA 10, Portable Extinguishers, and as acceptable to local fire marshal, on each fire extinguisher.

3.03 IDENTIFICATION

- A. Identify existence of fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" applied to door by process indicated below.
 - 1. Provide lettering to comply with requirements indicated for letter style, color, size, spacing and location or, if not otherwise indicated, as selected by Architect from manufacturer's standard arrangements.
 - 2. Application Process: Silk screen.
 - a. Provide red vertical lettering.

- B. Identify bracket-mounted extinguishers with red letter decals spelling "FIRE EXTINGUISHERS" applied to wall surface.
 - 1. Letter size, style and location as selected by Architect.

END OF SECTION 10522

**SECTION 10530
WALL SUPPORTED CANOPIES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of protective covers shown on drawings.
- B. Types of protective covers required include the following:
 - 1. Wall Supported Canopies
- C. Manufacturer's standard components used, providing components, accessories, and complete structure conform to architectural design appearance shown and to specified requirements.

1.03 QUALITY ASSURANCE

- A. Design Criteria: Comply with structural requirements indicated on drawings, or if not indicated, following criteria:
 - 1. Live Load: 25 psf.
 - 2. Roof Uplift: 25 psf.
 - 3. Wind Load: 110 mph.
- B. Deflection: Walkway cover deck to support a point load of 250 pounds without deflection.
- C. Fabrication Criteria: Provide protective covers produced by manufacture regularly engaged in fabrication and erection of type and quality indicated.
 - 1. Design sizes of prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly.
 - 2. Fabricate components in manner that once assembled may be disassembled, repackaged and reassembled with min. amount of labor and max. salvageability.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturers product information, specifications and installation instructions for building components and accessories.
- B. Shop Drawings: Submit complete erection drawings showing anchor bolts settings, roof framing, transverse cross sections, covering and trim details, and accessory installation details to clearly indicated proper assembly of components.
- C. Samples: Submit samples of following.
 - 1. 12" long by actual width of roofing panels, with required finishes.
 - 2. 12" long fascia, with required finishes.
 - 3. Available finishes for components.
 - 4. Fasteners for application of roofing panels.
 - 5. Sealants and closures.

1.05 CERTIFICATION

- A. Certification: Submit written Certification prepared and signed by a Professional Engineer, registered to practice in State of Georgia, verifying that cover design meets indicated loading requirements and codes of authorities having jurisdiction.

- B. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- 1.06 DELIVERY, STORAGE AND HANDLING
- A. Deliver and store prefabricated components, sheets, panels, and other manufactured items so they will not be damaged or deformed.
 - B. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering.
 - 1. Store metal sheets or panels so that water accumulations will drain freely.
 - 2. Do not store sheets or panels in contact with other materials which might cause staining.
- 1.07 WARRANTY
- A. Manufacturer's Product Warranty:
 - 1. Manufacturer guarantee panels for five (5) years against panel rupture, structural failure or perforation due to corrosion.
 - 2. Provide paint manufacturer's five (5) year guarantee against fading, cracking, peeling, blistering or wear-thru of paint film.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following:
 - 1. Ditmer Architectural Aluminum, Winter Springs, FL.
 - 2. E. L. Burns Co., Inc., Shreveport, LA.
 - 3. Mapes Industries, Inc., Lincoln, NE.
 - 4. Mason-Florida LLC.
 - 5. Mitchell Metals
 - 6. Peachtree Protective Covers, Inc, Atlanta, GA.
 - 7. Perfection Architectural Systems
 - 8. Superior Metal Products; Birmingham, Alabama

2.02 MATERIALS

- A. Aluminum Members: Alloy temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate.
- B. Fasteners: Non-magnetic stainless steel screws for deck fasteners, aluminum rivets for trim fasteners.
- C. Sealants: Refer to Section 07900 - Sealants.
- D. Protective Coating: Clear acrylic enamel.

2.03 SYSTEM DESCRIPTIONS

- A. Metal Door Canopies: Wall supported frame with aluminum roof panels and fascia of nominal width, length, height and type indicated.

2.04 COMPONENTS

- A. General: Length of span and spacing of frames as indicated except slight variations acceptable to meet manufacturer's standard.

- B. Wall Hanger Assemblies: Manufacturers standard assembly of pipe, roll formed or extruded aluminum and cast; extruded or formed connections.
- C. Fascia: Extruded Aluminum:
 - 1. Manufacturer's standard profile shown; min. 0.090" thick, 6-1/2" deep.
- D. Roof Panels: Extruded self-flashing sections interlocking into composite unit spanning min. two bays where possible; sufficient camber to offset deflection and cause positive drainage.
 - 1. Wall thickness: Min. required for structural properties for loads specified; no less than 0.062" thick.
 - 2. Depth: As indicated; min. 3".
- E. Accessories: Brackets, flashing, etc. of same materials and finish as prime components.

2.05 FINISHES

- A. Fluoropolymer Coating: Full-strength 70% "Kynar 500" coating baked-on for 15 minutes at 450°F (232°C), in a min. dry film thickness of 1.0 mils, 30% reflective gloss (ASTM D 523), over 0.3 mil baked-on epoxy primer.
 - 1. Provide color as selected by Architect from Manufacturer's standard colors.
 - 2. Durability: Provide coating field tested under normal range of weathering conditions for min. of 20 years without significant peel, blister, flake, chip, crack or check in finish, and without chalking in excess of 8 (ASTM D 659), and without fading in excess of 5 NBS units.
 - 3. Colors: Color to be selected by architect from manufactures standard colors. Provide a minimum of 9 from which the architect can select.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Install door canopies in locations shown on drawings; If not indicated on drawings, provide as a minimum the following:
 - 1. Install one canopy at each exterior door (single, double, multiple, and overhead) where door is not covered as a result of a roof overhang, installation of a walkway cover, or being recessed in the building.
 - 2. Install elsewhere where indicated on drawings.
- B. Where door canopies are to be installed, sizes to be as indicated; however minimum sizes to be as follows:
 - 1. Single Door Application: 8'-0" wide X 5'-0" Projection

3.02 ERECTION

- A. Framing: Erect framing true to line, level and plumb, rigid and secure.
 - 1. Anchor columns in manner indicated with full bearing to supporting structures.
 - 2. Use non-shrinking grout to obtain uniform bearing and to maintain true elevation.

3.03 ROOF PANELS

- A. General: Arrange and nest sidelap joints so that joints waterproof.
 - 1. Apply panels and associated items for neat and weathertight enclosure.
 - 2. Avoid "panel creep" or application not true to line.
 - 3. Protect factory finishes from damage.
- B. Provide weather seal where required; flash and seal roof panels where adjoining other construction with rubber, neoprene, or other closures to exclude weather.
- C. Where canopy abuts wall provide sheet metal vertical wall and cap flashing; Seal water tight.
 - 1. Flashing to be minimum 0.040" prefinished aluminum of color to match canopy fascia.

3.04 ADJUST AND CLEAN

- A. Clean completed system, inside and out, promptly after erection.
- B. Remove excess sealant compounds, dirt, and other substances from aluminum surfaces.
- C. Institute protective measures and other precautions required to assure protective covers without damage or deterioration, other than normal weathering, at time of Final Acceptance.

END OF SECTION 10530

**SECTION 10650
OPERABLE PARTITIONS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SUMMARY

- A. Extent of operable partitions, including locations and details, indicated on drawings and schedules.
- B. Types of operable partitions required include following:
 - 1. Manually-operated individual paired panel assemblies.
- C. Punching of overhead structural support per template provided by operable partition installer specified elsewhere in Division-5 Section.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's product literature and installation instructions for each type of operable partition and installation accessory required.
 - 2. Submit written data on physical characteristics, durability, resistance to fading and flame resistance characteristics.
- B. Shop Drawings:
 - 1. Submit shop drawings showing location and extent of operable partitions.
 - 2. Include plans, elevations, and large scale details of anchorages, and accessory items.
 - 3. Indicate location of each unit with building, conditions at openings, typical and special details, location and installation requirements for hardware operators.
 - 4. Include methods of installation for each type of support structure and fastening condition.
- C. Template Drawings: Submit location template drawings for items supported or anchored by permanent construction.
- D. Maintenance Data: Include data in Maintenance Manual specified in Division-1.
- E. Samples for Initial Selection Purposes: Manufacturer's standard color charts showing full range of colors and materials for each component exposed to view, available for each type of operable partition required.
- F. Samples for Verification Purposes: Submit following:
 - 1. 6" square samples of each panel facing material selected.
 - 2. 12" square samples of each finish selected.
 - 3. Prepare samples from same material to be used for Work.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm (material producer) with min. 3 years production experience, whose published literature clearly indicates general compliance of products with requirements of Section.
- B. Installer Qualifications: Firm specializing in operable partition installation with min. 2 years of experience in installation of operable partitions similar to those required for Project.

- C. Single Source Responsibility: Provide material produced by single manufacturer partitions and mounting hardware.

1.05 TESTING

- A. Test Reports: Submit certified test reports evidencing compliance with requirements for following:
 - 1. Fire performance characteristic.
 - 2. Physical properties indicated.
- B. Fire Performance Characteristics: Provide facing that identical to that tested for following fire performance requirements, according to test method indicated, by UL or other testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Surface Burning Characteristics: As follows:
 - a. Flame Spread: Max. 25.
 - b. Smoke Developed: Max. 50.
 - c. Test Method: ASTM E 84, UL 723, or NFPA 255.
- C. Physical Properties: Provide operable partitions identical to those tested for following physical properties, according to test method indicated.
 - 1. Sound Insulation: As follows:
 - a. Rating: NRC min. 42.
 - b. Test Method: ASTM E 336.

1.06 CERTIFICATIONS

- A. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
 - 2. Include supporting certified laboratory testing data indicating that material meets specified test requirements.
- B. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, fire hazard classification, and lot number.
- B. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity; laid flat, blocked off ground to prevent sagging and warping.
- C. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

1.08 SEQUENCING AND SCHEDULING

- A. Sequence operable partition installation with other work to minimize possibility of damage and soiling during remainder of construction period.

1.09 WARRANTY

- A. Special Project Warranty: Submit a written warranty, executed by the Contractor, Installer and the Manufacturer, agreeing to repair or replace units which fail in materials or workmanship within the specified warranty period.
 - 1. Warranty in addition to and not limitation of other rights Owner may have against Contractor under Contract Documents.
 - 2. Warranty period 2 years after date of Final Acceptance.

1.10 MAINTENANCE

- A. Maintenance Instructions:
 - 1. Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions.
 - 2. Include precautions against materials and methods detrimental to finishes and performance.
- B. Replacement Materials:
 - 1. After completion of work, deliver min. 2% of each type, color, and pattern of panel facing material, exclusive of material required to properly complete installation.
 - 2. Furnish accessory components as required.
 - 3. Furnish replacement materials from same production run as materials installed.
 - 4. Package replacement materials with protective covering, identified with appropriate labels.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of following:
 - 1. Emco, Inc.
 - 2. Hufcor
 - 3. Kwik-Wall Co.
 - 4. Modernfold Division, American-Standard Co.
 - 5. Panelfold, Inc.

2.02 MATERIALS

- A. Panel Configuration: Provide configuration as indicated.
 - 1. Series of paired, hinged panels, center stacking.
- B. Panel Operation: Provide operation as indicated:
 - 1. Manually operated.
- C. Suspension System:
 - 1. Heavy-duty continuous rolled formed steel or heavy duty extruded aluminum track suspended from overhead steel beam supports by adjustable steel hanger rods; heavy-duty trolley system panel supports specifically designed for use with size and type operable partition assembly indicated.
 - 2. Attach trolleys to panels with adjustable pendant bolts.
 - 3. Trolley: Support panels with four-wheel ball bearing trolley assemblies.
- D. Panel Weight: 9-12 lbs./sq.ft. as determined by panel size and accessories.
- E. Panel Construction: Provide construction as indicated:
 - 1. Minimum 22-ga. steel face sheets welded to min. 16-ga. steel channel frame, factory-fabricated panels, free of joints in faces.
 - 2. Top reinforcing as required to support hanging from suspension components; internal insulation, internal gasketed edge construction to achieve specified acoustical ratings.

- F. Panel Size:
 - 1. Thickness: 4"
 - 2. Panel Width: Maximum 48" wide.
 - 3. Length: Panel to be of length required to extend full width of room.
 - 4. Height: Full height; floor to ceiling with required clearances.
- G. Panel Finish: Panel finish shall be Class "A" reinforced vinyl with woven backing weighing not less than 20 ounces per linear yard.
 - 1. Color to be selected from manufacturers standard color line.
- H. Acoustical Requirement: Provide operable wall assembly tested by NSSEA accredited acoustical laboratory in full-scale (14' x 9" opening) laboratory sound transmission loss performance test, and rated for STC range of 48-52 (NSSEA Class G) when tested per ASTM E 90.
- I. Sound Seals:
 - 1. Vertical Seals:
 - a. Vertical seals between panels shall consist of aluminum tongue and groove astragal.
 - b. Deep nesting, interlocking astragals incorporating continuous vinyl acoustical seal.
 - 2. Horizontal Top Seal:
 - a. Horizontal top seals shall be continuous contact multi-finger vinyl sweep seals.
 - 3. Horizontal Bottom Seal:
 - a. Retractable seal, extruded vinyl face, exerting positive pressure downward, assuring sealing and resisting panel movement.
 - b. Bottom of panels to be equipped with automatic operable bottom seal providing a minimum of 1" and a maximum of 1-1/2" operating clearance and shall automatically drop as the panels are positioned.
 - c. Extension/retraction of bottom seals automatically actuated by movement of partition.
 - 1) Extended seal exerts nominal 20 lbs. pressure downward.
- J. Hinges: Semi-concealed, butt-type hinges, finished to match other exposed hardware.
 - 1. Provide min. three hinges per joint for heights up to 8'0"; one additional hinge for each additional 4'0" increase in height.

2.03 FINISHES

- A. Provide materials in colors and patterns (if applicable) selected by Architect from manufacturer's standard colors and patterns.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine site at which partitions installed.
- B. Do not proceed until unsatisfactory conditions corrected.

3.02 INSTALLATION

- A. Installation of folding partitions shall be by factory-authorized, factory-trained installer.
- B. Install operable partitions and accessories after other finishing operations, including painting, completed.
- C. Install operable partitions in conformance with drawings, approved shop drawings and using method indicated in strict compliance with manufacturer's written installation instructions; complying as applicable with ANSI E 557, Standard Recommended Practice for Architectural Application and Installation of Operable Partitions.
- D. Lubricate bearings and sliding parts; adjust to ensure smooth, easy operation.

- E. Match operable partitions for color and pattern by using partitions from cartons in same sequence as manufactured and packaged, if so numbered.
 - 1. Broken, cracked, chipped, or deformed partitions not acceptable.

3.03 CLEANING

- A. Clean all operable partition surfaces and clean adjacent surfaces soiled by work of this Section; Avoid use of abrasive cleaners or solutions containing corrosive solvents.
- B. Remove debris created by operable partition work from work site.
- C. Protect partitions against damage during construction period; ensure that partitions without damage or deterioration at time of Final Acceptance.

3.04 DEMONSTRATION

- A. Demonstrate proper operation and maintenance procedures to Owner's personnel.
- B. Deliver keys and operation/maintenance manuals to Owner; obtain receipt.

END OF SECTION 10650

**SECTION 10800
TOILET AND BATH ACCESSORIES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of each type of toilet accessory indicated on drawings and schedules.
- B. Types of toilet accessories required include following:
 - 1. Mirrors.
 - 2. Grab bar.
- C. Types of miscellaneous accessories required include following:
 - 1. Mop and broom holder.
 - 2. Electric hand dryers.

1.03 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.
- B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.
- C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- D. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.
- E. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.
- B. Samples: Submit full-size samples of units to Architect for review of design and operation; acceptable samples returned to Contractor for use in Project.
- C. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices and cut-out requirements in other work.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide toilet accessories by one of the following:
1. A&J Washroom Accessories.
 2. American Specialties, Inc.
 3. Bobrick Washroom Equipment, Inc.
 4. Bradley Corp.
 5. Columbia Accessories by PSISC
 6. McKinney/Parker Div., Essex Industries.
 7. Franklin Brass Mfg. Co.
 8. Hallmack-Nutone/Div. Scovill.
 9. G. M. Ketcham Co., Inc.
 10. Watrous, Inc.

2.02 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gage (.034") minimum, unless otherwise indicated.
- B. Aluminum: Manufacturer's standard alloy extruded aluminum shapes, with clear anodized finish.
- C. Brass: Leaded and unleaded, flat products, FS QQ-B-613; Rods, shapes, forgings, and flat products with finished edges, FS QQ-B-626.
- D. Sheet Steel: Cold rolled, commercial quality ASTM A 366, 20-gage (.040") min., unless otherwise indicated.
1. Surface preparation and metal pretreatment as required for applied finish.
- E. Galvanized Steel Sheet: ASTM A 527, G60.
- F. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- G. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- H. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.
- I. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.03 TOILET ACCESSORIES

- A. Glass Mirrors (MR, MG, M or HCM):
1. Mirror Glass, Tempered: 1/4" thick, Type I, Class 1, Quality q2, Kind FT, conforming to FS DD-G-451, with silvering, copper coating, and protective organic coating complying with FS DD-M-411.
 2. Mirror Frame: 3/4" x 3/4" type 304 stainless steel angle frame, fully welded frame, concealed theftproof mounting.
 3. Size: 18" wide x 36" high unless otherwise indicated on drawings.
 4. Application:
 - a. Provide and install mirrors where shown on drawings.
 - b. Where stainless steel mirrors are specified, omit glass mirror.
 5. Mount mirrors at heights noted on schedule on drawings.
 - a. At heights indicated in schedule on drawings.
 - b. Mount handicap mirrors max. 40" from finish floor to bottom of reflective surface.
 - c. Top of reflective surface of non-handicapped units to be 6'-0" A.F.F..
 - d. A minimum of one mirror in each toilet room to be considered handicapped accessible.

6. Products; Stainless steel framed tempered glass:
 - a. A&J Model U700T
 - b. ASI Model #0600B
 - c. Bobrick #B-2908 Series
 - d. Bradley Model #780-2
 - e. McKinney/Parker Model #150TG

- B. Stainless Steel Mirrors (SMR, MS, SSM, or HCSSM):
 1. Mirror face: stainless steel mirror faces: Not less than 20 gage, (.040") AISI Type 302/304 stainless steel sheet, hand-selected, stretcher-leveled with either No. 8 polished mirror finish or Type 430 "auto brite" annealed reflective finish. Bond face to 1/4" hardboard backing.
 2. Mirror Frame: 3/4" x 3/4" type 304 stainless steel angle frame, fully welded frame, concealed theftproof mounting.
 3. Mirror Size: Mirrors to be 18" wide x 36" high unless specifically indicated otherwise.
 4. Application:
 - a. Provide and install stainless steel mirrors as indicated herein and as noted elsewhere.
 - b. Where stainless steel mirrors are specified, omit glass mirror.
 - c. Mirrors in gymnasium dressing and toilet rooms to be stainless steel.
 5. Mount mirrors at heights noted on schedule on drawings.
 - a. At heights indicated in schedule on drawings.
 - b. Mount handicap mirrors max. 40" from finish floor to bottom of reflective surface.
 - c. Top of reflective surface of non-handicapped units to be 6'-0" A.F.F..
 - d. A minimum of one mirror in each toilet room to be considered handicapped accessible.
 6. Products:
 - a. Stainless steel framed stainless steel:
 - 1) A&J Model U700S
 - 2) ASI Model #0600C
 - 3) Bobrick #B-2906 Series
 - 4) Bradley Model #700-4
 - 5) McKinney/Parker Model #150 with stainless steel mirror.

- C. Grab Bars (GB):
 1. Grab Bars are referred to as "**GB**" or "**GBxx**" on drawings.
 - a. "xx" suffix on "GB" are numerical values representing length of grab bar in inches.
 2. Stainless Steel Type: Provide grab bars with wall thickness not less than 18 (.050") gage and as follows:
 - a. Mounting: Concealed, manufacturer's standard flanges and anchorages.
 - b. Clearance: 1-1/2" clearance between wall and inside face of bar.
 - c. Gripping Surfaces:
 - 1) Manufacturer's standard non-slip texture.
 - d. Grab Bar Diameter:
 - 1) Children Size (Ages 2-12): Outside diameter 1-1/4"
 - 2) Adult Size (Ages 13-Up): Heavy-Duty Size: Outside diameter of 1-1/2".
 - e. Products:
 - 1) Bars at handicapped water closets:
 - a) A&J Model UG30-B48 and UG30-A36
 - b) ASI Model #3202-48P and #3201-36P
 - c) Bobrick Model #B-62061.99 x 48" and #B-6206.99 x 36"
 - d) Bradley Model #8122-00248 and #8122-00236
 - e) McKinney/Parker Model #9605F-48CP and #9605F-36
 3. Application:
 - a. Handicapped Toilet Stall:
 - 1) One 36" length at rear of handicapped water closets.
 - 2) One 48" length at side of handicapped water closet.
 - b. Elsewhere where shown on drawings.
 4. Mounting:
 - a. At handicapped water closets:
 - 1) Mount back edge of 48" grab bar 6" from rear wall.
 - 2) Mount 36" grab bar behind water closet, with edge 6" from nearest side wall.

- b. Mount horizontal bars as follows:
 - 1) Children (grades K-3): 22" above finish floor to centerline
 - 2) Children (grades 4-7): 26" above finish floor to centerline
 - 3) Adults (grades 8-up): 33" above finish floor to centerline.

2.04 MISCELLANEOUS ACCESSORIES

- A. Mop and Broom Holder:
 - 1. 18-gage (.050") Type 304 stainless steel "hat" channel with springloaded rubber cam type mop/broom holders.
 - 2. Type: Min. 36" long with 4 holders.
 - 3. Products:
 - a. A&J Model UJ13B
 - b. ASI Model #8215B
 - c. Bobrick Model #B-223 x 36"
 - d. Bradley Model #995-4
 - e. McKinney/Parker Model #233 x 36"
 - 4. Application: Each Janitor's room and elsewhere as shown on drawings.
 - 5. Mounting: 4'-0" above finish floor; 50% of holder to extend over mop basin.
- B. Electric Hand Dryer (EHD):
 - 1. Fully Recessed Electric hand dryers shall 18 gage stainless steel cover, touchless operation, recessed mounting, with 16 gauge recessed steel box.
 - a. Motor: Heavy duty, 7500 RPM, double insulated.
 - b. UL & CSA component approved.
 - c. Fan Rotor: Pressed galvalume, electrically balances, delivers 150cfm.
 - d. Circuitry: Solid state with infra-red sensor. Unit to operate only when hands are placed in drying chamber.
 - e. Drying Time: 20-25 seconds
 - 2. Electrical service:
 - a. Refer to electrical drawings for electrical provisions.
 - b. Coordinate connections with work of Division 16 - Electrical.
 - 3. Products:
 - a. Pinnacle Dryer Corporation; Model PDC-R10
 - a. Columbia, Vortex
 - b. Xlerator with noise reduction nozzle (1.1N)
 - 4. Application:
 - a. Provide in each gang toilet (Toilet battery)
 - b. Elsewhere where shown on drawings.
 - 5. Mounting: Mount electric hand dryers fully recessed in wall and at height shown on schedule, if not shown mount as follows:
 - a. Mount at 38" from dryer base to finished floor.

2.05 FABRICATION

- A. General:
 - 1. Only unobtrusive stamped logo of manufacturer, as approved by Architect, permitted on exposed face of toilet or bath accessory units.
 - 2. On either interior surface not exposed to view or back surface, provide additional identification by means of either printed, waterproof label or stamped nameplate, indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories, General:
 - 1. Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled.
 - 2. Hang doors or access panels with continuous stainless steel piano hinge.
 - 3. Provide concealed anchorage wherever possible.

- C. Recessed Toilet Accessories, General:
 - 1. Except where otherwise indicated, fabricate units of all welded construction, without mitered corners.
 - 2. Hang doors or access panels with full-length stainless steel piano hinges.
 - 3. Provide anchorage which is fully concealed when unit closed.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Check wall openings for correct dimensions, plumbness of blocking or frames, and other preparation affecting installation of accessories.
- B. Check areas to receive surface mounted units for conditions affecting quality and execution of work.
- C. Verify spacing of plumbing fixtures and toilet partitions affecting installation and accessories.
- D. Do not begin installation of washroom accessories until openings and surfaces acceptable.

3.02 INSTALLATION

- A. Codes: Install accessories at heights and in manners complying with applicable accessibility standards, including ADA and ANSI.
- B. Install toilet accessory units in accordance with manufacturers' instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit.
- C. Install units plumb and level, firmly anchored in locations and at heights indicated.
- D. Install accessories at locations and heights indicated, level and plumb, in accordance with manufacturer's recommendations.
 - 1. Exposed fasteners: Tamper-proof.
 - 2. Fastener finish: Match items secured.
- E. Conceal evidence of drilling, cutting, and fitting on adjacent finishes.
- F. Fit flanges of accessories snug to wall surfaces; provide for caulking in gaps between 90° return flanges and finish wall surface after accessories installed.

3.03 MIRRORS

- A. Install mirror using concealed fasteners.
 - 1. Mirror shall be tight, secure and free of movement.
 - 2. Caulk around perimeter of mirror with clear silicone caulking.

3.04 GRAB BARS

- A. Provide 1-1/2" clearance between grab bar and wall.
- B. Mount to withstand min. vertical load of 250 lbs. after installation.
 - 1. Anchor to masonry walls with min. of 3/4" bolts and epoxy type anchors. Use of toggle bolts not acceptable.

3.05 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly.
 - 1. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces after removing temporary labels and protective coatings.
 - 1. Where finishes damaged due construction activities, including cleaning and polishing, remove and replaced damaged components with new.
- C. Deliver accessories schedule, keys and parts manual as part of project close-out documents.
- D. For Owner's permanent records, provide two sets of following items of manufacturer's literature:
 - 1. Technical data sheets of each item.
 - 2. Service and parts manual.
 - 3. Name of local representative to contact if field service or consultation required.

END OF SECTION 10800

**SECTION 11133
PROJECTION SCREENS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawing and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of projection screens shown on drawings.
- B. Types of projection screens required include:
 - 1. Front projection screens, electrically operated.
- C. Wood backing and trim for recessed screen installation included in Division-6 section.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain each type projection screen required from single manufacturer as complete units, including necessary mounting hardware and accessories.
- B. Measurement of Gain of Screen Viewing Surface: Measure gain of screen viewing surface against that of a magnesium carbonate surface by means of photogoniometer using test methods and test apparatus per FS GG-S-00172D(1) for determining effect of reflected light at various viewing angles on screen surfaces.
 - 1. Ratings of "one" refer to those viewing surfaces having reflectivity equal to magnesium carbonate surface.
- C. Fire Performance Characteristics: Provide projection screen fabrics identical to materials tested and passing requirements for flame resistance indicated below:
 - 1. NFPA 701 per small scale test.
 - 2. Federal Standard 191A/5903 for test method.
 - 3. FS GG-S-00172D(1) for flame resistance.
- D. Mildew Resistance: Provide mildew resistant screen fabrics as determined by Federal Standard 191A/5760
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application..
- F. Certificate of Analysis: The Manufacturer shall provide a "Certificate of Analysis" certifying that primary roofing membrane and flashing products meet requirements for those specified. This "certificate" shall be provided for each load delivered to project site.
- G. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each type screen indicated.

- B. For electrically operated projection screens and controls:
 - 1. Location of screen centerline relative to ends of screen case.
 - 2. Location of wiring connections for electrically operated units.
 - 3. Location of seams in viewing surfaces.
 - 4. Drop lengths
 - 5. Anchorage details, including connection to supporting structure for suspended units.
 - 6. Details of juncture of exposed surfaces with adjacent finishes.
 - 7. Accessories. Wiring diagrams.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver projection screens until building enclosed, other work within spaces where screens installed substantially complete, and installation of screens ready to take place.
- B. Protect screens from damage during delivery, handling, storage and installation.

PART 2 - PRODUCTS

2.01 ELECTRICALLY-OPERATED FRONT PROJECTION SCREENS

- A. General: Manufacturer's standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Provide units that are listed and labeled as an assembly by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Type: Heavy duty automatic electrically operated unit designed motor for mounting inside roller, three wire quick reverse, oil sealed, automatic thermal overload cutout, internal gears, capacitor and electric brake to prevent coasting.
- C. Controls: Remote, key-operated, three-position control switch installed in recessed device box with flush cover plate matching other electrical device cover plates in room where switch is installed.
 - 1. Provide locking cover plates for switches. Equip with stainless steel locking switch cover plate.
 - 2. Provide key-operated, three position toggle switch, power-supply switch.
 - 3. Provide infrared remote control consisting of battery-powered transmitter and receiver.
 - 4. Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.
 - 5. Limit Switch: Provide system with pre-set, but adjustable, limit switches to automatically stop picture surface in "up" and "down" positions.
- D. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission
 - 1. Roller: Rigid metal, mounted on vibration and noise absorbing supports
- E. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch- (9.5-mm-) diameter metal rod with ends of rod protected by plastic caps.
- F. Tab Tensioning: Provide units that have a durable low-stretch cord, such as braided polyester, on each side of screen connected to edge of screen by tabs to pull screen flat horizontally.
- G. Screen Fabric:
 - 1. Flame retardant and mildew resistant with white picture surface and black masking borders.
 - 2. Form bottom of fabric into pocket holding metal rod.
 - 3. Protect ends of rod with heavy duty caps.

- H. Viewing Area H x W.
 - 1. Applications and Size:
 - a. Lunchroom: 12'-0" x 12'-0"
 - b. Gymnasium: 14'-0" x 14'-0"
 - 2. Provide with black border option.
 - 3. Provide an extra screen drop as required so that bottom of screen extends to within the following heights above the floor:
 - a. Lunchroom: 2'-0" above the stage floor
 - b. Gymnasium: 4'-0" above floor.
 - I. Case: Wood with metal-lined wiring compartment with door in section of bottom of case, equipped with hinges, that open and closes automatically with lowering and raising of picture surface.
 - 1. When picture surface is lowered door to drop open by gravity.
 - 2. When picture surface is raised two ends of rod in bottom pocket of screen fabric to engage two hooks on door to lift to closed position where limit switch to cut off electrical current to screen.
 - 3. Provide second hinged door in balance of bottom of case with manual opening to provide access.
 - 4. Factory prime case.
- 2.01 MANUFACTURERS
- A. Products: Subject to compliance with requirements, provide one of following:
 - 1. Da-Lite Screen Company, Inc., "Boardroom Electrol" Series.
 - 2. Betford/Knox Manufacturing, Inc.
 - 3. Draper Screen Co., Inc. Envoy

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install projection screens at locations indicated in compliance with screen manufacturer's instructions.
- B. Install front projection screens with screen cases in position and relationship to adjoining work indicated, securely anchored to supporting substrate, and in manner which produces smoothly operating screen with plumb and straight vertical edges and plumb and flat viewing surface when lowered.

3.02 INSPECTION

- A. Inspect to verify that all rough-in, backing, and electric service properly installed and ready to receive projection screen assembly.

3.03 PREPARATION

- A. Provide framing for recessed applications of type recommended by manufacturer to provide proper installation and anchorage.

3.04 INSTALLATION - RECESSED PROJECTION SCREEN

- A. Install in strict accordance with manufacturer's instructions, approved shop drawings, and specifications.
- B. Anchor case to building structure; suspension from or anchoring to ceiling grid system not permitted.
- C. Align bottom of case doors flush with ceiling system units.
- D. Coordinate and connect electric supply to motor and control switch.
- E. Adjust limit switches, roller, and screen for proper operation.

3.05 PROTECTION AND CLEANING

- A. Protect projection screens after installation from damage during construction.
 - 1. If despite such protection, damage occurs, remove and replace damaged components or entire unit as required to restore units to original, undamaged condition.

END OF SECTION 11132

SECTION 11400
FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of food service equipment work indicated on drawings and by provisions of this Section, including schedules and equipment lists associated with either drawings or this Section.
- B. Refer to Division-15 sections for required drain traps, steam traps, atmospheric vents, valves, pipes and pipe fittings, ductwork, and other materials necessary to complete mechanical hookup of food service equipment; not work of this Section.
- C. Refer to Division-16 sections for wiring, disconnects, and other materials necessary to complete electrical hookup of food service equipment; not work of this Section.
 - 1. Electrical work shall comply with requirements of Division-16.
 - 2. The contractor is advised that the electrical characteristics of each item of equipment have been intentionally omitted from this section. For the electrical characteristics of each item of equipment the contractor shall refer to the electrical drawings.
 - 3. Kitchen equipment supplier shall be responsible for providing equipment compatible with the electrical service provided.

1.03 WORK INCLUDED

- A. Installation and connection of equipment listed as "New In the Contract":
 - 1. Where kitchen equipment furnished by contractor the complete installation of equipment, as defined in this section, part of the contractor's contract.
 - 2. Where kitchen equipment furnished by 'Separate Contract', the complete installation of equipment, as defined in this section, part of the separate contract.
 - 3. Contractor shall furnish, complete all food service equipment, labor, materials, tools and equipment necessary for the complete installation of kitchen equipment and refrigeration in a first-class manner, including all work incidental thereto in accordance with the drawings and these specifications.
 - 4. The term "Complete Installation" shall mean the delivery of the kitchen equipment and refrigeration, with transportation and trucking charges prepaid to the building site, uncrated, assembled, set in place, leveled, calibrated, and connected to utilities, operational, checked out and clean.

1.04 QUALITY ASSURANCE

- A. Food Service Equipment Supplier/Vendor shall have a permanent, fully staffed and equipped office within 100 miles of the project site. Such office shall have been in existence for a minimum of 5 years prior to bid.
- B. Installer's Qualifications: Firm with min. 3 years of successful installation experience on projects with food service equipment similar to that required for Project.
- C. Fabricator's Qualifications:
 - 1. Where indicated units require custom fabrication, provide units fabricated by shop skilled and with min. 5 years of experience in similar work.
 - 2. Fabricate all custom equipment items at same shop.
 - 3. Where units cannot be fully shop-fabricated, complete fabrication work at Project site.

- D. Codes and Standards:
1. NSF Standards:
 - a. Comply with applicable National Sanitation Foundation standards and recommended criteria.
 - b. Provide each principal manufactured or fabricated item of food service equipment with NSF "Seal of Approval".
 2. UL Labels:
 - a. Where available, provide UL labels on prime electrical components of food service equipment.
 - b. Provide UL "recognized marking" on other items with electrical components, signifying listing by UL, where available.
 3. ANSI Standards: Comply with applicable ANSI standards for electric powered and gas-burning appliances, for piping to compressed gas cylinders, and for plumbing fittings including vacuum breakers and air gaps to prevent siphonage in water piping.
 4. NFPA Codes: Install food service equipment in accordance with following National Fire Protection Codes (NFPA) Codes:
 - a. NFPA 54 - National Fuel Gas Code.
 - b. NFPA 70 - National Electrical Code.
 - c. NFPA No. 96 - "Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment".
 5. Health Code: Install food service equipment in accordance with local health department applicable requirements.
 6. ASME Boiler Code: Construct steam generating and closed steam heated equipment to comply with American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code; Section IV for units not exceeding 15 psig or 250°F (121°C), or Section I for higher pressure/temperature units.
 7. Boiler Permits: Comply with applicable requirements related to installation and permitting of kitchen equipment.
 - a. Provide, and pay costs for all required permits for installation and operation of pressure vessels and boilers.

1.05 CERTIFICATIONS

- A. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- B. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 2. Statement also state that proposed application of product on project is suitable and proper.

1.06 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each item; include roughing-in dimensions, service connection requirements, performances, power and fuel requirements, water and drainage requirements and other similar information.
- B. Shop Drawings:
 1. Submit dimensioned roughing-in drawings, at min. scale 1/4" = 1'-0", showing mechanical and electrical requirements.
 2. Submit dimensioned fabrication drawings for custom fabricated equipment including plans, elevations, and sections, at min. scale 3/4" = 1'-0", showing materials and gages used.
- C. Maintenance Manuals:
 1. Submit maintenance data and parts list for each item of food service equipment.
 2. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 1.
 3. Provide instructional video tapes for Owner's permanent library describing operation and maintenance procedures suggested for equipment where tapes are specified.

- D. Equipment and Cost List:
 - 1. Within thirty (30) days of the award of contract the contractor shall submit to the architect a complete list of equipment containing make and model numbers of each items of equipment to be furnished. List to include cost for each individual item of equipment.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver food service equipment in factory-fabricated containers designed to protect equipment and finish until final installation.
 - 1. Make arrangements to receive equipment at project site, or to hold in warehouse until delivery made to job site.
- B. Store food service equipment in original containers, and in location to provide adequate protection to equipment while not interfering with other construction operations.
- C. Handle food service equipment carefully to avoid damage to components, enclosures, and finish.
 - 1. Do not install damaged food service equipment; replace and return damaged components to equipment manufacturer.

1.08 PROJECT CONDITIONS

- A. Take field measurements to assure accurate fit of fabricated equipment.
- B. Check electrical, water and steam characteristics and gas pressure.
 - 1. Modify, as part of the cost of this contract, electrical service, as required to accommodate actual make and model of equipment being furnished.
 - 2. Provide pressure regulating valves where required for proper operation of equipment.
- C. Electrical Requirements: Provide motors and heating elements with electrical characteristics indicated on electrical drawings.
 - 1. Electrical characteristics specifically omitted from this section. Provide equipment compatible with electrical service provided.

1.09 SPECIAL PROJECT WARRANTY

- A. General Warranty: Provide written warranty signed by Food Service Equipment Supplier/Installer and Contractor, agreeing to replace/repair, if notified within one year after date of Final Acceptance, any equipment found inadequate due to defective materials, workmanship or installation, at no cost to Owner.
 - 1. Provide written warranty, signed by manufacturer, agreeing to replace or repair, within warranty period, compressors with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units adhered to during warranty period.
 - 2. Replacement limited to component replacement only, and not labor for removal and reinstallation.
 - 3. Warranty Period: 5 years from date of Final Acceptance.
- B. Single Point Warranty Servicing: As part of warranty, food service equipment supplier shall provide a 'single point' contact for warranty claims.

1.10 INSTRUCTION AND TRAINING

- A. As part of project closeout, and prior to requesting final inspection, food service contractor, in the presence of the owners personnel, conduct an 8 hour training session covering the proper start-up, operation, cleaning and maintenance of equipment furnished under this section. Upon the conclusion of the training the contractor shall submit, to the Architect, a written statement indicating the following:
 - 1. List of individuals participating in training.
 - 2. Nature and content of training.
 - 3. Signed statement, by participants, that participants fully understand the operation of the equipment.
- B. Training session shall be video taped for use by owner for additional employee training.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Stainless Steel: AISI Type 304.
 - 1. Provide non-magnetic sheets, free of buckles, waves, and surface imperfections.
 - 2. Provide No. 4 polished finish for any surfaces exposed.
 - 3. Provide self-adhesive protective paper covering on polished surfaces of stainless steel sheet work, and retain/maintain until time of final testing, cleaning, start-up, and Final Acceptance.
- B. Galvanized Steel Sheet: ASTM A 526, except ASTM A 527 for extensive forming; ASTM A 525, G90 zinc coating, chemical treatment.
- C. Steel Sheet: ASTM A 569 hot-rolled carbon steel.
- D. Stainless Steel Tube: ASTM A 554, Type 304 with No. 4 polished finish.
- E. Aluminum: ASTM B 209 sheet and plate, ASTM B 221 extrusions, 0.40-mill clear anodized finish where exposed, unless otherwise indicated.
- F. White Metal:
 - 1. Corrosion-resistant metal containing min. 21% nickel.
 - 2. Make casting free from pit marks, runs, checks, burrs, and other imperfections; rough grind, polish and buff to bright luster.
 - 3. In lieu of white metal castings, 18-8 stainless steel die-cast or stamped may be used.
- G. Sound Deadening:
 - 1. Heavy-bodied resinous coating, filled with granulated cork or other resilient material, compounded for permanent, non-flaking adhesion to metal in 1/8" thick coating.
 - 2. Apply coating of sound deadening material to underside of tops, drainboards, dish tables, and sinks.
- H. Sealants:
 - 1. ASTM C 920; Type S Grade NS, Class 25, Use NT.
 - 2. Provide sealant that when fully cured and washed meets requirements of Food and Drug Administration Regulation 21 CFR 177.2600 for use in areas where in contact with food.
- I. Color: Selected by Architect from manufacturer's standard colors.
- J. Backer Rod: Closed-cell polyethylene rod stock, larger than joint width.
- K. Gaskets: Solid or hollow (not cellular) neoprene or PVC; light gray, min. 40 Shore A hardness, self-adhesive or prepared for either adhesive application or mechanical anchorage.

2.02 FABRICATED PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide fabrication by one of following:
 - 1. Ace Manufacturing Co.
 - 2. Atlanta Kitchen Equipment, Inc.
 - 3. Delfield/Alco, div. of Alco Foodservice Co.
 - 4. Low-Temp Industries, Inc.
 - 5. Southern Equipment Fabricators, Inc.

- B. Refrigeration Hardware: Heavy-duty die-cast zinc, chrome-plated and polished.
 - 1. Hinges: Edge mounted, self-closing type.
 - 2. Latches: Edge mounted, arranged for locking device.
 - 3. Manufacturer: Subject to compliance with requirements, provide refrigerator hardware of one of following:
 - a. Grant Manufacturing Co.
 - b. Kason Hardware Co.
 - c. Standard-Keil Co.
- C. Handles and Pulls: Provide stainless steel handles with No. 4 finish, or die-cast zinc with polished chrome-plated finish.
 - 1. Provide die-stamped stainless steel pulls, recessed rectangular type, with beveled edge frame.
 - 2. Manufacturer: Subject to compliance with requirements, provide handles and pulls of one of following:
 - a. Grant Manufacturing Co.
 - b. Kason Hardware Co.
 - c. Standard-Keil Co.
- D. Door Slides: Provide stainless steel or galvanized steel door slides with min. load capacity of 100 lbs. per pair, and with positive door stop.
 - 1. Provide ball bearing rollers.
 - 2. Manufacturer: Subject to compliance with requirements, provide door slides of one of following:
 - a. Grant Manufacturing Co.
 - b. Kason Hardware Co.
 - c. Standard-Keil Co.
- E. Hinges: Provide stainless steel hinges, continuous type or butt type as indicated.
 - 1. Manufacturer: Subject to compliance with requirements, provide hinges of one of following:
 - a. Grant Mfg. Co.
 - b. Kason Hardware Co.
 - c. Standard-Keil Co.
- F. Sliding Door Hardware: Provide extruded aluminum door track.
 - 1. Provide galvanized steel door sheave with nylon surface and ball bearing inner races.
 - 2. Provide stainless steel bottom guide pins, spring loaded.
 - 3. Manufacturer: Subject to compliance with requirements, provide hinges of one of following:
 - a. Grant Mfg. Co.
 - b. Kason Hardware Co.
 - c. Standard-Keil Co.
- G. Adjustable Shelf Supports: Provide stainless steel shelf supports, snap-in type, and stainless steel brackets with countersunk mounting holes.
 - 1. Manufacturer: Subject to compliance with requirements, provide hinges of one of following:
 - a. Grant Mfg. Co.
 - b. Kason Hardware Co.
 - c. Standard-Keil Co.
- H. Catches: For hinged doors, provide permanent magnetic catch of sufficient strength to hold door shut.
- I. Locks: Manufacturer's standard brass 5-pin cabinet-type lock.
 - 1. Provide two keys for each lock, keyed separately.
- J. Faucets: Cast bronze body with nickel or triple chrome plated.
 - 1. Provide 12" swing spout faucets with ½" female flange for mounting on splash of multi-compartment sinks, one for two compartments, two for three and four compartments.
 - 2. Provide deck mounted faucets where indicated.
 - 3. Approved manufacturers subject to conformance with specified model:
 - a. Elkay Manufacturing Co.: #LK-66A.
 - b. Chicago Brass Co.
 - c. T & S Brass and Bronze Works, inc.

- K. Lever Drains: Provide 2", heavy cast-bronze body, removable flat stainless steel strainer, twist handle waste outlet, and one-piece connected chrome-plated brass overflow.
 - 1. Manufacturer: Subject to compliance with requirements, provide hinges of one of following:
 - a. Chicago Brass Co.
 - b. Franklin Machine Products.
 - c. Standard-Keil Co.
- L. Casters: Provide min. 6" dia. wheel casters, unless otherwise noted or detailed, with 1-1/8" tread width, complying with NSF standards.
 - 1. Provide sealed, self-lubricating bearings, cadmium-plated or bright zinc-plated steel disc wheels, and solid synthetic rubber tires.
 - 2. Provide foot brakes on **ALL** casters per unit.

2.03 FABRICATION OF EQUIPMENT

- A. Tops: Fabricate of 14-ga. stainless steel, with exposed edges rolled on 1-1/2" diameter radius, and with corners bullnosed.
 - 1. Where tops adjacent to walls or adjoining equipment, turn up 6" and back 1" on 45° angle unless otherwise indicated.
- B. Backsplashes: Cove horizontal and vertical corners.
- C. Dish tables and Drainboards: Fabricate of 14-ga. stainless steel with exposed edges formed into 1-1/2" x 190° rolled rim approximately 3" high.
 - 1. Provide built-in pitch of 1/2" min.
 - 2. Provide 8" high backsplashes with 2" return on 45° angle or 1-1/2" dia. rolled rim, as indicated.
 - 3. Construct front rim and backsplash on drainboards with continuous level plane with sink it adjoins.
 - 4. Support drainboards up to 36" in length by 1" dia. stainless steel tube welded to underside of drainboard and leg gusset.
 - 5. Support drainboards 36" and longer with legs; space legs maximum 48" on center.
 - 6. Cove horizontal and vertical corners with min. 3/4" radius.
- D. Framing: Mount tops on 1-1/2" x 1-1/2" x 1/8" galvanized angle iron, or 4" wide x 12-ga galvanized channels.
 - 1. Mount dish tables and drainboards on 4" wide x 14-ga stainless steel channels.
 - 2. Run framework around entire perimeter of unit, and cross brace on 30" centers.
 - 3. For dish tables and drainboards, run framing from front to back at each leg location, and run additional channel lengthwise, located at center of table width and welded with 1/4" studs welded at approximately 12" o.c.
 - 4. Provide each stud with suitable chrome-plated lock washers and cap nuts, and make stud lengths such that cap nuts made up tight bringing top down snugly to framing.
- E. Legs and Cross Rails: Construct legs of 1-5/8" OD x 16-ga. stainless steel tubing, with fully enclosed stainless steel bullet shaped adjustable foot with min. adjustment of 1" up or down without any threads showing.
 - 1. Fasten legs to 4" high stainless steel gusset with top completely sealed by means of stainless steel plate.
 - 2. Weld gusset continuously to bottom of unit framing.
- F. Drawers: Lift-out type drawer body, one-piece 20" x 20" x 5" die stamped of 20-ga. stainless steel, with inside radiused corners.
 - 1. Construct front of double pan stainless steel, 16-ga. exterior and 20-ga. interior.
 - 2. Provide lock for each drawer.
 - 3. Fasten drawer suspension guides to 18-ga. stainless steel housing suspended from angle framing under fixed top.
- G. Cabinet Bodies: Construct of 20-ga. stainless steel, with end panels formed with round corners for free standing units, and square corners for fixtures which adjoin walls or other fixtures.
 - 1. Provide 90° retentions on end panels at front and rear, turned in toward body of cabinet and welded for reinforcement.
 - 2. For cabinets with open shelving, provide double wall inner panels.
 - 3. Weld ends to horizontal angle or channel members to form integral cabinet base.

4. Provide backs of same material as ends, with vertical edges turned into match edges of ends.
 5. Weld making flush joint.
- H. Inserts: Where cold pans and other inserts installed in cabinet bases, provide apron full depth of insert and of same material as bodies with reinforced openings as required.
1. Form in openings on all sides.
- I. Sliding Doors: Construct of 20-ga. stainless steel with edges formed into channel extending around all sides, forming doors 7/8" thick.
1. Insert sound deadening material, and enclose with stainless steel back panel with welded corner joints.
 2. Mount doors on sliding door hardware.
 3. Construct doors to be removable for cleaning purposes, and provide with stops.
 4. Provide on each door, recessed stainless steel pulls, and locks.
- J. Hinged Doors: Construct same as sliding doors.
1. Mount on stainless steel continuous type hinges, fitted with stainless steel pulls, magnetic catches, and locks.
 2. Construct so that door face flush with cabinet body.
- K. Shelves: Construct of 14-ga. stainless steel.
1. Bottom Shelves: Extend forward and turn down at front flush with front facing of cabinet.
 2. Fixed Intermediate Shelves: Weld to front stiles and to 14-ga. stainless steel brackets so shelf is 1" away from back and ends of cabinet.
 3. Adjustable Shelves: Channel on all 4 sides, weld corners, and mount on removable stainless steel standards.
 4. Open Base Shelving:
 - a. Construct with edges rolled down on open sides, and 2" turn up with 3/4" radius on rear and ends where adjacent to walls and other equipment.
 - b. Neatly notch corners and weld to legs.
 - c. Reinforce shelving longitudinally with 14-ga. formed channel welded to underside.
 - d. Construct removable shelves as above, but fit over cross rails.
 - e. Do not exceed shelving sections of 30" long; where one section abuts another, turn down edges 1".
 5. Wall Shelves:
 - a. Construct with 1-1/2" roll on front and exposed ends, and with 2" turn up on back and ends where adjacent to walls or other fixtures.
 - b. Weld all corners.
 - c. Construct wall brackets of 14-ga. stainless steel with 1-1/2" flange at wall and completely welded to underside of shelf.
 - d. Fasten each bracket to wall with min. of two, 1/2" bolts anchored to wall.
 - e. Fasten shelf to wall bracket by means of studs welded to shelf, and secure with lock washer and chrome-plated cap nuts.
 - f. Install so that shelf sets 1-1/2" away from wall.
 6. Overshelves:
 - a. Set shelves mounted over equipment not adjacent to walls on 1" x 14-ga. stainless steel tubular standards fitted with stainless steel base flanges.
 - b. Completely weld top of tubular standard to 14-ga. stainless support channels, run channels full width of overshelf.
 - c. Run 1/2" steel tension rods through counter tops and reinforcing angle framing, secure with nuts and lock washers to assure stable sway-free structure.
 - d. Where shelves mounted over drainboards or dish tables, mount on upturned rolled edges omitting flanges, and scribe lower end of tube to match contour of roll.

- L. Sinks (Dishwasher Pre-Rinse, Pot Wash, Met Preparation and Vegetable Preparation): Fabricate from 14-ga stainless steel with interior corners rounded to 1" radius, both horizontally and vertically, forming cove in bottom.
1. Construct with butt edge joints, welded and ground smooth so no evidence of welding appears.
 2. Provide 8" high backsplashes with 2" return on 45° angle or 1-1/2" dia. rolled rim, as indicated.
 3. Divide multiple compartment sinks with double wall 14-ga stainless steel partitions rounded to ½" radius on top and having corners rounded same as other corners in sinks, continuously welded in place with welds ground smooth and polished.
 4. Provide back, bottom, and front of one continuous piece with no overlapping joints or open spaces between compartments.
 5. Pitch bottom of each compartment, and crease to die-stamped recess to receive lever type drain, without use of solder, rivets, or welding.
 - a. Furnish each compartment with one each lever operated waste tail piece.
 6. Finish front and exposed ends of sink with 1-1/2" 190° rolled edge.
 7. Finish back and ends adjacent to walls or other fixtures with splashback.
 8. Punch back splashback to receive wall-mounted faucets.
 - a. Holes to be 8" on center.
 - b. Punch two holes (one set) for one and two compartment sinks.
 - c. Punch Four holes (two sets) for three and four compartment sinks.
 9. For sinks in worktops, construct as above but omit roll edges and splashbacks; fabricate bowls flush with work surface.
- M. Cold Pans:
1. Fabricate from 14-ga. stainless steel lining and 20-ga. stainless steel casing.
 2. Cove interior horizontal and vertical corners.
 3. Insulate sides, end and bottoms, with material thermally equal to 2" of fiberglass insulation.
 4. Sweat ½" dia. copper cooling coils to underside of cold pan, and seal in thermoplastic material.
 5. Turn down counter top 1" into pan.
 6. Install completely concealed 1" wide plastic breaker strip.
 7. Install 1" chrome plated drain with plug.
 8. Provide ½" high false bottom of 14-ga perforated stainless steel in removable sections.

2.04 REFRIGERATION EQUIPMENT

- A. General: Provide refrigeration condensing units of size and capacities indicated, consisting of compressors, condensers, receivers, motors, mounting bases, vibration isolators, refrigeration components, safety devices, electrical controls, refrigerant and protective controls; all factory assembled and tested.
- B. Refrigerant:
1. Precharge units with refrigerant.
 2. Provide quick-connect type piping connections to receive piping from evaporator coils.
- C. Outdoor Mounting: Provide weather-tight housing and low ambient controls for units mounted outdoors.
- D. Refrigerant Piping:
1. Type ACR copper tubing, hard temper, with wrought fittings and silver solder joints.
 2. Insulate suction lines with ½" thick premolded foamed plastic insulation.
- E. Electrical Wiring: Provide required wiring between electrical rough-in and refrigeration units for proper operation.
- F. Plumbing Piping: Provide required water and drain piping between plumbing rough-in and refrigeration units for proper operation.
- G. Refrigeration Specialties:
1. Provide as indicated refrigerant dryer, liquid line solenoid valve, suction line filter, and expansion valve.
 2. Provide pump down control circuits consisting of thermostat and solenoid valve.
 3. Maintain box temperature from thermostat and liquid line solenoid valve, control compressor from suction pressure.

- H. Condensate Drain Lines:
 - 1. Type ACR copper tubing, hard temper, with wrought fittings and silver solder joints.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Rough-In Work:
 - 1. Installer examine roughed-in mechanical and electrical services, and installation of floors, walls, columns and ceilings, and other conditions under which food service work installed; verify dimensions of services and substrates before fabricating work.
 - 2. Notify Contractor of unsatisfactory locations and dimensions of other work, and of unsatisfactory conditions for proper installation of food service equipment.
 - 3. Do not proceed with fabrication and installation until unsatisfactory dimensions and conditions corrected in manner satisfactory to Installer.

3.02 INSTALLATION

- A. General: Set each item of non-mobile and non-portable equipment securely in place, level and adjust to correct height.
 - 1. Anchor to supporting substrate where indicated and where required for sustained operation and use without shifting or dislocation.
 - 2. Conceal anchorages where possible.
 - 3. Adjust counter tops and other work surfaces to level tolerance of 1/16" max. offset, and max. variation from level or indicated slope of 1/16" per ft.
- B. Equipment Anchoring: Where indicated, or required for safety of equipment operator, anchor equipment to floor or wall.
 - 1. Where equipment indicated anchored to floor, provide legs with adjustable flanged foot.
 - 2. Install 2 anchors on each foot.
- C. Work Surface (Sinks and Counters) Anchoring: Each stainless steel work counter and sink to be anchored to the wall in accordance with the following:
 - 1. Unless otherwise indicated place back splash 3" from face of wall.
 - 2. Provide stand off brackets at each leg. Secure stand off bracket to the wall using three each epoxy set type anchors.
- D. Exterior Compressors for Cooler Freezer; Install compressors where indicated, or if not indicated, as directed by the architect.
 - 1. Provide 6" thick concrete pad at each of the compressors. The pads shall be 6" larger than the pad (each direction).
- E. Field Joints: Complete field-assembly joints in work (joints which cannot be completed in shop) by welding, bolting-and-gasketing, or similar methods indicated.
 - 1. Grind welds smooth and restore finish.
 - 2. Set or trim gaskets flush, except for "T" gaskets as indicated.
- F. Enclosed Spaces: Treat spaces inaccessible after equipment installation, by covering horizontal surfaces with powdered borax at rate of 4-oz. per sq. ft.
- G. Closure Plates and Strips: Install where required, with joints coordinated with units of equipment.
- H. Cut-Outs: Provide cut-outs in food service equipment where required to run plumbing, electric, gas, or steam lines through equipment items for final connections.
- I. Access Panels/Doors: Where equipment (booster heater, etc) located behind stainless steel panels provide access doors in stainless steel panels as required for access and maintenance of equipment.

- J. Sealants and Gaskets: Install all around each unit to make joints airtight, watertight, vermin-proof, and sanitary for cleaning purposes.
 - 1. In general, make sealed joints min. 1/8" wide, and stuff backer rod to shape sealant bead properly, at 1/4" depth.
 - 2. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of materials at joint.
 - 3. At internal-corner joints, apply sealant or gaskets to form sanitary cove, min. 3/8" radius.
 - 4. Provide sealant-filled or gasketed joints up to 3/4" joint width; metal closure strips for wider joints, with sealant application each side of strips.
 - 5. Anchor gaskets mechanically or with adhesives to prevent displacement.
- K. Piping: Install necessary piping from relief valves on kettles and steamers to exhaust in manner to avoid steam coming in contact with operating personnel, and in accordance with applicable codes.
 - 1. Install required piping from indirect drain connections to floor drains.

3.03 FIELD QUALITY CONTROLS

- A. Testing:
 - 1. Delay start-up of food service equipment until service lines tested, balanced, and adjusted for pressure, voltage, and similar considerations; and until water and steam lines cleaned and treated for sanitation.
 - 2. Before testing, lubricate each equipment item in accordance with manufacturer's recommendations.
 - 3. Test each item of operational equipment to demonstrate that it is operating properly, and that controls and safety devices are functioning.
 - 4. Repair or replace equipment found defective in operation, including units below capacity or operating with excessive noise or vibration.

3.04 CLEANING

- A. After completion of installation, and completion of other major work in food service areas, remove protective coverings, if any, and clean food service equipment, internally and externally.
 - 1. Restore exposed and semi-exposed finishes to remove abrasions and other damages; polish exposed-metal surfaces and touch-up painted surfaces.
 - 2. Replace work not successfully restored.
- B. Prior to date of Final Acceptance on food service equipment work, buff exposed stainless steel finishes lightly, using power buffer and polishing rouge or grit of No. 400 or finer.
- C. Final Cleaning: After testing and start-up, and before time of Final Acceptance, clean and sanitize food service equipment, and leave in condition ready for use in food service.

3.05 CLOSEOUT PROCEDURES

- A. Provide services of Installers technical representative, and manufacturer's technical representative where required, to instruct Owner's personnel in operation and maintenance of food service equipment.
- B. Schedule training with Owner, provide at least 7-day notice to Contractor and Architect/Engineer of training date.
- C. Provide instructional video tapes for Owner's permanent library describing operation and maintenance of each piece of equipment where specified.

3.06 SCHEDULE OF FOOD SERVICE EQUIPMENT

A Serving Line: All units by same manufacturer except as otherwise noted and conform to Georgia Department of Health requirements.

A1. Solid Stainless Steel Tray Slide: Provide a 14 ga. Stainless steel “v” ridge tray slide as shown. Tray slide shall be mounted on top of masonry wall and shall be provided with two stainless steel angles studded to the bottom side for securing to the wall in the field.

A1.1 Low-Temp Industries Model Code A.

- a. 12" wide x length indicated.
- b. 14-ga. stainless steel with 3 inverted "V" grooves.
 - 1) Turn down 90° edges 1-1/2"
 - 2) Tray slide shall be provided with turn up on counter side of slide.
 - 3) Fabricate 90° returns at ends of runs where indicated, without inverted "V" grooves.
 - 4) Weld, grind and polish all corners and splices.
 - 5) Make necessary provisions to accommodate roll-up door/shutter.
- c. Approved manufacturers subject to conformance with specified model.
 - 1) Ace Fabricators, Inc.
 - 2) Delfield Co.

A2. Portable Solid Top Table Enclosed Base:

A2.1 Low-Temp Industries Model 36-ST-EB; Enclosed Base, Flat Counter to be used for tray and flatware dispenser.

- a. Size: 36-3/8" long x 30" wide x height required
- b. Top to be 30" wide and fabricated from 14 ga. stainless steel with square turn down on all sides and corners fully welded, ground and polished. Top to have #4 satin finish and all edges having #7 hilite finish.
- c. Body to be seamless molded fiberglass (F.R.P.) with smooth exterior surfaces and rounded corners. To be constructed by a hand lay-up process with four layers of 1.5 oz continuous strand fiberglass mat, plus a 24 oz layer of woven roving on the bottom for added strength. To be flame retardant per specification ASTM E-162 having a flame spread of 25 or less. Body interior to be reinforced at each end with 4" wide, 12 gauge galvanized channel welded to form integral “U” frame for maximum stress relief.
- d. 5" diameter, ball bearing swivel type casters to be non marking and with brakes on all wheels. Casters to be mounted with interior and exterior bracing for maximum stress relief.
- e. All equipment to be built in accordance with the Underwriters Laboratories, Inc. and the National Sanitation Foundation, Inc. standards and shall bear the Underwriters Laboratories, Inc. listing label for safety and the Underwriters Laboratories classification label for sanitation.
- f. Provide this unit with the following options:
 - 1) Line up locks to be barrel bolt and key slot design with cam locking action. Locks to be placed on opposing corners for maximum versatility. Code AA.
 - 2) Four(4) silverware wells to be 4-1/2" cutout complete with nylon cylinder. Code LL
 - 3) Provide a stainless steel lined opening in the counter top. This opening shall be approximately 12" deep and shall serve as a small well for stacking of disposable trays; four stacks of trays.

A3. Portable Hot/Cold Unit:

A3.1 Portable Hot Food Table Open Base; Low Temp Industries "Colorpoint" Custom unit fabricated as follows:

- a. Top to be 30" wide and fabricated from a minimum of 14 ga. stainless steel with square turndown on all sides and corners fully welded, ground and polished. Top to have #4 satin finish and all edges having #7 hilite finish.
- b. Body to be seamless molded fiberglass (F.R.P.) with smooth exterior surfaces and rounded corners. To be constructed by a hand lay-up process with four layers of 1.5 oz continuous strand fiberglass mat, plus a 24 oz layer of woven roving on the bottom for added strength. To be flame retardant per specification ASTM E-162 having a flame spread of 25 or less. Body interior to be reinforced at each end with 4" wide, 12 gauge galvanized channel welded to form integral “U” frame for maximum stress relief.

- c. Rear of body under the solid top section to have an open storage base made from 18-gauge stainless steel. Liner to have removable top panels to allow for service access.
- d. Provide with dry/moist electric hot/cold QuickSwitch food wells to be bottom mounted and have a 12" x 20" die stamped opening with ¼" raised beaded edge. Interior pan to be 20 gauge deep drawn, 304 stainless steel, with coved corners and fully insulated with fiberglass insulation. The exterior jacket to be constructed of stainless steel. Each hot food well to use a 500-watt heat source with solid state digital controls for maximum energy efficiency. All switches and controls to be fully accessible. All wells are wired to a circuit breaker for current overload protection. All wells shall also be fully wrapped with refrigeration coils to serve as cold wells when needed. The unit shall come complete with 1/3 HP condensing unit and louvered housing for same. The operator side shall have hinged access doors with louver panel in center.
- e. 5" diameter, ball bearing, swivel type casters to be nonmarking and with brakes on all wheels. Casters to be mounted with exterior & interior bracing for maximum stress relief.
- f. All equipment to be built in accordance with the Underwriters Laboratories, Inc. and the National Sanitation Foundation, Inc. standards and shall bear the Underwriters Laboratories, Inc. listing label for safety and the Underwriters Laboratories classification label for sanitation.
- g. Provide this unit with the following options:
 - 1) Provide a custom food protector VG series – all glass construction with glass clips. The unit shall be operator serve style with curved front glass and glass top shelf as required. NO lights or heat lamp are required. The glass clips shall be brushed aluminum finish and will be top mounted.
 - 2) Line up locks to be barrel bolt and key slot design with cam locking action. Locks to be placed on opposing corners for maximum versatility. Code AA
- h. Approved manufacturers subject to conformance with specified model:
 - 1) Ace Fabricators, Inc.
 - 2) Delfield/Alco, div. of Alco Foodservice Co.
 - 3) Precision Metal Products, Inc.

A4. Portable Milk Dispenser - Forced Air; Open Crate Dispenser:

- A4.1** Low Temp Industries, "Colorpoint" CPM-BFD-12, 5 year compressor warranty. Fabricate as follows:
- a. Top to be fabricated from minimum of 14 ga. stainless steel, with square turndown on all sides and corners fully welded, ground and polished. Top to be double wall construction with urethane insulation. Top to have #4 satin finish and all edges having #7 hilite finish.
 - b. Divided doors to be by-folding, made of ABS plastic, fully-insulated, with PVC hinge. Door opening shall have a full perimeter gasket to ensure a positive door seal.
 - c. Refrigerated cabinet shall have a type 304 stainless steel exterior or body panels made from fiberglass reinforced polyester (F.R.P.) with smooth exterior surfaces. Unit to have a water-tight stainless steel interior liner, fully-insulated with urethane. Unit to have a condensate drain extended below to a shut-off valve.
 - d. Refrigeration system shall maintain a temperature of 38 degrees by finned tube forced air coil(s) with an accessible thermostatic expansion valve connected to a fully hermetic condensing unit. System to include all necessary controls for proper operation, and removable stainless steel louvered panels on the front and rear of cabinet to provide necessary ventilation.
 - e. The fully hermetic condensing unit operating on R-134a refrigerant shall be prepiped with all necessary controls for proper operation, factory tested and made ready to plug in on the job.
 - f. A cross flow ventilated compressor compartment to have two (2) stainless steel exterior frames complete with removable stainless steel louvers, one front and one rear. Provide with one additional oversized end louvered access panel for ease of service.
 - g. Provide (4) four 5" diameter, ball-bearing swivel type, non-marking casters to be concealed within the body, mounted on 12 gauge channels for support.
 - h. Unit shall include (4) four non-marking corner bumpers.
 - i. All equipment to be built in accordance with the Underwriters Laboratories, Inc. and the National Sanitation Foundation, Inc. standards and shall bear the Underwriters Laboratories, Inc. listing label for safety and the Underwriters Laboratories classification label for sanitation.

- j. Approved manufacturers subject to conformance with specified model:
 - 1) Ace Fabricators, Inc.
 - 2) Delfield Co.
 - 3) Precision Metal Products, Inc.

A5. Portable Cashier's Stand:

- A5.1** Low Temp Industries "Colorpoint" Model 28CSS (oriented as shown). Fabricate follows:
- a. Size: 28-3/8" long x 30" wide x height required
 - b. Top to be 30" wide and fabricated from minimum of 14 ga. stainless steel, with square turndown on all sides and corners fully welded, ground and polished. Top to have #4 satin finish and all edges having #7 hi-lite finish.
 - c. Body to be seamless molded fiberglass (F.R.P.) with smooth exterior surfaces and rounded corners. To be constructed by a hand lay-up process with four layers of 1.5 oz continuous strand fiberglass mat, plus a 24 oz layer of woven roving on the bottom for added strength. To be flame retardant per specification ASTM E-162 having a flame spread of 25 or less. Body interior to be reinforced at each end with 4" wide, 12 gauge galvanized channel welded to form integral "U" frame for maximum stress relief.
 - d. 5" diameter, ball bearing, swivel type casters to be non-marking and with brakes on all wheels. Casters to be mounted with exterior & interior bracing for maximum stress relief.
 - e. All equipment to be built in accordance with the Underwriters Laboratories, Inc. and the National Sanitation Foundation, Inc. standards and shall bear the Underwriters Laboratories, Inc. listing label for safety and the Underwriters Laboratories classification label for sanitation.
 - f. Provide this unit with the following options:
 - 1) Cashier drawer assembly to have drawer face powder coated black with removable 3" deep drawer liner mounted on stainless steel roller bearing slides. Drawer face to be complete with cylinder lock and keys. Code HH
 - 2) Convenience outlet, flush mount type, to be 120VAC or 208VAC, prewired and fused as required. Receptacle to be recessed in stainless steel housing on a body surface. Specify location and electrical requirements. 120V-15 & 20amp to be furnished as Ground Fault. Code DD
 - 3) Line up locks to be barrel bolt and key slot design with cam locking action. Locks to be placed on opposing corners for maximum versatility. Code AA
 - 4) 3" Knock out in the counter top for computer cords
 - g. Approved manufacturers subject to conformance with specified model:
 - 1) Ace Fabricators, Inc.
 - 2) Delfield Co.
 - 3) Precision Metal Products, Inc.
 - 4) Servolift Eastern Corp.

B Refrigeration/Freezing/Heating: Five (5) year warranty required on refrigeration compressors.

B1. Reach-in Refrigerator:

- B1.1** Victory Model RS-1D-S7.
- a. One (1) compartment, 32" deep.
 - b. Two (2) half height hinged glass doors with heavy duty cylinder locks.
 - c. Construction: All stainless steel.
 - d. Furnish with 13 universal bottom support pan slides per compartment; Type A/C Universal
 - e. Cord and plug
 - f. Digital Thermometer
 - g. 5" Casters; All with locks; ball bearing, swivel, non-marking type
 - h. Approved manufacturers subject to conformance with specified model.
 - 1) The Delfield Co.
 - 2) Hobart Corp.
 - 3) Traulsen & Company, Inc

B2. Reach-in Hot Cabinet:

- B2.1** Winston Model HA4522.
- a. Half high doors with magnetic door latches and heavy duty cylinder locks.
 - b. Separate Controls for food temperature and texture.
 - c. Humidity Control
 - d. High Speed fan.
 - e. Solid state temperature sensors and controls
 - f. Capacity: either 14 each 18" X 26" pans or 28 each 12" X 20" X 2-1/2" pans.
 - g. Universal Tray Slides (angles)
 - h. Adjustable 5" casters, all with brakes.
 - i. Approved manufacturer subject to conformance with specified model.
 - 1) Crescent Metal Products, Inc. "Cres-Cor"
 - 2) InterMetro Industries Corp.
 - 3) Precision Metal Products, Inc.
 - 4) Servolift Eastern Corp.

C Dishwashing:

C1. Pulper:

- C1.1** Somat Remote Model SP-75S: Provide one (1) SPC-75S high tank Pulper, 30" diameter, 39-1/2 high, free standing polished stainless steel tank with stainless steel return water flushed feed tray, stainless steel hinged lid with limit switch, return water flush tray, stainless steel feed tray cover, 3/8" thick stainless steel slurry chamber, 7½ HP direct drive TEFC (Totally Enclosed Fan Cooled) motor with 1-5/8" diameter stainless steel drive shaft, internal junk box and cutting mechanism. HyPoint cutting mechanism shall consist of stainless steel impeller and security ring. Impeller to have two cylindrically ground, replaceable, rotating cutters, 17-4 stainless steel, heat treated to 45 R. Three stationary, replaceable top cutters. One-piece security ring, precision ground, 17-4 stainless steel, heat treated to 45 R.
- a. Valve Package: Pre-piped bronze valve package assemblies to include all valves required for proper operation.
 - b. Som-A-Trol® (Electrical Control Panel): Wall mounted, UL approved, NEMA-4 stainless steel enclosure. Includes all necessary power, control and water level components prewired to a terminal strip. A push button station shall be provided.
 - c. Capacity: 1,250 pounds per hour of food service waste mix.
 - d. Finish: All exterior surfaces, except where polished stainless steel, are prime coated and finished with two coats of epoxy paint.
 - e. Provide with following accessories:
 - 1) Stainless steel slurry pump, 3 hp TEFC direct drive.
 - 2) Prewired to a unit mounted NEMA 4X junction box.
 - 3) Stainless steel Som-A-Trol electronic control panel
 - 4) Stainless steel feed tray cover
 - 5) Multi-pulper package
 - 6) Buss Communications
 - 7) Spanish/English operating placards
 - f. Approved manufacturer subject to conformance with specified model.
 - 1) Champion
 - 2) Meiko

C2. Extractor

- C2.1 Somat Model HE-9S
- a. Hydra-Extractor: Provide one (1) HE-9S Hydra-Extractor, rigid stainless steel weldment with supporting frame, head assembly with 5 HP TEFC (Totally Enclosed Fan Cooled) motor mounted to a belt driven 25:1 gear reducer, removable stainless steel access cover, extended stainless steel discharge chute with boot and limit switch, chemical additive pump, automatic rinse system. Water extractor mechanism consists of 9” diameter stainless steel screw with stainless steel encased nylon brush edge, matching 9” diameter reinforced stainless steel screen and stainless steel plug cutter.
 - b. Valve Package: Pre-piped bronze valve package assemblies to include all valves required for proper operation.
 - c. Som-A-Trol (Electrical Control Panel): Wall mounted, UL approved, NEMA 4 stainless steel enclosure. Includes all necessary power and control components prewired to a terminal strip. Provide with emergency stop button. Unit to be pre-wired to a unit-mounted junction box.
 - d. Capacity: 3,000 pounds per hour of pulped food service waste mix.
 - e. Finish: All exterior surfaces, except where polished stainless steel, are prime coated and finished with two coats of epoxy paint.
 - f. Furnish with following accessories:
 - 1) Direct drive, 316 stainless steel Return Pump, 7-1/2 HP
 - 2) Prewired to a unit mounted NEMA 4X junction box.
 - 3) Extended discharge chute with boot and limit switch
 - 4) Pulp level detector.
 - 5) Extended stand.
 - 6) Interior/Exterior neoprene wall seal with stainless steel band.
 - 7) Buss Communications.
 - 8) Spanish/English operating placards.
 - g. Approved manufacturer subject to conformance with specified model.
 - 1) Champion
 - 2) Meiko

D Sinks:

D1. Not Used

E Tables and Counters:

E1. Not Used

F Food Preparation:

F1. Not Used

G Cooking:

G1. Range: Not used

G2. Steamer: Not used

G3. Braising Skillet: Not used

G4. Convection Oven: Not Used

G5. Combi-Oven:

- G5.1** Provide Electric Combi-**Duo** Mobile Self-Cooking Center, Model SCC102 as manufactured by Rational.
- a. Furnish with standard features as follows and accessories:
 - 1) Two (2) individual units.
 - 2) LCD touch screen with self-explanatory symbols for maximum ease of control.
 - 3) 3 cooking modes: Moist Heat (85°F to 265°), Dry Heat (85°F to 575°F), and Combination of Moist Heat and Dry Heat (85°F to 575°F).
 - 4) ClimaPlus controls for humidity measurement and ongoing regulation throughout the cooking process.

- 5) 350 cooking programs with up to 12 steps each, freely selectable by product name. Cooking programs may be uploaded into unit via USB interface.
 - 6) Core temperature probe with 6-point measurement.
 - 7) 5 programmable air speeds.
 - 8) HACCP data memory and output via USB interface.
 - 9) Automatic pre-selected starting time adjustable for date and time.
 - 10) Digital temperature displays and digital timer ranging from 0-24 hours
 - 11) Time settings in hours/minutes or minutes/seconds
 - 12) CalcDiagnosis System, including automatic SelfClean for steam generator
 - 13) Automatic SelfClean for steam generator
 - 14) Service diagnostic system with automatic service notices display
 - 15) Menu-guided descaling program
 - 16) CleanJet automatic cleaning system
 - 17) Integral hand shower with automatic rewind, integral water shut-off function and infinitely variable jet strength
 - 18) Centrifugal grease separation with no additional grease filter required.
 - 19) Seamless, trough-shaped hygienic stainless steel cooking cavity with rounded corners
 - 20) Service door with front access.
 - 21) Unit to be splash- and hose-proof to Standard IPX5.
 - 22) Five (5) stainless steel wire grid shelves.
 - 23) Capacity for either (10) 18" x 26" pans or up to (20) 12" x 20" pans.
 - 24) Half-Day Demonstration/Training as provided by Rational Certified Chef.
- b. Furnish with following accessories:
- 1) UG-II Open Stand with Pan Slides
 - 2) Five (5) additional stainless steel grid shelves.
 - 3) Fifteen (15) 12" x 20" CombiFry Baskets
 - 4) Four (4) Cleaner Tablets, pack of 100
 - 5) Four (4) Rinse Aid Tablets, pack of 50
 - 6) Everpure KleenSteam ARX System, Item 9797-00 (by Others)
- c. Utility requirements:
- 1) Electrical: Voltage/Phase; Refer to electrical drawings
 - 2) Water: 3/4" CW
 - 3) Drain: 2" Open Drain
- d. Warranty:
- 1) One Year Parts and Labor
- e. Approved manufacturers subject to conformance to specified model.
- 1) Blodgett Oven Co.
 - 2) Cleveland Range, Inc.
 - 3) Dover Industries Groen.

G6. Steam Kettle: Not Used

G7. Fryer: Not Used

G8. Pizza Oven:

- G8.1** Lincoln 1100 Series-Double Stack-Gas, Impinger II Conveyor Oven with standard equipment and accessories and follows:
- a. Stainless steel front, side, tops and legs
 - b. Digital controls with a single on/off switch
 - c. Microprocessor controlled time/conveyor speed.
 - d. Provide with 'FastBake' feature
 - e. Entry and exit shelves
 - f. Provide instructional video tape on operation and maintenance.
 - g. Approved manufacturers subject to conformance with specified model.
 - 1) Blodgett
 - 2) Dover Industries Groen
 - 3) Market Forge

H Shelving, Dunnage:

H1. Not Used

I Carts, Conveying Equipment:

I1. Not Used

M Miscellaneous:

M1. Scales: Not Used

M2. Hose Reel:

M2.1 T&S Brass and Bronze Works, Inc. "Reel Kleen" Model B-1400.

- a. Reel: Enclosed, automatic stop and retraction type.
- b. Hose: 35' long 3/8" ID.
- c. Accessories:
 - 1) B-1420 quick connect squeeze valve.
 - 2) B-1422 jet spray.
 - 3) B-1423 fan spray.
 - 4) B-1424 hook nozzle.
 - 5) B-964 vacuum breaker.
 - 6) RK-2 shut-off valve.
 - 7) B-513 mixing valve.
 - 8) C-CVV-1/2" horizontal check valve.
 - 9) Watts 7U backflow preventer.
- d. Approved manufacturers subject to conformance with specified model.
 - 1) Fisher
 - 2) Chicago Faucet

M3. Hand Sink and Pedestal Base:

M3.1 Advance Tabco Hand Sink and Pedestal Base, Model 7-PS-99

- a. Type; Hand sink with enclosed based and paper towel and soap dispenser.
- b. Construction: Heavy gauge type 304 stainless steel construction, all welded construction.
- c. Fittings: All fittings to be brass/chrome plated.

END OF SECTION 11400

**SECTION 11481
GYMNASIUM EQUIPMENT**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of gymnasium equipment shown on drawings.
 - 1. Installation of equipment to include all structural requirements, fittings, accessories, motors and controls necessary and/or required for proper installation and operation of specified equipment.
- B. Following types of equipment required:
 - 1. Basketball backstop.
 - 2. Equipment floor sleeves.
 - 3. Padded wall mats.
 - 4. Electrically operated fabric roll-up divider curtains
 - 5. Wrestling Mat Storage Units
- C. Approved Manufacturers:
 - 1. Basketball Backstops:
 - a. Provide backstops produced by one of following:
 - 1) Draper, Inc
 - 2) Porter Equipment Co.
 - 3) Medart.
 - 4) AALCO Athletic Equipment.
 - 5) Everlast Sporting Goods Mfg. Co., Inc.
 - 6) Performance Sports
 - 2. Equipment Floor Sleeves:
 - a. Provide equipment produced by one of following:
 - 1) Porter Equipment Co.
 - 2) Medart.
 - 3) AALCO Athletic Equipment.
 - 4) Everlast Sporting Goods Mfg. Co., Inc.
 - 5) Performance Sports
 - 3. Padded Wall Mats:
 - a. Provide equipment produced by one of following:
 - 1) Porter Equipment Co.
 - 2) Medart.
 - 3) AALCO Athletic Equipment.
 - 4) Everlast Sporting Goods Mfg. Co., Inc.
 - 5) Performance Sports
 - 4. Divider Curtain:
 - a. Provide equipment produced by one of following:
 - 1) Porter Equipment Co.
 - 2) Medart.
 - 3) AALCO Athletic Equipment.
 - 4) Everlast Sporting Goods Mfg. Co., Inc.
 - 5) Performance Sports

5. Wrestling Mat Storage Unit
 - a. Provide equipment produced by one of following:
 - 1) Resilite Sports Products, Inc
 - 2) Anthem Sports
 - D. Type and Quality: For purposes of designated type and quality of work of this Section, drawings and specifications based on products of manufacturers named; similar and equal products of other listed manufacturers acceptable if "prior" approved by Architect.
 - E. Related work performed by others:
 1. Wire, conduit and electrical boxes for controls and motors to be provided under the building contract. Refer to Plans and Specifications for building contract for an indication of work being performed under other contract.
 2. Final electrical connections to backstops, motors and controls to be performed by a Licensed electrician under this contract.
- 1.03 SUBMITTALS
- A. Manufacturer's Data: For information only, submit 2 copies of manufacturer's drawings, rough-in diagrams, specifications and installation instructions for each item of equipment required.
 1. Include data substantiating that products comply with requirements.
 2. Show on transmittal form that copy of information transmitted to Installer on each item.
 - B. Shop Drawings:
 1. Submit shop drawings for fabrication and installation of all equipment items and assemblies not fully described by manufacturer's data.
 2. Shop drawings showing layout, elevations, dimensions, fabrication details, method of attachment and electrical wiring diagrams, requirements and locations.
 - C. Color Samples:
 1. Submit samples of fabric for selection
 - D. Installation Instruction:
 1. Submit manufacturer's installation and maintenance instructions.
 - E. Structural Design:
 1. Basket Ball Back Stops: Provide full description of methods by which loads are to be transferred from backstops to structure; indicate load and direction of load.
 - a. Back Stop supplier is responsible for structural design of basketball back stop system complete with frame, connections, and support system.
 - b. Support system to be compatible with structural building frame.
 2. Divider Curtains: Loads to be transmitted to building structural members and requirements for supplementary bracing and structural support members.
 - a. Manufacturer shall provide calculations and reports for tests performed by an independent testing laboratory accredited by the American Association of Laboratory Accreditation (A2LA) that clearly demonstrate compliance with minimum safety factors included in product specifications.
 - b. Certificates for Divider Curtain Vinyl and Mesh to prove they meet the requirements of Greenguard Children & Schools
- 1.04 DESIGN CONSIDERATIONS
- A. The building structure has been designed to withstand the loads transferred to the structure from the basketball back stops. However, unless noted or detailed otherwise, no special structural provisions have been included in the building design to accommodate the installation of the basket ball back stop(s).
 1. Under this contract the basketball back stop supplier shall be responsible for providing and installing additional structural steel and accessories necessary for installation of backstops.

1.05 QUALITY CONTROL

- A. Source limitation: All components including curtain, suspension system, electric winches, and controls for divider shall be products of a single manufacturer.
- B. Welding to be performed by personnel having passed Welder Qualification testing in accordance with American Welding Society (AWS) code D1.1 or higher. Manufacturer to provide certification and test results upon request

PART 2 - PRODUCTS

2.01 MATERIALS AND FABRICATION

- A. General: Provide manufacturer's standard products except as otherwise indicated.
- B. Hoist Cable: 1/4" diameter galvanized air craft cable with an ultimate breaking strength of 7000 pounds.

2.02 PLAY AND SIDE COURT GOALS - GENERAL

- A. Center Strut Units: Goal shall be mounted directly through bank and into a heavy structural steel weldment (Center Strut) which shall be clamped to vertical 6-5/8" O.D. center support to eliminate any strain on bank should a player hang on the front mounted goal.
 - 1. This direct mount feature shall conform to the N.C.A.A. recommendation (1988 Rule Book, Page BR-60, Paragraph D-5) which states that the design of the unit shall transfer the load directly to the backboard support (Center Strut) so as to minimize stress to glass backboard.
 - 2. The upper bank extension shall be adjustable, providing the official NCAA and NFSHSA regulation of 6" from front of the "Center Strut" to the face of the backboard.
- B. Backstop shall be suspended by special adjustable hangers to provide for precise plumbing of frame during installation. Support hangers shall be offset 2" from center line of "Center-Strut" to properly weight lock unit in playing position without use of ropes, latches or springs.
 - 1. Backstops shall be supported from 3-1/2" O.D. pipe anchored to structural framing members by means of precision die formed fittings.
 - 2. Superstructure pipes to be reinforced with special bridging when truss centers exceed 14'-0".
- C. Finish: All metal components shall be factory primed with black primer compatible with finished paint.

2.03 BASKET BALL BACKSTOPS

- A. Game Backstop; Shall be Porter Athletic Equipment Company, or approved equal, as follows:
 - 1. Backstop: #917W Forward Folding Unit with integral height adjustment feature capable of providing adjustments from 8'-0" to 10'-0" above floor.
 - 2. Back Board: #00224-300 rectangular glass bank
 - 3. Safety Padding: #00227-000
 - 4. Goal: #00243-300 Break Away goal.
 - 5. Electric Winch: #00707-000 Winch with wall mounted key switch.
 - 6. Safety Strap: #10797-000 Automatic safety device
 - 7. Cable/Strap Retractor: #10798-000 Retractor Reel.
- B. Construct vertical frame assembly of single 6-5/8" O.D. pipe centered behind board and sufficient diagonal and back brace pipes to insure max. rigidity securely clamped and bolted together with malleable iron fittings.
- C. Where building structure does not permit direct attachment, provide custom-designed heavy duty superstructure as part of this contract.

2.04 EQUIPMENT FLOOR SLEEVES:

- A. Equipment Floor Sleeves: Porter No. 00870-000 equipment floor sleeve, Heavy Wall stainless steel with inside diameter to accept a 3-1/2" O.D. upright.
1. Cap bottom of sleeve.
 2. Fabricate sleeve with "U" anchor bar welded to sides of sleeve and extending 1'-9" below finish floor into concrete footing.
 3. Sleeve Length: Sufficient for game standard to extend 9" below finished floor.
 4. Provide separate cover assembly, designed for mounting in wood or synthetic type floors.
 - a. Plate consisting of cast aluminum mounting flange, cork gasket and 5" diameter removable chrome plated cover with special tool for cover removal.

2.05 WALL PADS:

- A. Padded Wainscot: Everlast Sporting Goods Manufacturing Co., "Eversafe" safety-cushioned wainscot panel or approved equal.
1. Panel Sizes: 2'-0" x 6'-0" high.
 2. Construction: 2-1/2" thick cushion of polyurethane foam cemented to 3/8" thick plywood backing.
 3. Cover assembly (face and edges) with vinyl coated nylon fabric, color selected by Architect, securely fastened to plywood backing with staples.
 4. Application: Install padded wall panels at each end of gymnasium playcourt.

2.06 DIVIDER CURTAIN

- A. Type: Electrically operated, roll-up gymnasium divider including motor, belts, controls, clamps for attachment to building structure, threaded rod supports, and other components required for complete functional installation.
1. Operation: Curtain rolled up and down by belts wound onto overhead rotating drive pipe operated by electrical motor.
 2. Configuration: Rectangular shape with straight bottom and extending across room as indicated on Drawings.
 - a. Maximum dimension of stored divider: 2 feet from bottom of structural support to bottom of rolled curtain.
 - b. Minimum required clearance between vertical curtain edges and adjacent fixed objects: 6 inches.
 - c. Provide 36 inches space between curtain ends and walls or fixed objects to allow passage space around divider. At bleachers allow for 36" between end of curtain and bleachers in retracted position.
 3. Operating mechanism: Drive pipe winch powered with 3/4 HP, 110VAC, 60-cycle, single-phase, reversible capacitor, C-Face motor with thermal overload protection. Entire winch assembly to be UL listed and shall carry a five-year warranty. Provide with load holding worm gear reduction and integral limit switches to control curtain travel. Drive pipe shall rotate in pipe support assemblies spaced at approximately 9 feet.
 4. Attachment: Attach to structural support with beam clamps, hanger brackets, and 1/2 inch minimum diameter threaded rods. Attachment clamps designed to be capable of supporting a minimum of 5,000 lbs each and provided in sufficient number to provide a combined minimum 45:1 attachment point safety factor.
 5. Hoist belts: 5 inches wide white polyester webbing attached to drive pipe, passing under bottom batten, and terminating at top batten. Space belts at approximately 15 feet on center.
 6. Bottom roller: 3-1/2 inches minimum diameter steel pipe with aluminum strip for attachment of curtain.
- B. Curtain Fabrication: Fabricate curtain as follows:
1. Bottom 12 feet: Opaque solid vinyl coated polyester fabric:
 - a. Weight: 18 ounces per SY.
 - b. Resistant to rot, mildew, and ultraviolet light.
 - c. Flammability: Rated self extinguishing in accordance with California State Fire Code F-31.5 and F-140.
 - d. Color: Selected by Architect from manufacturer's standard range.

2. Upper curtain section: Vinyl coated polyester mesh.
 - a. Weight: 9 ounces per SY.
 - b. Resistant to rot, mildew, and ultraviolet light.
 - c. Flammability: Rated self extinguishing in accordance with California State Fire Code F-230.
 - d. Color: Selected by Architect from manufacturer's standard range.
 - e. Seams: Horizontal and electronically welded with 1 inch full contact weld.
 - f. Outer edge hems: Triple turned with double welds.
 - g. Top edge: Solid fabric in triple thickness and double welded to mesh and/or solid curtain fabric to form 6 inches wide pocket for top pipe batten.
 - h. Bottom edge cut square for attachment to roller pipe with aluminum stop strip.
 - C. Curtain Safety Device: Provide curtain safety device. Curtain safety device to be directly speed sensitive to automatically lock divider curtain in position at any time during storage or operation. In the event of an over-speed situation (greater than 1.5 feet per second) caused by malfunction of the hoisting apparatus, whether sudden or gradual, device will immediately activate. The curtain safety device shall work regardless of direction of rotation and automatically resets when load is reversed or removed.
 - D. Controls: Provide key lock, 3-position, momentary contact wall control switch to lower, raise, and stop gymnasium divider. Provide with switch box and plastic cover plate.
- 2.07 WRESTLING MAT STORAGE RACK
- A. Mat Storage Rack: Furnish wrestling mat storage units capable of storing three mat sections in a vertical position with no more than 4'-0" protrusion from wall and complying with the following:
 1. Wall rack constructed on 14 gauge, zinc plated steel frames.
 2. Dimension of frame to be 3' wide, 9'-11" high, 17'-8" long with an approximated loaded depth of 4'-0" and a weight of 650 empty.
 3. Unit to hold three wrestling mats.
 4. Units to be designed for attachment to floor and wall.
 5. Cable and winch operated.
 - B. Bumper Guards:
 1. Furnish padded bumper guards fabricated using 18 ounce vinyl fabric over 2" minimum thickness padding.
 2. Padding shall be designed to cover metal components, including winch, of mat storage unit.
 3. Padding to be secured using velcro straps
 - C. Mat Storage Sack:
 1. Furnish with mat storage sack for storage of each rolled section of wrestling mats.
 2. Secure with velcro straps.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate configuration, size, and installation of gymnasium divider with height, slope, and type of building structure and lighting fixtures, mechanical equipment, ductwork, fire-suppression system, bleachers, athletic equipment, and other potential obstructions
- B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication of special components, when possible, to ensure proper fitting of work.
 1. Verify height of structure; modify backstop support system as required to accommodate structure height.
 2. Allow for adjustment and fitting of trim and filler panels wherever taking of field measurements before fabrication might delay work.
- C. Inspection: The contractor shall examine the work area and conditions under which the products specified herein are to be installed. Notify Architect in writing of conditions detrimental to installation of products specified and the completion of the work. Do Not proceed with work until unsatisfactory conditions have been corrected.

1. Verify location of HVAC duct work and accessories provided under other contract; coordinate work performed under this contract with work being performed by others.
 - a. Modify backstop support system as required to accommodate HVAC duct and other mechanical system components.
2. Verify location of Light fixtures, devices and accessories provided under other contract; coordinate work performed under this contract with work being performed by others.
 - a. Modify backstop support system as required to accommodate lights and other electrical system components.

3.02 INSTALLATION

- A. Install equipment complying with manufacturer's instructions.
- B. Provide and install Basket Ball Back Stops in locations shown on drawings. If not shown provide:
 1. Play (Main) Court; 2 Each Glass Back Stops.
 2. Practice (Side) Courts; 4 Each Glass Back Stops.
- C. Provide and install gymnasium floor sleeves in locations shown on drawings. If not shown provide:
 1. Four each gymnasium floor sleeves in locations to be directed by Architect.
 2. Top plate of floor sleeve to be flush with top surface of finished floor.
 3. Install interior basketball backstops and related items in locations shown on drawings, at regulation heights, anchoring all components securely in place in accordance with Manufacturers written instructions.
 4. All items to be installed plumb and level.
 5. Rim height to comply with applicable regulations and standards.
 6. Located back stop in relationship to play court as shown on drawings and in accordance with applicable regulations and standards.
- D. Ensure that operating parts work freely and fit neatly; adjust hardware and catches as required.
- E. Repair or replace damaged parts, dents, buckles, abrasions or other damage affecting appearance or serviceability, as acceptable to Architect.
- F. Painting:
 1. Refinish factory primed components where factory applied finish is damaged.
 2. Apply field applied painted finish, minimum three coats, in accordance with provisions of Section 09900, Painting and Finishing. Color to be as selected by Architect.
- G. Coordinate and cooperate with other trades for proper location of roughing-in services connections specified in other Divisions of these specifications.
- H. Installation of cables and electrical connections by licensed electricians under this contract; provide all wiring diagrams and supervise electrical connections.
- I. Test all operations and verify that units in good working order at time of Final Approval.

3.03 PADDED WALL PANELS

- A. Install padded wall panels in accordance with manufacturers written instructions and as described herein.
 1. Install panels at each end wall of play court for full width of play court.
 2. Panels to be installed plumb and square.
 3. Tightly abut adjacent panels.
 4. Extend panels to within 4" of wall openings (louvers, vents and/or doors).
 5. Attach panels to wall with concealed fasteners of type recommended by manufacturer spaced no more than 6" on center along the perimeter of each panel.

3.04 DIVIDER CURTAIN:

- A. Install divider curtain at play court centerline. Extend to within 3' of wall and 3' of bleachers in the retracted position.
- B. Install even and level with curtain hanging 2 inches above floor in down position.
- C. Install control switch such that operator has view of complete gymnasium divider during lowering and raising.
- D. Adjust limit switches of electric winch to ensure accurate position in both stored and lowered positions.

3.05 WRESTLING MAT STORAGE UNITS

- A. Securely and permanently anchor mat storage wrack to wall and floor in accordance with manufacturer's written instructions.
 - 1. Set unit square, plumb and level.
- B. Install and render operational winch loading system.
- C. Install protective bumper pads.

3.06 INSTRUCTION

- A. Prior to final inspection and at the time designated by the Owner, demonstrate to the Owner's representatives the proper operation and maintenance of items specified herein.
 - 1. A verification of instructions shall be signed by an Owner's Representative and submitted to the Architect as part of the closeout documents.
- B. Operate divider curtains to ensure proper lifting and lowering. Adjust as required to ensure smooth operation and accurate positioning.

END OF SECTION 11481

**SECTION 12494
WINDOW SHADES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manually operated, roll-up fabric interior window shades with single rollers, including mounting and operating hardware.
- B. Application: Manually Operated Shades:
 - 1. Provide manually operated shades at all **new** exterior windows.
 - 2. Window shades not required at doors and door side lights unless specifically noted otherwise.

1.02 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: Blocking for support of window shade hardware.
- B. Section 07900 - Joint Sealers: Sealants for perimeter of shade system.
- C. Section 09260 - Gypsum Board Assemblies: Suspended gypsum board ceilings to contain recessed window shade pockets.
- D. Section 09510 - Acoustical Ceilings: Suspended acoustical panel ceilings to contain recessed window shade pockets.

1.03 REFERENCES

- A. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

1.04 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product specified, including:
 - 1. Preparation instructions and recommendations.
 - 2. Installation and maintenance instructions.
 - 3. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
 - 4. Storage and handling requirements and recommendations.
 - 5. Mounting details and installation methods.
- B. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
- C. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings, field verified window dimensions, quantities, type of shade, controls, fabric, and color, and include opening sizes and key to typical mounting details.
- D. Selection Samples: For each finish product specified, two complete sets of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two complete sets of shade components, unassembled, demonstrating compliance with specified requirements. Shade fabric sample and aluminum finish sample as selected, representing actual product, color, and patterns. Mark face of material to indicate interior faces.

1.05 INFORMATION SUBMITTALS

- A. Qualification Data:
 - 1. Submit installer's qualifications
- B. Product Certificates:
 - 1. For each of shadeband material, signed by product manufacturer.

- C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
 - D. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.
- 1.06. CLOSE OUT SUBMITTALS
- A. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
- 1.07. MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials that match products and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Roller Shades: Full size units equal to 5% of quantity installed for each size, color and shadeband material indicated, but no fewer than two units.
- 1.08. QUALITY ASSURANCE
- A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.
 - B. NFPA Flame-Test: Passes NFPA 701. Materials tested shall be identical to products proposed for use.
 - C. Mock-Up: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Locate mockup in window(s) designated by Architect.
 - 2. Do not proceed with remaining work until mockup accepted by architect.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed work if undisturbed at time of Substantial Completion.
- 1.09. DELIVERY, STORAGE, AND HANDLING
- A. Do not deliver window shades until building is enclosed and construction within spaces where shades will be installed is substantially complete.
 - B. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.
 - C. Label containers and shades according to Window Shade Schedule.
 - D. Store products in manufacturer's unopened packaging until ready for installation.
- 1.010. SEQUENCING
- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
 - B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.011. FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.012. WARRANTY

- A. Hardware and Shade Fabric: Draper's standard twenty-five year limited warranty.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. BTX Window Automation, Inc.
 - 2. DFB Sales
 - 3. Draper Inc.
 - 4. Hunter Douglas Contract
 - 5. Lutron Electronics Co., Inc.
 - 6. MechoShade Systems, Inc.
 - 7. Nysan Solar Control Inc.; Hunter Douglas Company
 - 8. OEM Shades Inc.
 - 9. Shade Techniques, LLC
 - 10. Silent Gliss USA, Inc.
 - 11. SM Automatic, Inc.
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.02. MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Manufacturer's standard
 - a. Loop Length: Full length of roller shade
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Clip, jamb mount
 - 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
 - a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.
- B. Spring Operating Mechanisms: Roller contains spring sized to accommodate shade size indicated. Provide with positive locking mechanism that can stop shade movement at each half-turn of roller and with manufacturer's standard pull.
- C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End location: right side of inside face of shade
 - 2. Direction of Shadeband Roll: Regular, from back of roller
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method
- D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

- E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- F. Shadebands:
 - 1. Shadeband Material: Light-filtering fabric
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As selected by Architect from manufacturer's full range
- G. Installation Accessories:
 - 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches
 - 2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.
 - 3. Endcap Covers: To cover exposed endcaps
 - 4. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 6 inches.
 - b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
 - 5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess of pocket and snap-in attachment to wall clip without fasteners.
 - a. Closure-Panel Width: 2 inches
 - 6. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
 - 7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
 - 8. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.03. SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701 testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - 1. Source: Roller-shade manufacturer
 - 2. Type: PVC-coated polyester
 - 3. Weave: Mesh
 - 4. Roll Width: Match Window Size; No greater than 4'-0" wide
 - 5. Orientation on Shadeband: Up the bolt
 - 6. Openness Factor: 10 percent
 - 7. Color: As selected by Architect from manufacturer's full range

2.04. ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side of 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill or floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
 - 2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
 - 1. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panels(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02. ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions
 - 1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass.

3.03. ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.04. CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

**SECTION 12760
TELESCOPING BLEACHERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Definition: Operable systems of multiple-tiered benches on interconnected, folding supports which permit closing, without requiring dismantlement, into nested relationship for purposes of storing or moving.
- B. Types specified in this Section include following:
 - 1. Wall-attached units.
- C. Electrical wiring and connections:
 - 1. Electrical Stub outs for bleachers have been provided under the building contract.
 - 2. Under this contract the contractor shall be responsible for:
 - a. Verifying electrical service to be provided under the building contract.
 - b. Verifying electrical service provided under building contract is appropriate for equipment to be provided under this contract. If electrical characteristics are not suitable for equipment being furnished, the contractor shall include in his cost necessary revisions to equipment to function correctly with service being provided.
 - c. Providing final electrical connections between electrical rough-outs and bleachers.
 - 3. Electrical work to be performed by a licensed electrician and comply with applicable electrical codes.

1.03 QUALITY ASSURANCE

- A. Applicable Codes:
 - 1. NFPA Standard: Comply with applicable requirements of NFPA 102, "Standard for Assembly Seating, Tents, and Air-Supported Structures", and specifically with Chapter 9, "Folding and Telescopic Seating", except where more stringent requirements indicated or imposed by authorities having jurisdiction.
 - 2. International Building Code: Comply with applicable provisions of International Building Code.
 - 3. Electrical Codes: Comply with applicable provisions of National Electric Code.
 - 4. Americans With Disabilities Act (ADA).
 - 5. ANSI A117.1; 1987; Handicapped Accessibility Code.
 - 6. Where provisions of applicable codes conflict the more stringent of the requirements shall govern.
- B. Qualifications of Manufacturer: The Manufacturer of products of this Section shall have been successfully engaged in the business of manufacturing the products described herein for a period of not less than five (5) years immediately prior to furnishing products in this section.
 - 1. In addition to the above the manufacturer shall furnish the Architect the following:
 - a. A list of 10 comparable installations completed in the last five years.
 - b. Proof of financial ability to fulfill the contract.
- C. Qualifications of Installer: Installation of product specified herein shall be accomplished only by skilled workmen experienced in the installation of products specified, the installation instructions of the manufacturer of the products being installed, and who are completely familiar with the requirements of this portion of the work.
- D. Warranty: Contractor shall furnish Manufacturers standard 10 Year warranty against delamination, deterioration, or other failure of bleacher components or systems.
 - 1. Failed materials shall be replaced or repaired as directed by Architect at no cost to the Owner.

1.04 SUBMITTALS

- A. Prior to commencing work submit the following:
 - 1. A certified statement of qualifications.
 - 2. A certified statement to the effect that all products proposed to be used meet the requirements of this section.
- B. Product Data: Submit manufacturer's product literature and installation instructions for each type bleacher and accessory indicated; include color charts where materials requiring color selection indicated.
- C. Shop Drawings: Submit shop drawings indicating layout of telescoping bleacher units coordinated with field measurements and including seat heights, row spacing and rise, aisle widths and locations, overall dimensions in closed and open position, connections and relationship to adjoining work, accessories, types of materials, and finishes.
 - 1. Bleacher supplier shall submit two sets of shop Drawings to State Fire Marshall's office for review and approval.
 - a. Modify and resubmit shop drawings as required to obtain approval.
 - 2. One copy of State Fire Marshall Approved plans shall be submitted to Architect along with complete set of shop drawings.
- D. Samples: Submit following:
 - 1. Plywood: 12" square samples of standard footrest material finished with manufacturer's standard coating.
 - 2. Molded Plastic Seats: One end cap in each color indicated.
- E. Colors: Submit manufacturers standard colors from which the Architect may select.
 - 1. The Architect shall be permitted to select multiple colors; including combination of colors to spell out word or abbreviation to be selected, on each bank of bleachers.
- F. Operating and Maintenance Data: Submit detailed instructions indicating proper means for operating and maintaining each type of bleacher unit and accessory required.

1.05 DELIVERY AND STORAGE

- A. Materials shall be adequately packaged and protected during shipment. Upon arrival at job site, contractor shall inspect materials for damages and stains. Damaged or permanently stained materials shall be removed from the site and replaced at no cost to the owner. Store materials in dry-ventilated area until immediately before installation.

1.06 PROJECT CLOSEOUT

- A. Operation and Maintenance Data:
 - 1. Provide complete written operation and maintenance data.
- B. Instruction: The manufacturer shall conduct on-site training of the Owner's personnel in the proper operation and maintenance of the bleachers. Training to be video taped with the tape being turned over to the Owner for future use.
- C. Placard: Furnish and install permanent metal or engraved plastic (min. 1/8" thick) placard at each end of the bleachers written instructions in the proper operation of the bleachers.
 - 1. Affix to wall with screws.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following:
1. The Folding Bleacher Co
 2. Hussey Seating Co.
 3. Interkal Inc.
 4. Universal Bleacher Co.

2.02 DESIGN CRITERIA

- A. Bleachers shall be designed to support and resist, in addition to their own weight, the following minimum loads:
1. Seatboards and footboards: Designed for a Minimum of 120 Pounds per Lineal Foot, Live Load.
 2. Other Components: Designed for a Minimum of 100 Pounds per Square Foot, Live Load.
 3. Side Sway: Designed for a Minimum load of 24 Pounds per linear foot or row.
 4. Front to Rear Sway: Designed for a Minimum load of 10 Pounds per linear foot or row.
- B. Railings, Posts, and sockets to be designed to withstand the following horizontal forces when applied separately:
1. 50 Pounds per foot acting outward at top-rail.
 2. 25 Pounds per foot acting outward at mid-rail.
- C. Overall Dimensions: Bleachers to be designed to manufacturers standard dimensions complying with the following:
1. Rows: 5
 2. Length: 94'-6"
 3. Open Depth: 9'-3"
 4. Closed Depth: 3'-5"
 5. Row Spacing: 24"

2.03 MATERIALS

- A. Lumber: Softwood, kiln dried, surfaced 4 sides, 1" nominal thickness, complying with PS 20 for solid lumber or PS 56 for glued-up lumber and with following requirements.
1. Lumber Species and Grade: One of following at manufacturer's option.
 - a. Douglas Fir complying with WWPA Grading Rules for C Select grade.
 - b. Southern Pine complying with SPIB Grading Rules for C and Better finish grade.
 2. Lumber Form: At manufacturer's option, provide solid lumber or lumber either edge and end glued, end glued only, or finger joined, as required to produce size needed for bleacher components.
- B. Plywood: 5/8" nominal thickness, 5-ply construction, A-C veneer grades with solid crossbands, Group 1 veneer species for all plies, Exterior, APA grade trademarked, complying with PS-1.
1. Rise Per Row: 10
- C. Structural Steel Shapes, Plates and Bars: ASTM A 36, except where higher strength steel indicated or standard with manufacturer.
- D. Steel Sheet: ASTM A 366, Class 1, commercial quality, cold-rolled sheet, 0.055" min. thickness.
- E. Structural Tubing: ASTM A 501, hot-rolled.
- F. Polyethylene Plastic: ASTM D 1248, Type III, Class B; molded, high density, color-pigmented, textured, impact-resistant, structural formulation, internal reinforcement ribs; in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.
- G. Fasteners: Vibration-proof, of size and material standard with manufacturer.

2.04 CONSTRUCTION

- A. General:
 - 1. Provide manufacturer's standard telescopic bleacher system fabricated to comply with requirements indicated.
 - 2. Smoothly round corners, edges and exposed fasteners, if any, to eliminate snagging and pinching hazards.
 - 3. Form exposed sheet metal with flat, flush surfaces, true to line and level, and without cracking and grain separation.
 - 4. Perform welding by operators and processes complying with AWS requirements.
- B. Bench Seats and Upper Risers: Fabricate from following materials to form seats with uniform heights per bleacher unit of not less than 16" nor more than 18", as standard with manufacturer:
 - 1. Material: Polyethylene plastic, 18" long, interlocking and contoured to form individual seats, with recesses for number plates and molded end caps at exposed ends.
- C. Lower Risers and Foot Rests:
 - 1. Provide recessed lower riser and fully closed foot rest construction.
 - 2. Fabricate riser from heavy gage steel sheet with baked enamel, vinyl-cladding or galvanized finish as standard with manufacturer.
 - 3. Fabricate foot rest from plywood as standard with manufacturer.
- D. Understructure: Fabricate understructure from structural steel members of size, spacing and form required to support design loads with cantilevered bench seat supports to product toe space uninterrupted by vertical bracing.
 - 1. Steel understructure to be fully welded by certified welders.
- E. Support Column Wheels: Provide manufacturer's standard wheel assembly under each support column.
 - 1. Include wheels of size, number and design required to support bleacher units and to achieve smooth operation without damage to flooring surface, but not less than 4 per column nor less than 3-1/2" in diameter and 1" wide.
- F. Aisles: Fabricate bleacher units with following types of aisles, at locations and of widths indicated:
 - 1. Footrest Level Type: Interrupt bench seats to provide aisle walking surfaces at foot rest level.
 - 2. Provide manufacturer's standard metal nosing for aisles with wood walking surfaces.
- G. Row Spacing: Fabricate units with row spacing of 24", unless otherwise indicated.
- H. Row Rise: Fabricate units with row rise of between 9-5/8" and 10-1/2", as standard with manufacturer.
- I. Type of Bleacher Units: Provide assemblies of the following type fabricated in lengths and number of rows indicated.
 - 1. Wall-Attached Type: Provide units with rear of understructure permanently attached to wall/floor construction.
- J. Accessories: Provide following accessories of manufacturer's standard design and construction, at locations indicated or required.
 - 1. Foot Level aisles, 48" wide minimum; except where noted.
 - 2. End panels covering exposed ends of bleacher units in closed position.
 - 3. Rear fillers including supports for closing openings between top row and rear wall of adjoining construction.
 - 4. End railings of telescoping, self-storing type; furnish at each end of bleachers.
 - 5. Aisle railings of removable type; furnish at each aisle.
 - 6. Front railings at handicapped spaces of removable type; furnish at H.C. spaces.
 - 7. Intermediate steps at all aisles.

8. Scorer's table (15" X 8'-0") of removable type for attachment to mounting sockets provided as part of bleacher unit; furnish one unit on home side.
 - a. Table shall have high pressure plastic laminate finish with painted steel tubular legs. Table shall be designed with a sloped top and a pencil tray along bottom edge.
9. Trap Doors to be provided where necessary for access to areas under bleachers for cleaning purposes.

2.05 FINISHES

- A. Wood and Transparent Finish:
 1. Prepare surfaces by machine sanding, supplemented by hand sanding where required, followed by application of sealer coats and transparent top coats, of type, in number, and by process standard with manufacturer.
 2. Apply to wood surfaces except where otherwise indicated.
- B. Painted Ferrous Metal Surfaces:
 1. Apply manufacturer's standard baked enamel finish over shop-cleaned ferrous metal surfaces.
 2. Apply to exposed and concealed metal surfaces including understructure, except where other types of finishes indicated.
- C. Painted Plywood: Manufacturer's standard wear-resistant finish in manufacturer's standard color.
- D. Galvanized Finish: Manufacturer's standard G60 galvanized finish with matte finish, complying with ASTM A 525.

2.06 OPERATION

- A. General: Provide bleacher units incorporating manufacturer's standard telescoping system of seating and understructure members which permit opening and closing with respect to adjacent rows, which allow any or all rows to be locked open for use, and which close with vertical faces of upper skirts in same vertical plane.
 1. All rows shall extend and stack in a telescopic action. One or more rows may be extended as desired.
 2. Each row shall automatically and positively lock in extended position without use of floor plates or shoes.
 3. A system for assuring positive engagement and proper alignment between all vertical supports is required.
- B. Furnish tractive or non-tractive electric operation, at Contractor's option.
- C. Tractive Electric Operation:
 1. Provide manufacturer's standard powered operation of bleacher units by means of series of electric motor-driven units mounted under first rows of bleacher units which apply tractive force to floor.
 2. Use units with non-marking rubber rollers or tracks which will not mar or damage type of floor over which bleacher units move.
 3. Control units by either plug-in, walk-along pendant switch or remotely, from key operated switch in wall mounted control station, as standard with manufacturer.
 4. Coordinate wiring requirements and current characteristics of motors and control stations with building electrical system.
- D. Non-Tractive Electric Operation:
 1. Provide manufacturer's standard non-tractive powered operation of bleacher units by means of electric-motor operated pusher-linkage and reel system which does not apply tractive force to floor.
 2. Use linkage system fitted with rollers on every link to let chains roll smoothly across floor.
 3. Control units by either plug-in, walk-along pendant switches or from key-operated switch in wall mounted control station, as standard with manufacturer.
 4. Coordinate wiring requirements and current characteristics of motors and control stations with building electrical system.
- E. Limit Switches: Equip motors with limit switches to shut off motor when bleachers exceed a pre-set limit of travel.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Field Measurements:
 - 1. Take field measurements prior to preparation of shop drawings and fabrication of special components, when possible, to ensure proper fitting of work.
 - 2. Provide "cut-outs" in bleachers where necessary to accommodate columns, pilasters and other off-sets in walls.
- B. Inspection: The contractor shall examine the work area and conditions under which the products specified herein are to be installed. Notify Architect in writing of conditions detrimental to installation of products specified and the completion of the work. Do Not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install telescoping bleacher units to comply with manufacturer's instructions and final shop drawings.
- B. Provide accessories indicated and anchors, inserts, and other items required for installation of units and attachment of adjoining construction.
- C. Make electrical hook-ups in accordance with manufacturers written instructions and applicable codes.
 - 1. As part of this section provide and install disconnects at each point of connection.
- D. Test all operations and verify that units in good working order at time of Final Approval.

3.03 ADJUSTMENT AND CLEANING

- A. Upon completion of installation, including work of other trades, lubricate, test and adjust telescoping bleachers to operate easily and in compliance with manufacturer's specifications.
- B. Ensure that operating parts work freely and fit neatly; adjust hardware and catches as required.
- C. Repair or replace damaged parts, dents, buckles, abrasions or other damage affecting appearance or serviceability, as acceptable to Architect.
- D. Prior to cleaning remove all maskings and labels.
- E. Painting: Refinish factory painted components where factory applied finish is damaged.
- F. Clean installed bleacher units on exposed and semi-exposed surfaces.
- G. Touch-up shop applied finishes to restore damaged or soiled areas.

3.04 INSTRUCTION

- A. Prior to final inspection and at the time designated by the Owner, demonstrate to the Owner's representatives the proper operation and maintenance of items specified herein.
 - 1. A verification of instructions shall be signed by an Owner's Representative and submitted to the Architect as part of the closeout documents.

END OF SECTION 12760

SECTION 13930
WET-PIPE FIRE SUPPRESSION SPRINKLERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 WORK INCLUDED

- A. Work under this Section includes provision of all plant, labor, and materials necessary to furnish and install products and systems specified, including all anchors, fittings, accessories, devices, and attachments required for complete installation and operation of automatic sprinkler system, fire department connections and accessories that complies with requirements of contract documents, N.F.P.A. 13, 14 and 24 and other applicable local, state and national codes, and the Owner's insurance company, Sections of Division 15, Mechanical, and Section of Division 16, Electrical.
 - 1. References to standards and codes are intended to establish minimum requirements. Such references are not intended to limit the scope of the work. The contractor shall provide all materials and labor to necessary to comply with provisions of the contract documents and as required to provided a fully functional, code compliant system.
 - 2. Where conflicts exists between the requirements of this section and referenced codes and standards the more stringent of the requirements shall govern. In cases where the conflict is not an issue of stringency or scope, the requirements of these technical specifications shall govern.
- B. Work includes providing a complete and operational building sprinkler system for each new interior space, portions of existing building as indicated, exterior overhangs, and exterior covered areas (canopies, walkway covers, and other exterior covered areas).
- C. Contractor responsible for coordination of requirements of sprinkler system with all conditions of building including, but not limited to, shelving, lights, grilles and diffusers, piping, ductwork, doors, windows, cooking equipment, walls (fire-rated and non-fire-rated), beams, joists, columns, HVAC equipment, electrical panels and equipment, ceilings, areas without ceilings, ceiling and soffit furrings, floors and all building appurtenances.
- D. Related Sections; The Following Sections contain requirements that relate to this Section:
 - 1. Section 02513; Fire Water Distribution
 - 2. Section 02514; Site Water
 - 3. Section 15000; General
 - 4. Section 15012; Standards
 - 5. Section 15094; Hangers
 - 6. Division 16000; Electrical

1.03 CODES AND REGULATIONS

- A. Conform sprinkler system design, equipment, materials, devices, and installation to N.F.P.A. Codes and Requirements of Governmental Bodies and Bureaus including following:
 - 1. N.F.P.A - 13, 14 and 24.
 - 2. Local Fire Department
 - 3. State Fire Marshal
 - 4. City Fire Marshal
 - 5. City Building Department
 - 6. Fire Insurance Rating Bureau
 - 7. Safety Fire Commissioner

1.04 SPRINKLER SYSTEM DESIGN

- A. It is the responsibility of Contractor and Sprinkler Installer to **DESIGN SPRINKLER SYSTEM** and submit proposed sprinkler system to State Fire Marshal and Local City/County Fire Marshals or Building Inspector and Owner's Insurance Company.
 - 1. Revise and resubmit design to reviewing authorities as necessary and required to obtain approval.
 - 2. Obtain final approved drawings from Fire Marshals and Insurance Company before submitting sprinkler system to Architect for review.
 - 3. Submittals delivered to Architect for review, which have not been reviewed and approved by above listed agencies, will be returned for correction without review by the Architect.
- B. Sprinkler Installer, prior to bid date, visit jobsite and perform all water pressure tests necessary to comply with these specifications.
 - 1. Contractor shall use pressure measured for design of sprinkler system.
 - 2. If existing pressure exceeds 60 PSI Static, sprinkler contractor shall use 60 PSI static for design calculations. Do not assume a pressure greater than 60 PSI will be available.
- C. Based on preliminary tests of water pressure and flow rate on existing 8" water mains the following conditions should be anticipated:
 - 1. Water supply data given below is to be used for informational purposes only. The contractor is responsible for field verifying and acquiring design data necessary for bidding and for the design of the system. The information contained herein shall not be used for either bidding or design purposes.
 - 2. Fire Hydrant Location:
 - a. Static Pressure: 96 PSI
 - b. Residual Pressure: 90 PSI
 - c. Flow Rate: 1680 GPM
- D. Seismic Design: Where building located within a seismic zone, as defined by the current edition of the Southern Building Code, include in system design provisions required for seismic design.
 - 1. Provide sway bracing for piping.

1.05 SYSTEM DESCRIPTION

- A. Design criteria includes, but is not limited to, providing a **Wet** and **Dry** Sprinkler Systems, hydraulically calculated to comply with above Codes and Regulations.
 - 1. Provide **Wet** Sprinkler systems for areas other than those indicated to be Dry pipe system.
 - 2. Provide **Dry** Pipe Sprinkler systems where code requires or lack of weather protection dictates. Areas required to have dry pipe system include, but are not limited to:
 - a. Exterior Covered areas (Work areas, recessed building entrances, canopies, walks, bus loading areas).
 - b. Other areas where pipe is subjected to freezing.
- B. Sprinkler entrance: Sprinkler water will enter the building as follows:
 - 1. Refer to Site Plan and/or floor plan for location of service entrance.
 - 2. Under this contract the sprinkler contractor shall extend the sprinkler line from riser to fire loop, install cut off valve, and connect to water source.
- C. Sprinkler Risers: Provide number of risers required by code and as follows:
 - 1. Provide number of risers required by facility.
 - 2. Provide a minimum of two risers new risers.
 - 3. Provide a minimum of one riser for each 45,000 sf of building area.
 - 4. Refer to civil drawings for modifications to existing sprinkler entrance, risers and FDC.
- D. Allocated Space: The size of the room in which the sprinkler riser is to be placed is shown on the drawings. Should the design utilized require more space, the contractor shall notify the Architect in writing prior to the bid date so that appropriate changes may be incorporated into the contract documents. Lack of notification shall be construed as an indication that the allocated areas are adequate.

- E. Wet Automatic Sprinkler System Required in following areas:
 - 1. Portions of existing building where indicated on drawings.
 - 2. Portions of existing building where space or elements in the spaces modified.
 - 3. All areas of new construction
 - 4. Exterior areas required by code.
 - 5. Other areas indicated on drawings.
 - F. Make equipment, devices, apparatus, and accessories requiring normal servicing, operation or maintenance, easily accessible.
 - G. Wiring of signal and alarm devices: Provide as part of this contract, electrical service (wire, conduit, devices, signals, alarms, etc), controls, and connections necessary to render system operational. As part of the work of this section interconnect sprinkler system, including post indicator valve and flow switches at back flow preventor to Building Fire Alarm system.
 - 1. Electrical work to conform with the Requirements of Division 16.
 - 2. Electrical work to be performed by Licensed Electricians.
- 1.06 OPERATING INSTRUCTIONS
- A. Furnish typed instructions relative to sprinkler controls, alarm device operations and emergency procedures.
 - B. Encase instructions in metal frame with clear lucite cover and permanently install next to sprinkler riser main.
 - C. Develop and provide a drawing showing the location of each riser and the are served by the riser, Drawing shall be framed with a clear lucite cover. Permanently affix to wall adjacent to each sprinkler riser.
 - D. Provide three copies of NFPA 13A Pamphlet and NFPA 25.
- 1.07 QUALITY ASSURANCE
- A. Sprinkler Installer: Licensed in State of Georgia as "Fire Protection Sprinkler Contractor" and:
 - 1. Regularly engaged in making such installations.
 - 2. Successfully installed automatic fire extinguishing sprinkler systems of same type and design as specified.
 - 3. Provide evidence of such qualifications; data to include:
 - a. Names and locations of at least five (5) installations where Sprinkler Installer installed such systems.
 - b. Indicate type and design of each system and certify that each system performed satisfactorily in manner intended for period of not less than five (5) years..
 - c. Copy of valid "Certificate of Competency" and copy of certificate of each "certified holder" responsible for sprinkler system installation as described in Georgia Fire Sprinkler Act.
 - 4. Submit qualifications to Architect with Working/Shop Drawings; drawings submitted without above qualifications will not be reviewed and considered not complying with specifications.
 - B. Certification of Compliance: As part of shop drawings the sprinkler contractor shall submit a certificate stating that the materials and installation methods to be used comply with the provisions of the specifications and the provisions of applicable codes.
- 1.08 TESTS AND CERTIFICATION
- A. Sprinkler Contractor test system, and pay associated costs, in accordance with Chapter 1, Paragraph 11 of NFPA-13, current applicable Standards of the Insurance Company, Fire Marshal, and all local requirements.
 - 1. Conduct tests in presence of authority having jurisdiction, Architect, and Insurance Company and Owner's Representative.
 - 2. Contractor have available at site, a copy of the prescribed test.
 - 3. Contractor give ample notice of time for conducting tests.

- B. Minimum test requirements, unless otherwise noted or required by code shall include:
 - 1. Wet Sprinkler System; Hydrostatically tested at 200 PSI or 50 PSI above maximum operating pressure; whichever ever is greater for a minimum of two hours.
 - a. Maximum allowable leakage: No visible leakage.
 - b. Maximum allowable Pressure drop: 0 PSI.
 - 2. Dry Sprinkler System; Compressed Air tested at 40 PSI for 24 hours.
 - a. Maximum allowable Pressure Loss: 1.0 PSI in 24 Hours.
 - C. Should any component of system fail prescribed test, Contractor replace such component with component of increased strength as required to withstand test; such replacements made at no additional cost to Owner.
 - D. Additives and corrosive chemicals, sodium silicate or derivatives of sodium silicate, brine or other corrosive chemicals shall not be used for testing systems and stopping leaks.
 - E. Upon completion of installation and test, Contractor prepare "Contractor's Material and Test Certificate", as prescribed in Chapter 1, Paragraph 12, of NFPA-13.
 - 1. Contractor's and Owner's Representative sign certificate.
 - 2. Contractor furnish copies of signed Certificate to Authorities with jurisdiction, Owner, Insurance Rating Bureau and Architect.
- 1.09 SUBMITTALS
- A. Pre-requisite: Obtain written or stamped approval of drawings Fire Insurance Bureau, authorities having jurisdiction, State and Local inspecting Fire Marshal and Owner's Insuring Company prior to submitting shop drawings to Architect for approval.
 - B. Detailed Drawings: Prepare and submit min. of four (4) complete sets of detailed working drawings showing equipment, underground fire service lines, risers, pumps, piping and heads.
 - 1. Provide Reflective ceiling Plan showing ceiling and head layout. Coordinate with reflective ceiling plan to be furnished by ceiling contractor.
 - C. Hydraulic Calculations: Contractor to develop and submit to architect as part of shop drawings complete hydraulic calculations including, but not limited to:
 - 1. Flow Diagram
 - 2. For gridded and tree systems, pressures at hydraulic junction points shall balance within 0.5 psi. The highest pressure at the junction point shall be carried into the calculations.
 - 3. Supply water pressure test data used in sprinkler system design. Water pressure data shall include flow, residual pressure, static pressure, date taken and location.
 - D. NFPA Certificates: On completion of installation, obtain and deliver to the architect the NFPA-85A and NFPA-85B certificates of final inspection and approved by the Georgia Department of Administrative Services, Risk Management Services, and the State Fire Marshal. test certificates shall be signed by a certificate of competency holder.
 - E. Submit min. of four (4) copies of manufacturer's catalog data and specifications of all major components of sprinkler system.
 - 1. Catalog data to completely describe and generally detail products used.
 - F. Obtain written or stamped approval of drawings Fire Insurance Rating Bureau, authorities having jurisdiction, State and Local inspecting Fire Marshal and Owner's Insurance Company before submitting to Architect.
 - 1. Submit copy of approvals with shop drawing submittal.
 - G. Coordinate sprinkler drawings with mechanical and electrical drawings, and reflected ceiling plans.
 - 1. Because drops for sprinkler heads installed before lighting, air ducts and air outlets installed, Sprinkler Installer locate heads so as to avoid interference with such items.
 - 2. Locations for plumbing, mechanical and electrical components have priority over sprinkler piping and head locations.

- H. Sprinkler Head Layout: Where sprinkler heads installed on modular ceiling panels, locate heads in center of ceiling panel, or located in other symmetrical pattern acceptable to Architect.
 - 1. Where sprinkler heads installed in modular ceiling panels, heads shall be located in center of panel in a symmetrical pattern acceptable to architect.
 - 2. Sprinkler heads and escutcheons shall not be in contact with ceiling grid, HVAC grilles, or lighting fixture frames.
 - 3. Sprinkler Contractor furnish additional heads required for coordinated ceiling pattern without additional cost, even though number of heads may exceed minimum code requirements.
 - I. Record Drawings: At project closeout, submit record drawings of installed fire water system piping and products in accordance with requirements of Division 1 Sections of Specifications.
- 1.10 FLOW TEST:
- A. Upon the completion of the work the contractor shall conduct tests of the water flow and pressures at the fire protection riser to verify that the flows and pressures are consistent with those used in the design of the system.
 - 1. Data to be obtained in the performance of the tests to include:
 - a. Flow rate (gallons per minute)
 - b. Static Pressure
 - c. Residual Pressure
 - 2. The results of the test data, along with the following information, shall be furnished to the architect, as part of the close out documents:
 - a. Firm: Name and Address
 - b. Individual who performed the test: Name, address and phone number
- 1.11 DELIVERY, STORAGE AND HANDLING
- A. Delivery of Materials:
 - 1. Time purchase and delivery of materials with progress of construction so as to limit time materials are exposed to the elements.
 - B. Store off ground in dry ventilated space or protect with breathable waterproof tarpaulins.
 - 1. Where stored at building exterior place on pallets or other devices to elevate materials off of ground.
 - 2. Protect all materials from exposure to dirt, soil, mud, and moisture.
 - C. Where materials are exposed to dirt, soil, mud, moisture or other contaminants, the contractor shall remove such contaminants from all materials.
 - 1. Where corrosion is evident on pipes, fittings, and/or accessories, such corrosion shall be removed and the pipes painted with a rust inhibiting paint.
 - 2. Where interior of pipe is found to be corroded, such pipe shall be removed from the project site and replaced with new, non-corroded materials.
- 1.12 GUARANTEE
- A. Sprinkler Installer, in addition to other warranties or guarantees required by Contract Documents, guarantee all piping, devices, and related materials on workmanship for period of two years from date of Architect's final acceptance of Work; correct defects promptly at no cost to Owner.
 - B. Because Contractor responsible for providing sprinkler system coordinated with Contract Documents and approved by all authorities specified above in "Codes and Regulations", Contractor correct all deficiencies pointed out by field inspectors representing these authorities. Such corrections shall be at no cost to the contract.

PART 2 - PRODUCTS

2.01 PIPE MATERIAL

- A. Underground, Exterior Piping:
 - 1. Class 50 or 52 Ductile Iron, Mechanical joint water main.
- B. Above ground, interior Piping:
 - 1. Pipes 1-1/2" in size and smaller:
 - a. Black steel, Schedule 40, ASTM-A120-84 and ASTM A53-84, with threaded, grooved or welded joints.
 - b. Schedule 10 not permitted.
 - 2. Pipes over 1-1/2" in size:
 - a. Either Schedule 40 or Schedule 10, ASTM-A120-84 and ASTM A53-84, grooved, welded joints or thread joints.
 - 3. No slip joints or plain end couplings or fittings permitted.
- C. Screwed Fittings: Malleable iron or cast iron, 175 psi cold water pressure. ANSI-B2.1, ANSI-B16.3.
- D. Grooved Fittings and Couplings: Malleable Iron, UL Listed for Fire Protection Systems.
- E. Flanged fittings: Cast iron, 175 psi cold water pressure, ANSI B16.1.
- F. Flange joint: Cast iron flanges, 175 psi cold water pressure. ANSI-B16.1.

2.02 EQUIPMENT

- A. Approved manufacturers/installers subject to conformance with Contract Documents:
 - 1. Grinnell
 - 2. Viking
 - 3. Automatic Sprinkler
- B. Required Equipment: Furnish equipment necessary for a fully operational system in accordance with applicable regulations. Provide, as a min. the following equipment:
 - 1. Piping.
 - 2. Non-corrosive pipe hanger rod and clevis type hangers.
 - 3. Water alarm valve(s), motor(s) and bell(s) or flow switch(s) and alarm bell(s).
 - 4. Automatic ball drips.
 - 5. Pressure gauges.
 - 6. Valved drains and test connections.
 - 7. Fire Lateral shut-off valves, OS&Y pattern gate valves.
 - 8. Zone shut-off valves, OS&Y pattern gate valves.
 - 9. Building shut-off valves, OS&Y pattern gate valves.
 - 10. Post Indicator valve(s) with electrically monitored flow switch for interconnection to building fire alarm system.
 - 11. Free standing siamese fire department connections.
 - 12. Supervised and monitored back flow preventor on sprinkler riser.
 - 13. Pressure reducing valves where water pressure exceeds 175 PSI.
 - 14. Air compressor for dry pipe sprinkler systems.

2.03 BACK FLOW PREVENTORS

- A. Back Flow Preventor: Furnish, as part of this section **one** of the following types of back flow preventors:
 - 1. Double Check Valve(s) Back Flow Assembly; Watts Series 709; with flow electrically supervised flow valves interconnected to building fire alarm system; size to match fire water entrance where acceptable to local officials.
 - 2. Reduced Pressure Back Flow Assembly; Watts Series 909; with flow electrically supervised flow valves interconnected to building fire alarm system size to match fire water entrance for use where chemicals introduced into sprinkler system.

2.04 SPRINKLER HEADS

- A. Provide following types as required:
 - 1. Concealed sprinkler body and escutcheon, matte white finish.
 - a. Areas with suspended gypsum ceilings.
 - b. Areas with gypsum board furring
 - c. Gang Toilet Facilities.
 - d. Corridors and Lobbies.
 - 2. Pendant type chrome plated, exposed body and escutcheon.
 - a. Other areas with suspended ceiling.
 - 3. Standard upright type head for exposed piping, brass finish.
 - a. Areas without finished ceilings and in concealed spaces.
 - 4. Quick Response, concealed horizontal sidewall sprinkler heads (jets).
 - a. For use in existing building to sprinkler the following areas: Keyboarding 303A, Art 304, Art 308, Teach Work Room 311, Storage 316, Band 319, Choral 326.
- B. Temperature Range: Ordinary type, 160°F except where subject to high temperatures caused by unit heaters, hot pipes, or other heat source, provide high temperature type, 250°F.

2.05 DRY-PIPE VALVES:

- A. Dry pipe valves to be UL 260; Differential Type; 175-psig (1200-kPa) working pressure with cast-iron flanged inlet and outlet, bronze seat with 'O' ring seals, and single-hinge pin and latch design.
 - 1. Provide with UL 1486 quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment and fill-line attachment.

2.06 AIR-PRESSURE MAINTENANCE DEVICES:

- A. Air pressure maintenance devices: Provide automatic device to maintain correct air pressure in piping. System to be designed for pressure ratings of 14 to 60 psig (95 to 410 kPa) adjustable range and a maximum 175-psig (1200-kPa) maximum inlet pressure. Provide with all equipment required for proper operation, including, but not limited to:
 - 1. Compressor
 - 2. Shutoff valves to permit servicing without shutting down sprinkler system piping.
 - 3. By-pass valve for quick filling
 - 4. Pressure regulator or switch to maintain pressure.
 - 5. Strainers.

2.07 SPRINKLER HEAD CABINET

- A. Provide one wall mounted sprinkler head cabinet with 6 of each type of sprinkler head used, together with required wrenches for replacing heads.

2.08 ALARM SYSTEM

- A. For wet type systems install water flow indicator of vane type with automatic reset and instant recycling retard and circuit closer, for connection by Fire Alarm Installer in each zone branch.
- B. For dry type systems install a pressure switch with automatic reset and instant recycling retard and circuit closer, for connection by Fire Alarm Installer in each zone branch.
- C. On each zone shut-off valve, install tamper switch to indicate whether the valve open or closed, for connection by Fire Alarm Installer.
- D. At each back flow preventor provide electrically supervised flow switch interconnected with the building fire alarm system.
- E. Interconnect post indicator valve flow switch with building fire alarm system.

PART 3 - EXECUTION

3.01 WATER SERVICE

- A. Sprinkler contractor to extend sprinkler piping to existing water supply in configuration and location shown on civil drawings.

3.02 INSTALLATION

- A. General: Conform work and materials to requirements of Fire Marshal (NFPA 13), Local Building Codes and Owner's Insurance Company.
 - 1. Fire Protection Installer (Fire Protection Sprinkler Contractor licensed by State of Georgia to perform such work) install complete fire sprinkler system piping and appurtenances from its source (origin) at connection to nearest adequate and available water main.
 - 2. Refer to Georgia State Fire Safety Law, sections 21-11-2(5) and 25-11-5 for additional requirements.
- B. Trench Work: Furnish trench work for all underground piping, fittings, valves, etc.
 - 1. Cut no trenches near or under building foundations without Architect's approval, perform trenching and backfilling in accordance with paragraph entitled "Utilities System Trenching", Section 02222.
- C. Underground Supply Piping: Furnish all piping, fittings, valves, etc., necessary for complete underground piping installation from building to nearest and adequate water main.
 - 1. Conform work and materials to requirements of Fire Marshal (NFPA 13), Local Building Codes, and Owner's Insurance Company.
 - 2. Refer to Georgia State Fire Safety Law, sections 21-11-2(5) and 25-11-5 for additional requirements.
 - 3. Install ductile iron underground piping below frost line and otherwise properly protect against freezing or mechanical injury.
 - 4. Clamp all bends, offsets, fittings, piping, etc., in approved manner.
 - 5. Provide concrete thrust blocks at all changes in direction of underground piping. As a minimum provide 4 Cubic Feet at each location.
 - 6. Provide necessary pipe or hose, etc., to discharge water so no damage will occur to buildings or surrounding property.
- D. Back Flow Preventor: Contractor shall provide and install a back flow prevention system in accordance with applicable regulations:
 - 1. Back flow preventer shall consist of either double check valves or reduced pressure devices; as required by applicable codes, regulations and authorities having jurisdiction.
 - a. Where chemicals are use in system provide reduced pressure back flow preventor assembly.
 - b. Where no chemicals are use in system provide double check valve pressure back flow preventor assembly.
 - 2. Provide and install in accordance with applicable regulations.
 - 3. Protect system components from freezing.
 - 4. Provide OS&Y pattern gate valve each side of back flow preventer to allow for removal and replacement of back flow preventor.
 - 5. Interconnect electrically supervised flow switch with building fire alarm system.
- E. Placement of Back Flow Preventor: Back flow preventor shall be placed at the interior of the building on the sprinkler riser assembly.
 - 1. Contractor shall be responsible for verification that available space is adequate.
 - a. If necessary and acceptable to authorities having jurisdiction, stack back flow preventors vertically.
 - b. If space is not adequate notify architect prior to performing any work.
 - 2. Interconnect electrically supervised flow switch with building fire alarm system.
- F. Post Indicator Valve: Install post indicator valve on each sprinkler service entrance.
 - 1. Locate a minimum of 40'-0" from building in location indicated on civil drawings.
 - 2. Pour a 2'-0" X 2'-0" X 6" deep concrete pad at base of valve.
 - 3. Install valve true and plumb.
 - 4. Interconnect with building fire alarm system.

- D. Sprinkler Installer, prior to bid date, visit jobsite and perform all water pressure tests necessary to comply with these specifications.
 - 1. Provide additional materials, equipment and labor necessary to provide additional pressure should existing pressure not be adequate.
 - G. Existing Fire Department Connection: The existing wall mounted FDC at the kitchen can wash shall be removed.
 - 1. Piping serving FDC in can wash shall be removed.
 - 2. Piping serving FDC outside of can wash shall be modified as shown on civil drawings.
 - H. New Fire Department Connection: Furnish and install one 2 1/2" x 4 siamese type fire department connection complete with check valve, ball drip, etc. as required.
 - 1. Connection of rough brass finish with threads to match those used by the local fire department.
 - 2. Locate FDC (fire department connection) within 100'-0" of nearest fire hydrant measured along fire truck-accessible paved road, drive or parking lot.
 - 3. Provide a free standing FDC in location indicated on Civil drawings.
 - I. Furnish and install draw-off piping required for systems with discharge to acceptable points; run inside auxiliary drains to discharge at approved locations.
 - 1. Discharge lines to be run concealed in construction; exposed applications not acceptable.
 - 2. At locations of draw-off valves provide access panels in construction. Access panels to be of type appropriate for materials in place, of minimum size 12" X 12"; stainless steel frame and cover, with screw activated cam lock.
 - J. Inspector's Test Connection:
 - 1. Provide inspector's test connection as required for each system.
 - 2. Locate test valve 7'-0" above floor.
- 3.03 PIPING
- A. All piping and system components, except in mechanical room, shall be run **fully concealed** in construction. Exposed piping not acceptable, unless prior approved by Architect.
 - B. All sprinkler piping to be located within the building envelope so that it occurs within a the heated space. Piping failing to comply with this requirement to be removed and replaced by contractor at no cost to the contract.
 - C. Where not possible to install piping within heated envelope provided ry pipe system complying with applicable codes.
 - D. **Existing Building:** Where existing spaces are renovated and/or modified as part of the scope this project, the existing sprinkler system shall be modified and heads relocated as required to accommodate new work and provide necessary coverage.
 - E. **Existing Fine Arts Wing:** The piping serving the fine arts wing shall be run above corridor, storage, toilets, and similar spaces. Piping shall be run above spaces Kiln 305, Storage 306, Janitor 307, Storage 309, Toilet 310, Corridor 312, Toilet 313, Toilet 314, Storage 317, Storage 318, Vestibule 320, Office 321, ISF 322, Office 323, Rep. 324, Storage 325.
 - 1. No piping shall be run above the ceilings in spaces Keyboarding 303A, Art 304, Art 308, Teach Work Room 311, Storage 316, Band 319, Choral 326.
 - F. **New Classroom Wing:** Horizontal piping serving the new classrooms shall be run at the underside of the roof deck to allow for future conversion of space to a black box theater.

3.04 DRY-PIPE SYSTEM:

- A. Dry Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment and fill line attachment.

- B. Air Pressure Maintenance Devices for Dry Pipe Systems:
 - 1. Install shutoff valves to permit servicing without shutting down sprinkler system.
 - 2. Provide by-pass valve for quick filling.
 - 3. Provide pressure regulator or switch to maintain system pressure; pressure ratings with 14 to 60 psig (95 to 410 kPa) adjustable range and 175 psig (1200 kPa) maximum inlet pressure.
- C. Install air compressor and compressed air supply piping; Connect compressed-air supply to dry -pipe sprinkler piping.
- D. Electrical Connections: Connect air compressor to pressure gages and controls, electrical power system, and fire alarm system devices, including low-pressure alarm.

3.05 STRUCTURAL SUPPORT

- A. Where trunk lines (lines over 3" in size) exist, support from structure in accordance with the following:
 - 1. Where line run parallel to structural steel, bar joist, purlins, roof trusses, or other structural member provide a minimum of 3" X 3" X 1/4" steel angle between a minimum of three adjacent members. Angle shall be selected for load deflection not to exceed 1/360th of span. Support piping from steel angle.

3.06 MECHANICAL SUPPORTING DEVICES

- A. Support Piping in accordance with provisions of other Section of Division 15 and as herein specified.
- B. Suspend piping using threaded rods and clevis type hangers in accordance with other Sections of Division 15. Hanger clamp shall be of type compatible with overhead structure.
 - 1. Attach hangers to structural supports above.
 - 2. Do not attach hangers to bracing, bridging, or horizontal studs.

3.07 FLUSHING SYSTEM

- A. Upon completion of installation of system piping, and prior to connection to public water system the contractor shall flush, test and inspect sprinkler piping and stand piping system in accordance with the provisions of applicable sections of NFPA 13 and NFPA 14.
 - 1. Flush exterior underground piping (sprinkler lateral) thoroughly with new water connections before connecting to Sprinkler System risers at interior of building and water main.
 - 2. Upon completion of interior piping system flush entire system to remove debris and other contaminants.
- B. Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedures until satisfactory results are obtained.
- C. Report test results promptly and in writing to the Owner, Architect and agency having jurisdiction.

3.08 LABELING

- A. Provide labeling in accordance with requirements of NFPA 13 and NFPA 14 and Division 15 Section 'Basic Mechanical Materials and Methods'..
- B. Where gate valves occur above ceiling provide plastic laminate engraved label, pop-riveted to ceiling grid immediately below valve. Refer to other Sections of Division 15.

3.09 SIGNS

- A. Provide and place suitable sign to indicate purpose of each control valve, test connection, main and auxiliary drains, etc., as required by NFPA 13.

3.10 PAINTING

- A. Paint **all** exposed and concealed sprinkler piping.
 - 1. Painting materials and methods to be in accordance with provisions of Section 09900, Painting.
 - 2. Colors to be as required by code for color identifications.

3.11 CONDITIONS FOR ACCEPTANCE:

- A. The following conditions shall exist for the work to be considered to acceptable.
 - 1. All requirements of contract documents have been met.
 - 2. The system has been inspected and approved by Local and State Fire Marshal.
 - 3. The system has been inspected and approved by Local Building Inspector.
 - 4. The system is fully operational.
 - 5. The system has been interconnected with Fire Alarm system.
 - 6. The system is free from all leaks.
 - 7. The system components, whether exposed or not, are free from rust.

END OF SECTION 13930

**SECTION 14240
HYDRAULIC ELEVATORS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Refer to other sections of these specifications for related work which is not work of this section, including electrical service with fused disconnect switches for elevator system, hoistway, pits, and machinery rooms with access, flooring, lighting, ventilation and services.
- C. Division 3 Concrete:
 - 1. Inserts, sleeves and anchors in concrete.
- D. Division 4 Masonry:
 - 1. Inserts, sleeves and anchors in masonry.
- E. Division 5 Metals:
 - 1. Hoist beams, pit ladders, steel framing, auxiliary support steel.
 - 2. Steel angle sill supports and grouting hoistway entrance sills and frames.
- F. Division 9 Finishes:
 - 1. Elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
- G. Division 15 Plumbing:
 - 1. Sump pit and oil interceptor.
- H. Division 15: Heating, Ventilation and Air Conditioning
 - 1. Heating and ventilating hoistways and machine rooms.
- I. Division 16 Sections:
 - 1. Electrical service to elevators, including fused disconnect switches.
 - 2. Emergency power supply, transfer switch and auxiliary contacts.
 - 3. Heat and smoke sensing devices.
 - 4. Convenience outlets and illumination in machine room, hoistway and pit.

1.02 DESCRIPTION OF WORK

- A. Section includes: Hydraulic passenger elevators as shown and specified. Elevator work includes:
 - 1. Standard pre-engineered hydraulic passenger elevators.
 - 2. Elevator car enclosures, hoistway entrances and signal equipment.
 - 3. Rail bracket supports at pit, each floor and roof.
 - 4. Guide rail bracket supports
 - 5. Divider beams between hoistway at each floor and roof.
 - 6. Jack(s).
 - 7. Operation and control systems.
 - 8. Accessibility provisions for physically disabled persons.
 - 9. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
 - 10. Materials and accessories as required to complete the elevator installation.

1.03 REFERENCED STANDARDS

- A. ASTM B221; Aluminum-Alloy Extruded Bars, Rods, Shapes, Tubes
- B. ASTM B209; Aluminum-Alloy Sheet and Plate.
- C. ASTM A167; Stainless and Heat-Resistant Chromium-Nickel Steel Plate, Sheet and Strip.
- D. PS 1; Construction and Industrial Plywood.
- E. FS L-P-508; Plastic Sheet, Laminated, Decorative and Non-Decorative.
- F. ASTM A526; Steel Sheet, Zinc Coated (Galvanized) by Hot Dip Process, Commercial Quality.
- G. MIL-L-1914; Lumber and Plywood, Fire Retardant Treated.
- H. AWS D1.1; Structural Welding Code.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: An approved manufacturer with minimum fifteen years experience in manufacturing, installing, and servicing elevators of the type required for the project.
 - 1. Firm shall be the manufacturer of the power unit, controller, signal fixtures, door operators cab, entrances, and all other major parts of the elevator operating equipment.
 - 2. The major parts of the elevator equipment shall be manufactured in the United States, and not be an assembled system.
 - 3. Manufacturer shall have a documented, on-going quality assurance program.
 - 4. ISO-9001:2000 Manufacturer Certified
 - 5. ISO-14001:2004 Environmental Management System Certified
- B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than fifteen years of satisfactory experience installing elevators equal in character and performance to the project elevators.
- C. Regulatory Requirements: Elevator and installation shall comply with applicable provisions of listed regulatory requirements:
 - 1. Building Code: International Building Code, Current Edition
 - 2. Elevator Code: Except for more stringent requirements indicated or imposed by governing regulations (which must be complied with), comply with applicable requirements of ANSI/ASME A17.1, Safety Code for Elevators, and Escalators (hereinafter referred to as "Code").
 - 3. Electric Code: ANSI C1; National Electric Code.
 - 4. Inspection: ANSI A17.2, American Standard Practice for Inspection of Elevators, Escalators, and Moving Walks.
 - 5. NFPA Code: Comply with applicable NFPA codes, and specifically with sections relating to electrical work and elevators.
 - 6. NFPA 70, National Electrical Code
 - 7. Fire Resistance of Entrances: Comply with NFPA No. 80, and provide units bearing UL labels with 30-min. temperature rise on labels.
 - a. Provide UL or FM labels.
 - 8. ADA Standards for Handicapped: Except as otherwise indicated, comply with "Americans with Disabilities Act" requirements including clearances, handrails, locations for signal equipment and similar provisions.
- D. Fire-rated Entrance Assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(B), and NFPA 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).

- E. Inspection and testing: Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
 - 1. Arrange for inspections and make required tests.
 - 2. Deliver to the Owner upon completion and acceptance of elevator work.
- F. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- G. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed technical product data and installation instructions for each principal component or product, and include certified test reports on required testing.
 - 1. List and describe features of control system, performances, and operating characteristics.
- B. Shop Drawings:
 - 1. Show equipment arrangement in the machine room/control space, pit and hoistway.
 - 2. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
 - 3. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
 - 4. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
 - 5. Indicate electrical power requirements and branch circuit protection device recommendations.
 - 6. Provide equipment room layout.
- C. Samples:
 - 1. Submit samples of exposed finishes of car enclosures, hoistway entrances, and signal equipment.
 - 2. Provide 6" to 8" square samples of sheet materials and 10" to 12" lengths of running trim members.
- D. Operation and Maintenance Manuals: Submit bound manual for each elevator or group of elevators, with operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing, for major and critical components, emergency instructions, and similar information. Include the following:
 - 1. Owners Manual and Wiring Diagrams.
 - 2. Parts list, with recommended parts inventory
- E. Certificates and Permits: Provide Owner with copies of all inspection/acceptance certificates and operating permits required by governing authorities to allow normal, unrestricted use of elevators.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver elevator materials, components and equipment.
 - 1. Secure and protect delivered materials until installed.

1.07 PROJECT CONDITIONS

- A. Prohibited Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion .

1.08 MAINTENANCE AND WARRANTY

- A. Initial Maintenance Service:
 - 1. Provide full maintenance service by skilled, competent employees of elevator Installer for period of 12 months following date of Final Acceptance.
 - 2. Include monthly preventive maintenance, performed during normal working hours.
 - 3. Include repair/replacement of worn or defective parts or components and lubrication, cleaning and adjusting as required for proper elevator operation in conformance with specified requirements.
 - 4. Include 24 hr/day, 7 days/week emergency callback service.
 - 5. Exclude only repair/replacement due to misuse, abuse, accidents or neglect caused by persons other than Installer's personnel.
 - 6. Maintenance service contract to be performed solely by the elevator manufacturer; work shall not be assigned to any agent or subcontractor, without prior written consent by Architect.
- B. Continuing Maintenance Service: Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.
 - 1. Installer provide continuing maintenance proposal to Owner, in form of standard yearly (or other period) maintenance agreement, starting on date construction contract maintenance requirements concluded.
 - 2. State services, obligations, conditions and terms for agreement period, and for renewal options.
- C. Warranty: Provide special project warranty, signed by Contractor, Installer and Manufacturer, agreeing to replace/repair/restore defective materials and workmanship of elevator work during warranty period.
 - 1. "Defective" hereby defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected and unsatisfactory conditions.
 - 2. Provide coincidental product warranties for major components of elevator work; submit with maintenance manuals.
 - 3. Warranty period: 24 months starting on date of Final Acceptance of Project.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Basis of Specification: The specification is based on the ThyssenKrupp Low Rise, Hydraulic, Above ground, Twin Post Elevator Endura 2500
- B. Manufacturer: Other acceptable manufacturers, subject to compliance with requirements and being equal to basis of specifications:
 - 1. Dover Corp.
 - 2. Montgomery Elevator Co.
 - 3. Mowrey Elevator Co.
 - 4. Otis Elevator Co.

2.02 MATERIALS, GENERAL

- A. Colors, patterns, and finishes: As selected by the Architect from manufacturer's standard colors, patterns, and finish charts.
- B. Steel:
 - 1. Shapes and bars: Carbon.
 - 2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
 - 3. Finish: Factory-applied baked enamel.
- C. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness.
- D. Flooring: As indicated on finish schedule

2.03 HOISTWAY EQUIPMENT

- A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood subfloor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.
- B. Sling: Steel stiles affixed to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
- C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.
- D. Guide Shoes: Slide guides shall be mounted on top and bottom of the car.
- E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on a steel template that is fastened to the pit floor or continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.
- F. Jack: Jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to insure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless telescopic 2-stage. Two jacks piped together, mounted one on each side of the car with each having two telescopic sections designed to extend in a synchronized manner when oil is pumped into the Assembly. Each jack section shall be guided from within the casing or the plunger assembly used to house the section. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section.
- G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the landings and correct for overtravel or undertravel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.
- H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade readily biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)

2.04 POWER UNIT

- A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit consisting of the following items:
 - 1. Oil reservoir with tank cover.
 - 2. An oil hydraulic pump.
 - 3. An electric motor.
 - 4. Oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.
- B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
- C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating shall be selected for specified speed and load.
- D. Control System: Shall be microprocessor based and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure.

- E. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
 - 1. Relief valve shall be externally adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
 - 2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
 - 3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
 - 4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
- F. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
- G. Oil Type: USDA certified biobased product, ultra low toxicity, readily biodegradable, energy efficient, high performing fluid made from canola oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives. Especially formulated for operating in environmentally sensitive areas.
USDA certified biobased product, >90% bio-based content, per ASTM D6866

2.05 HOISTWAY ENTRANCES

- A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
 - 1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates, sight guards, and necessary hardware.
 - 2. Main landing door & frame finish: ASTM A1008 steel panels, factory applied powder coat finish.
 - 3. Typical door & frame finish: ASTM A 366 steel panels, factory applied powder coat enamel finish.
- B. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.
- C. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
 - 1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
 - 2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
 - 3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.
- D. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.06 CAR ENCLOSURE

- A. Car Enclosure:
 - 1. Walls: Walls shall be finished with factory applied powder coat. Cab type TKS, reinforced cold-rolled steel.
 - 2. Canopy: Cold-rolled steel with hinged exit.
 - 3. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel.
 - 4. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
 - a. Door Finish: ASTM A1008 steel panels, factory applied powder coat enamel finish.
 - b. Cab Sills: Extruded aluminum, mill finish.
 - 5. Handrail: Provide 1.5" diameter cylindrical metal on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
 - 6. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.

- B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station will give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.07 DOOR OPERATION

- A. Door Operation: Provide a direct current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. Closed-loop, microprocessor controlled motor-driven linear door operator, with adjustable torque limits, also acceptable. AC controlled units with oil checks or other deviations are not acceptable.
 - 1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
 - 2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
 - 3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel will reverse and the door will reopen to answer the other call.
 - 4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.
 - 5. Limited Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.
 - 6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then attempt to open six times to try and correct the fault.
 - 7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then attempt to close six times to try and correct the fault.
 - 8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.
- B. Door Protection Devices: Provide a door protection system using 150 or more microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.08 CAR OPERATING STATION

- A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Swing return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code. microbanoil Switches for car light and accessories shall be provided.
- B. Emergency Communications System: Integral phone system provided.
- C. Auxiliary Operating Panel: Not Required
- D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

2.09 CONTROL SYSTEMS

- A. Controller: The elevator control system shall be microprocessor based and software oriented. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
- B. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.

2.10 HALL STATIONS

- A. Hall Stations, General: Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
 - 1. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.
- B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.
- C. Hall Position Indicator: Not Applicable
- D. Hall lanterns: Not Applicable
- E. Special Equipment: Not Applicable

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

- A. Oil Hydraulic Silencer: Install an oil hydraulic silencer (muffler device) at the power unit location. The silencer shall contain pulsation absorbing material inserted in a blowout proof housing arranged for inspecting interior parts without removing unit from oil line.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and machine rooms/control space, as constructed and verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
 - 1. Notify Contractor in writing of any dimensional discrepancies or other conditions detrimental to proper installation or performance of elevator work.
 - 2. Do not proceed with elevator installation until unsatisfactory conditions corrected in manner acceptable to Installer.
 - 3. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION OF ELEVATOR SYSTEM

- A. Install elevator systems components and coordinate installation of hoistway wall construction.
 - 1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
 - 2. Comply with the National Electrical Code for electrical work required during installation.
- B. Jack unit excavation (if required by the type of jack provided): Drill or otherwise excavate below elevator pit construction as required to install the jack unit.
 - 1. Install casing for jack unit.
 - 2. Provide HDPE jack protection system for all in ground jacks.

3. Set casing for jack unit assembly plumb, and partially fill with watersettled sand, eliminating voids. Back fill depth shall be sufficient to hold the bottom of the jack in place over time.
 - C. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.
 - D. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.
 - E. Lubricate operating parts of system where recommended by manufacturer.
- 3.03 FIELD QUALITY CONTROL
- A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required by A17.1 Code and local authorities having jurisdiction. Perform other tests, if any, as required by governing regulations or agencies.
 - B. Operating Tests:
 1. Load each elevator to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to next.
 2. Record temperature rise of pump motor during 30-minute test period.
 3. Record failures of elevator to perform as required.
 - C. Advise Contractor, Owner, Architect and inspection department of governing agencies, in advance of dates and times tests to be performed on elevators.
- 3.04 ADJUSTING
- A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.
- 3.05 CLEANING
- A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless stall shall be cleaned with soap and water and dried with a non-abrasive surface; shall not be cleaned with bleached-based cleansers.
 - B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
- 3.06 PROTECTION
- A. At time of Final Acceptance of elevator work (or portion thereof), provide suitable protective coverings, barriers, devices, signs or such other methods or procedures to protect elevator work from damage or deterioration.
 1. Maintain protective measures throughout remainder of construction period.
 - B. Provide similar protective measures for elevator units placed in temporary service, including inspection and maintenance service during period of temporary service.

3.07 INSTRUCTION AND MAINTENANCE

- A. Instruct Owner's personnel in proper use, operations and daily maintenance of elevators.
 - 1. Review emergency provisions, including emergency access and procedures followed at time of failure in operation and other building emergencies.
 - 2. Train Owner's personnel in normal procedures followed in checking for sources of operational failures or malfunctions.
 - 3. Confer with Owner on requirements for complete elevator maintenance program.
- B. Make final check of each elevator operation, with Owner's personnel present and just prior to date of Final Acceptance.
 - 1. Determine that control systems and operating devices function properly.

3.08 HYDRAULIC ELEVATOR SCHEDULE

- A. Elevator G1 (Gymnasium)
 - 1. Make and Model: ThyssenKrupp Elevator Endura Above-ground
 - 2. Rated Capacity: 2500 pounds
 - 3. Type: Low Rise, Hydraulic, Above ground, Twin Post
 - 4. Capacity: 2500 pounds
 - 5. Speed: 110 fpm (feet per minute)
 - 6. Operation System: TAC32
 - 7. Landings: 2 total
 - 8. Openings: Front-1; Rear-1
 - 9. Platform: 5'-8 1/4" wide X 7'-0" deep.
 - 10. Clear Inside Dimensions: 6'-8" wide X 4'-3 1/2" deep.
 - 11. Hoist-way Dimensions: 8'-4" x 6'-8 3/4"
 - 12. Openings: One at front, one at rear
 - 13. Entrances: 3'-6" X 7'-0"; single speed
 - 14. Floors: Two
 - 15. Travel Distance: 14'-8" Plus or Minus; Field verify.
- B. Elevator(s) shall comply with following specification;
 - 1. Type: Passenger, with Class A loading capacity.
 - 2. Operation; Single car; Simplex Collective
 - 3. Microprocessor: All major functions shall be microprocessor controlled; call allocation, logic functions, door control, speed sensing, and position to be computer controlled
 - 4. Door Operation: Microprocessor controlled; direct current powered with limited door reversal and nudging
 - 5. Control System: Oilhydraulic controller.
 - 6. Machine Type: Hydraulic
 - 7. Signal Equipment: Impulse signal fixtures. Position indicator in car. Car Riding lantern. All floor markings in car, hall and entrances to be raised with braille indications. Car buttons mounted at 20 degree angle..
 - 8. Car Enclosures:
 - a. Doors: Powdered Coated Doors
 - b. Door Sill: Aluminum
 - c. Front Panel: Stainless Steel Front Panel
 - d. Walls: Applied Vertical Plastic laminate applied wall panels; black reveal.
 - e. Ceiling: Powdered Coated uspended frame with white translucent panels.
 - f. Handrails: Metal Bar; Stainless steel.
 - g. Protection Pads: Provide protection pads for fronts and walls.
 - h. Floor: VCT (Vinyl composition tile) flooring
 - 9. Hoistway Entrances:
 - a. Frame: Powdered Coated
 - b. Doors: Center opening, Powdered Coated

10. Additional Requirements:
- a. Codes: Meet all Georgia accessibility and ADA requirements for handicapped.
 - b. Handicapped: Handicapped signal and control package
 - c. Operation: Push Button with keyed lock out on each floor
 - d. Ventilation: Two speed exhaust fan.
 - e. Access: Hoistway access package.
 - f. Power: Emergency Power Operation
 - g. Lighting: Emergency Lighting

END OF SECTION 14240

**SECTION 15000
GENERAL PROVISIONS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.
- B. It is recognized that separate sub-contracts may be instituted by THIS CONTRACT'S GENERAL CONTRACTOR with others. It is the responsibility of THIS CONTRACT'S GENERAL CONTRACTOR to completely inform, coordinate and advise those sub-contractors as to all of the requirements, conditions and information associated with providing and installing their portion of the total job.

1.02 IMPOSED REGULATIONS:

- A. Applicable provisions of the State and Local Codes and of the following codes and standards in addition to those listed elsewhere in the specifications are hereby imposed on a general basis for mechanical work. In each case, the prevailing edition shall be the current adopted edition of the state where the project is located.
 - 1. International Mechanical Code.
 - 2. International Plumbing Code.
 - 3. International Gas Code.
 - 4. International Energy Conservation Code.
 - 5. International Fire Code.

1.03 SCOPE OF WORK:

- A. Provide all labor, materials, equipment and supervision to construct complete and operable mechanical systems as indicated on the drawings and specified herein. All materials and equipment used shall be new, undamaged and free from any defects.

1.04 EXISTING SERVICES AND FACILITIES:

- A. Damage to Existing Services: Existing services and facilities damaged by the Contractor through negligence or through use of faulty materials or workmanship shall be promptly repaired, replaced, or otherwise restored to previous conditions by the Contractor without additional cost to the Owner.
- B. Interruption of Services: Interruptions of services necessary for connection to or modification of existing systems or facilities shall occur only at prearranged times approved by the Owner. Interruptions shall only occur after the provision of all temporary work and the availability of adequate labor and materials will assure that the duration of the interruption will not exceed the time agreed upon.

- C. Removed Materials: Existing materials made unnecessary by the new installation shall be removed, shall remain the property of the Owner and shall be stored at a location and in a manner as directed, or, if classified by the Owner's authorized representative as unsuitable for further use, shall become the property of the Contractor and shall be removed from the site.

1.05 PRODUCT WARRANTIES:

- A. Provide manufacturer's standard printed commitment in reference to a specific product and normal application, stating that certain acts of restitution will be performed for the Purchaser or Owner by the manufacturer, when and if the product fails within certain operational conditions and time limits. Where the warranty requirements of a specific specification section exceed the manufacturer's standard warranty, the more stringent requirements will apply and modified manufacturer's warranty shall be provided. In no case shall the manufacturer's warranty be less than one (1) year.

1.06 PRODUCT SUBSTITUTIONS:

- A. General: Materials specified by manufacturer's name shall be used unless prior approval of an alternate is given by addenda. Requests for substitutions must be received in the office of the Architect at least 10 days prior to opening of bids.

PART 2 - PRODUCTS

2.01 GENERAL MECHANICAL PRODUCT REQUIREMENTS:

- A. Standard Products: Provide not less (quality) than manufacturer's standard products, as specified by their published product data. In addition to the indication that a particular product/model number is acceptable, comply with the specified requirements. Do not assume that the available off-the-shelf condition of a product complies with the requirements; as an example, a specific finish or color may be required.
- B. Uniformity: Where multiple units of a general product are required for the mechanical work, provide identical products by the same manufacturer, without variations except for sizes and similar variations as indicated.
- C. Product Compatibility, Options: Where more than one product selection is specified, either generically or proprietarily, selection is Purchaser's or Installer's option. Provide mechanical adaptations as needed for interfacing of selected products in the work.
- D. Equipment Nameplates: Provide a permanent operational data nameplate on each item of power operated mechanical equipment, indicating the manufacturer, product name, model number, serial number, speed, capacity, power characteristics, labels of tested compliance, and similar essential operating data.
- E. Locate nameplates in easy-to-read locations. When product is visually exposed in an occupied area of the building, locate nameplate in a concealed position (where possible) which is accessible for reading by service personnel.

PART 3 - EXECUTION

3.01 PRODUCT INSTALLATION, GENERAL:

- A. Except where more stringent requirements are indicated, comply with the product manufacturer's installation instructions and recommendations, including handling, anchorage, assembly, connections, cleaning and testing, charging, lubrication, startup, test operation and shut-down of operating equipment. Consult with manufacturer's technical experts, for specific instructions on unique product conditions and unforeseen problems.
- B. Protection and Identification: Deliver products to project properly identified with names, models numbers, types, grades, compliance labels and similar information needed for distinct identifications; adequately packaged or protected to prevent deterioration during shipment, storage and handling. Store in a dry, well ventilated, indoor space, except where prepared and protected by the manufacturer specifically for exterior storage.
- C. Permits and Tests: Provide labor, material and equipment to perform all tests required by the governing agencies and submit a record of all tests to the Owner or his representative. Notify the Architect five days in advance of any testing.

END OF SECTION 15000

**SECTION 15005
MECHANICAL COORDINATION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. Coordinate the actual location of all mechanical work visible in finished spaces with the Architect/Engineer. This includes air distribution devices, exposed ductwork, thermostats, humidistats, switches, sensors, etc.

PART 2 - PRODUCTS

2.01 MECHANICAL PRODUCT COORDINATION:

- A. Power Characteristics: Refer to the electrical sections of the specifications and the electrical drawings for the power characteristics available for the operation of each power driven item of mechanical equipment. The electrical design was based on the power requirements of the mechanical equipment manufacturer scheduled or specified. Any modifications to the electrical system which are required due to the use of an approved equivalent manufacturer shall be made at no additional cost to the owner. All changes must be clearly documented and submitted for review by the Architect/Engineer prior to purchasing equipment. Coordinate purchases to ensure uniform interface with electrical work. The mechanical contractor shall furnish a detailed list of equipment electrical characteristics to the electrical contractor for the purpose of preparing the coordination affidavit required by Section 16000.
- B. Coordination of Options and Substitutions: Where the contract documents permit the selection from several product options, and where it becomes necessary to authorize a substitution, do not proceed with purchasing until coordination of interface of equipment has been checked and satisfactorily established.
- C. Firestopping: Refer to architectural drawings for the locations of all fire rated ceilings, floors and walls. The contractor shall furnish detailed shop drawings of all firestopping details to be used for both piping and ductwork. All firestopping details shall be U.L. listed and subject to approval by the Authority having jurisdiction.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION:

- A. Substrate Examination: The Installer of each element of the mechanical work must examine the condition of the substrate to receive the work, and the conditions under which the work will be performed, and must notify the Contractor in writing of conditions detrimental to the proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- B. Do not proceed with the installation of sleeves, anchors, hangers, roof penetrations and similar work until mechanical coordination drawings have been processed and released for construction. Where work must be installed prior to that time in order to avoid a project delay, review proposed installation in a project coordination meeting including all parties involved with the interfacing of the work.

3.02 CUTTING AND PATCHING:

- A. Structural Limitations: Do not cut structural framing, walls, floors, decks and other members intended to withstand stress, except with the Architect's or Engineer's written authorization. Authorization will be granted only where there is not other reasonable method for completing the mechanical work, and where the proposed cutting clearly does not materially weaken the structure.
- B. Where authorized, cut opening through concrete (for pipe penetrations and similar services) by core drilling or sawing. Do not cut by hammer-driven chisel or drill.
- C. Other work: Do not endanger or damage other work through the procedures and processes of cutting to accommodate mechanical work. Review the proposed cutting with the Installer of the work to be cut, and comply with his recommendations to minimize damage. Where necessary, engage the original Installer or other specialists to execute the cutting in the recommended manner.
- D. Where patching is required to restore other work, because of either cutting or other damage inflicted during the installation of mechanical work, execute the patching in the manner recommended by the original Installer. Restore the other work in every respect, including the elimination of visual defects in exposed finishes, as judged by the Architect. Engage the original Installer to complete patching of the following categories of work:
 - 1. Exposed concrete finishes.
 - 2. Exposed masonry.
 - 3. Waterproofing and vapor barriers.
 - 4. Roofing, flashing and accessories.
 - 5. Interior exposed finishes and casework, where judged by the Architect to be difficult to achieve an acceptable match by other means.

3.03 COORDINATION OF MECHANICAL INSTALLATION:

- A. General: Sequence, coordinate and integrate the various elements of mechanical work so that the mechanical plant will perform as indicated and be in harmony with the other work of the building. The Architect/Engineer will not supervise the coordination, which is the exclusive responsibility of the Contractor. Comply with the following requirements:
 - 1. Install piping, ductwork and similar services straight and true, aligned with other work

- and with overhead structures and allowing for insulation. Conceal where possible.
2. Arrange work to facilitate maintenance and repair or replacement of equipment. Locate services requiring maintenance on valves and similar units in front of services requiring less maintenance. Connect equipment for ease of disconnecting, with minimum of interference with other work.
 3. Give the right-of way to piping systems required to slope for drainage (over other service lines). Piping shall be located to avoid interference with ductwork and light fixtures.
 4. Store materials off the ground and protected from standing water and weather.
- B. Drawings: Conform with the arrangement indicated by the contract documents to the greatest extent possible, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, comply with the Architect's decision on resolution of the conflict.
- C. Electrical Work: Coordinate the mechanical work with electrical work, and properly interface with the electrical service. In general, and except as otherwise indicated, install mechanical equipment ready for electrical connection. Refer to electrical sections of the specifications for electrical connection of mechanical equipment.
- D. Smoke Detectors: Duct mounted smoke detectors shall be furnished under the electrical sections of the specifications. As part of the Mechanical work, each detector shall be installed in ductwork as shown or indicated on the mechanical drawings and wired into the respective supply fan control circuit to shut down the fan upon sensing the products of combustion.
- E. Utility Connections: Coordinate the connection of mechanical systems with exterior underground utilities and services. Comply with the requirements of governing regulations, franchised service companies and controlling agencies. Provide a single connection for each service except where multiple connections are indicated.

3.04 COORDINATION OF MECHANICAL START-UP:

- A. Seasonal Requirements: Adjust and coordinate the timing of mechanical system start-ups with seasonal variations, so that demonstration and testing of specified performance can be observed and recorded. Exercise proper care in off-season start-ups to ensure that systems and equipment will not be damaged by the operation.
- B. Painting and Air Distribution: Coordinate the initial cleaning and start-up of the air distribution system, to occur prior to preparatory cleaning and general interior painting and decorating on the project. The HVAC system should not be operated until drywall work is completed. Drywall dust must not be allowed to contaminate the interior of air handling units and ductwork. Use high efficiency temporary filters until project closeout.

END OF SECTION 15005

**SECTION 15011
MECHANICAL EXCAVATING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. Coordination: Where excavation and backfill for mechanical work passes through or occurs in the same areas as work specified in the Division 2 sections, comply with both the requirements of the Division 2 sections and the requirements of this section, whichever is the more stringent (as determined by the Architect/Engineer in cases of conflicting requirements).

1.03 JOB CONDITIONS:

- A. Existing Utilities: Locate and protect existing utilities and other underground work in a manner which will ensure that no damage or service interruption will result from excavating and backfilling.

PART 2 - PRODUCTS

2.01 BACKFILL MATERIALS:

- A. Subbase Material: A graded mixture of gravel, sand, crushed stone or crushed slag.

PART 3 - EXECUTION

3.01 EXCAVATING:

- A. Inspection: The excavator must examine the areas to be excavated, and the conditions under which the work is to be performed, and notify the Contractor in writing of conditions detrimental to the proper completion of the work. Do not proceed with excavating until unsatisfactory conditions have been corrected in a manner acceptable to the excavator.
- B. General:
 - 1. Do not excavate for mechanical work until the work is ready to proceed without delay, so that the total time lapse from excavation to completion of backfilling will be minimum.
 - 2. Provide signs, illuminations and barricades as necessary to prevent accidents at

excavations.

3. Excavate with vertical sided excavations to the greatest extent possible, except where otherwise indicated. Where necessary, provide sheeting and cross-bracing to sustain sides of excavations. Remove sheeting and cross-bracing during backfilling wherever such removal would not endanger the work or other property. Where not removed, cut sheeting off at a sufficient distance below finished grade to not interfere with other work.
4. Excavate for piping with 6" to 9" clearance both sides of pipe, except where otherwise shown or required for proper installation of pipe joints, fittings, valves and other work. Excavate for other mechanical work to provide minimum practical but adequate working clearances. Provide a minimum of 12" clearance around underground tanks.
5. For work to be supported directly on undisturbed soil, do not excavate beyond required depths, and hand excavate the bottom cut to accurate elevations. Except as otherwise indicated, support the following work on undisturbed soil at the bottom of the excavations:
 - a. Piping of 5" and less pipe/tube size.
 - b. Cast-in-place concrete.
6. Where directed, excavate additional depth to reach satisfactory soil-bearing conditions. Backfill with subbase material, compacted as directed, to indicated excavation depth.
7. Except as otherwise indicated, excavate for exterior water-bearing piping so that the top of piping will not be less than 2'- 0" vertical distance below finished grade.
8. Store excavated material (temporarily) near the excavation, in a manner which will not interfere with or damage the excavation or other work.
 - a. Retain excavated material which complies with the requirements for backfill material.
 - b. Dispose of excavated material which is either in excess of quantity needed for backfilling or does not comply with requirement for backfill material.

3.02 DEWATERING:

- A. Maintain dry excavations for mechanical work by removing water. Pump minor inflow of ground water from excavations; protect excavations from major inflow of ground water by installing temporary sheeting and waterproofing. Provide adequate barriers which will protect other excavations from being damaged by water, sediment or erosion from or through mechanical work excavations.

3.03 BASE PREPARATION:

- A. Install subbase material to receive mechanical work, and compact by tamping to form a firm base for the work. For piping, shape the subbase to fit the shape of the bottom 90 degrees of the cylinder, for uniform continuous support.
- B. Shape subbases and bottoms of excavations with recesses to receive pipe bells, flanges connections, valves and similar enlargements in the piping systems.

3.04 BACKFILLING:

- A. Do not backfill until installed mechanical work has been tested and accepted, wherever testing is indicated.

- B. Condition backfill material by either drying or adding water uniformly, to whatever extent may be necessary to facilitate compaction to the required densities. Do not backfill with frozen soil materials.
- C. Backfill simultaneously on opposite sides of mechanical work, and compact simultaneously; do not dislocate the work from installed positions.
- D. Backfill excavations in 8" high courses of backfill material, uniformly compacted to the following densities (percent of maximum density, ASTM Standard Proctor), using power-driven hand-operated compaction equipment.
 - 1. Lawn/Landscaped Areas: 90%
 - 2. Roadways: 95%
 - 3. Paved Area, Other than Roadways: 95%
- E. Backfill to elevations matching adjacent grades, at the time of backfilling excavations for mechanical work.
- F. Where compaction tests indicate lower densities of backfill than specified, continue compaction (and re-excavation and backfilling where necessary) and provide additional testing as directed by the Architect/Engineer.

3.05 PERFORMANCE AND MAINTENANCE:

- A. Where subsidence is measurable or observable at mechanical work excavations during the guarantee period, remove the surface (pavement, lawn or other finish), add backfill material, compact and replace the surface treatment. Restore the appearance, quality and condition of the surface or finish to match adjacent work, and eliminate evidence of the restoration to the greatest extent possible.

END OF SECTION 15011

**SECTION 15012
MECHANICAL STANDARDS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. Industry Standards: It is a general requirement that mechanical work comply with applicable requirements and recommendations of standards published by listed agencies and trade associations, except to the extent more detailed and stringent requirements are indicated or required by governing regulations.

B. Listing of Associations, Standards, and Abbreviations:

- | | | |
|-----|--------|--|
| 1. | AGA | American Gas Association
1515 Wilson Blvd.
Arlington, VA 22209 |
| 2. | AMCA | Air Movement & Control Association
30 W. University Dr., Arlington Heights, IL 60004
302/394-0150 |
| 3. | ARI | Air-Conditioning and Refrigeration Institute
4301 North Fairfax Drive, Suite 425, Arlington, VA
22203
703/524-8800 |
| 4. | ASHRAE | American Society of Heating, Refrigerating &
Air Conditioning Engineers, Inc.
1791 Tullie Circle, NE, Atlanta, GA. 30329
404/636-8400 |
| 5. | AWS | American Welding Society, Inc.
2501 NW 7th St., Miami, FL 33125
305/642-7090 |
| 6. | CISPI | Cast Iron Soil Pipe Institute
2020 K. St., NW, Washington, DC
202/233-4536 |
| 7. | NEBB | National Environmental Balancing Bureau
1611 North Kent St.,
Arlington, VA 22209 |
| 8. | NEC | National Electrical Code by NFPA |
| 9. | NEMA | National Electrical Manufacturers Association
1300 N 17 th Street, Suite 1847
Rosslyn, VA 22209
703/841-3200 |
| 10. | NFPA | National Fire Protection Association
407 Atlantic Ave., |

Boston, MA 02210
617/482-8755

- | | |
|------------|---|
| 11. SMACNA | Sheet Metal & Air Conditioning Contractors National Association, Inc.
8224 Old Courthouse Rd., Tysons Corner
Vienna, VA 22180
703/790-9890 |
| 12. TIMA | Thermal Insulation Manufacturers Association
7 Kirby Plaza
Mt. Kisco, NY 10549
912/241-2284 |
| 13. UL | Underwriters' Laboratories, Inc.
207 East Ohio St.,
Chicago, IL 60611
312/642-6969 |

PARTS 2 AND 3 - PRODUCTS AND EXECUTION

A. NOT APPLICABLE:

END OF SECTION 15012

**SECTION 15013
MECHANICAL SUBMITTALS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUBMITTAL FORMS AND PROCEDURES:

- A. The purpose of submittals is to demonstrate to the Architect/Engineer that the Contractor understands the design concept. The Architect/Engineer's review of such drawings, schedules, or cuts shall not relieve the Contractor from responsibility for deviation from drawings or specifications unless he has, in writing, called the Architect/Engineer's attention to such deviations at the time of submission, and has received from the Architect/Engineer, in writing, permission for such deviations. All submittals must be completely checked by the Contractor prior to submission for review.
- B. Quantities: Except as otherwise indicated in other sections, submit 5 copies. Quantity indicated does not include copies required for regulatory agencies.
- C. Submittals shall be made for all items contained in the following specification sections:
 - 1. Mechanical Coordination
 - 2. Mechanical Identification
 - 3. Pipe, Tube, and Fittings
 - 4. Hangers and Supports
 - 5. Mechanical Sound, Vibration, Wind and Seismic Control
 - 6. Piping Systems Insulation
 - 7. Gas Piping System
 - 8. Domestic Water Piping System
 - 9. Soil, Waste and Vent Piping System
 - 10. Water Heaters and Accessories
 - 11. Plumbing Fixtures
 - 12. Water Coolers
 - 13. Air Treatment Systems
 - 14. Electric Heaters
 - 15. Split System Heat Pumps
 - 16. Rooftop Air Conditioners
 - 17. Fans
 - 18. Ductwork and Accessories
 - 19. Air Distribution
 - 20. Kitchen Hoods and Accessories
 - 21. Energy Recovery Ventilation Units
 - 22. Building Automation System
 - 23. Mechanical Testing, Adjusting and Balancing
 - 24. Mechanical Commissioning

- D. Response to Submittals: A Submittal Review Report shall be issued by the Architect/Engineer with the following classifications for each item:
1. **"No Exceptions Taken"**: No corrections, no marks. Contractor shall submit copies for distribution.
 2. **"Make Corrections Noted"**: A few minor corrections. Items may be ordered as marked up without further resubmission. Submit copies for distribution.
 3. **"Revise and Resubmit"**: Minor corrections. Item may be ordered at the Contractor's option. Contractor shall resubmit drawings with corrections noted.
 4. **"Rejected"**: Major corrections or not in accordance with the contract documents. No items shall be ordered. Contractor shall correct and resubmit drawings.
- E. Coordinate mechanical submittals through the Contractor for the general work, and mark each submittal with his name and the date of the transmittal to the Architect/Engineer. Prior Approvals or Submittals must be received by mail or be hand delivered. Submittal data received by facsimile machine is not acceptable and will not be reviewed.

1.03 FORMAT:

- A. Submittals shall be made by specification section. Submittal data shall be placed in one or more hard-back 3-ring binders, arranged and labeled according to specification section.
1. Each binder shall contain a title page and table of contents. Provide separator tabs, and **label by specification section**. Make note in the table of contents, any drawings that accompany the submittal.
 2. Title page shall contain Project Name, Contractor's Name, Division 16 Superintendent's name, Suppliers and point of contact for each, and date.

PART 2 - PRODUCTS

2.01 SUBMITTAL REQUIREMENTS:

- A. General: Each specification section shall list the required submittal items. All submittal items shall conform to the requirements listed below. For each major section of submittal data, include a summary page which lists items and model numbers for each piece of equipment.
- B. Shop Drawings: Prepare mechanical shop drawings to accurate scale except where diagrammatic representations are specifically indicated. Show clearance dimensions of critical locations, and show dimensions of spaces required for operation and maintenance of equipment. Show piping connections and other service connections, and show interface with other work including structural support. Indicate by note, the portions of mechanical work shown on the shop drawings which deviated from the indication of work in the contract documents, and explain the reasons for the deviations. Show how such deviations coordinate with interfacing deviations on shop drawings for other portions of the work, currently or previously submitted.
- C. Manufacturer's Data: Where pre-printed data is submitted for more than one distinct product,

- size, type, material, trim, accessory group or other variation, mark submitted copy with black pen to indicate which of the variations is to be provided. Delete or mark-out significant portions of preprinted data which are not applicable. Where operating ranges are shown, mark data to show portion of range required for project application. Expansion or elaboration of standard data to describe a non-standard product must be processed as a shop drawing submittal. For each product include the manufacturer's production specifications, installation or fabrication instructions, nearest source of supply (including telephone number), sizes, weights, speeds, operating capacities, piping and service line connection sizes and locations, statements of compliance with required standards and governing regulation (include manufacturer's signed statements if not covered in printed data), performance data (where applicable) and similar information needed to confirm compliance with the requirements.
- D. Certifications: Where specifically indicated, submit with notarized execution.
 - E. Test Reports: Submit test reports which have been signed and dated by the firm performing the test and prepared in the manner specified in the standard or regulation governing the test procedures as indicated.
 - F. Manufacturer's Product Warranties: Where pre-printed and published warranty includes substantial deviation from required warranty (as judged by the Architect or Engineer), product is automatically disqualified from use on the project, except where manufacturer prepares and issues a specific product warranty on the product, stating that it is in lieu of the published warranty, and is executed by an authorized officer, and complies with the requirements. Warranties shall comply with the requirements of individual specification section where those requirements exceed the manufacturer's standard warranty.

PART 3 - EXECUTION

3.01 CLOSEOUT REQUIREMENTS:

- A. Operating Instructions: Submit manufacturer's operating instructions for each item of mechanical equipment and supplement with additional project application instructions where necessary. Prepare and submit specific operating instructions for charging, start-up, control or sequencing of operation, phase or seasonal variations, shut-down, safety and similar operational instructions. Prepare in typewritten form in completely explained and easily understood English language.
- B. Maintenance Manuals: Organize each copy of the required system maintenance manuals to include an index followed by thumb-tab marked sections for each of the following:
 1. System operating instructions.
 2. Emergency instructions including addresses and telephone numbers of service sources.
 3. Regular system maintenance procedures including lubrication.
 4. Spare parts listing and stocking recommendations.
 5. Inspection, adjusting, rebalancing, cleaning, parts replacement, and similar maintenance instructions and recommendations, including the proper use of tools and accessories.
 6. Valve schedule and control diagram for each system.
 7. Manufacturer's data for each operating item in each system.
 8. Manufacturer's product warranties and guarantees relating to the system and equipment items in the system.

9. Corrected or approved issues of submittal items relating to the system.
 10. Bind each maintenance manual in one or more vinyl-covered, 2", 3-ring binder, plus pocket-folder type binders for folded drawings, and mark the back spine of each binder with system identification and volume number.
- C. Maintenance Materials: Deliver to Owner's representative at the location as directed, in containers or packages suitable for storage and fully identified.
- D. Guarantees: Where indicated as "Certified", provide guarantee which, in addition to execution by an authorized officer of each guarantor, is attested to by the Secretary of each guarantor and bears the corporate seal.

END OF SECTION 15013

**SECTION 15015
MECHANICAL IDENTIFICATION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in the manufacture of identification systems required for this product.
- B. Submittals: Submit manufacturer's data on materials and submit a sample of each type required.

PART 2 - PRODUCTS

2.01 MECHANICAL IDENTIFICATION MATERIALS:

A. Plastic Pipe Markers:

- 1. General: Product manufacturer's standard pre-printed, flexible or semi-rigid, permanent, color-coded, plastic-sheet pipe markers, complying with ANSI A13.1.
 - 2. Small Pipe: For external diameters less than 6 inches (including insulation, if any), provide full band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
 - a. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
 - b. Adhesive lap joint in pipe marker overlap.
 - c. Laminated or bonded application of pipe marker to pipe (or insulation).
 - d. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4 inch wide; full circle at both ends of pipe marker, tape lapped 1-1/2 inch.
 - 3. Large Pipes: For external diameters of 6 inches and larger (including insulation, if any), provide either full-band or strip-type pipe markers, but not narrower than 3 x letter height (and of required length), fastened by one of the following methods:
 - a. Laminated or bonded application of pipe marker to pipe (insulation).
 - b. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1-1/2 inches wide: full circle at both ends of pipe marker, tape lapped 3 inches.
- B. Lettering: Comply with piping system names as specified, scheduled or shown, and abbreviate only as necessary for each application length.
- C. Arrows: Print each pipe marker with arrow indicating direction of flow, either integrally with piping system service lettering or as separate unit of plastic (to accommodate both

directions).

D. Plastic Tape: Manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.

1. Width: Provide 1-1/2 inches wide tape markers on pipes with outside diameters including insulation of less than 6 inches, 2-1/2 inches wide tape on larger pipes.
2. Color: Comply with ANSI A13.1.

E. Engraved Plastic-Laminate Signs:

1. General: Provide engraving stock melamine plastic laminated, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core, letter color, except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
2. Thickness: 1/16 inch, except as otherwise indicated.
3. Fasteners: Self-tapping stainless steel screws, except contact type permanent adhesive where screws cannot or should not penetrate the substrate.

F. Valve Tags:

1. Valve tags shall be 18 gauge (minimum) brass with 1-1/4" (minimum) height and width. Identification letters and numbers shall be stamped in tag and shall be filled with black paint
2. Valve tags shall be attached to valve using cable ties. Cable ties shall be self-locking nylon ties.
3. Valve tags shall be installed at all shut-off, balancing, metering, and drain valves. Valve tag shape and designations shall be as follows:

Identification System	Shape	Numbers
Domestic Cold Water	Hexagonal	CW-1, 2, 3, ...
Domestic Hot Water	Hexagonal	HW-1, 2, 3, ...
Dom. Hot Water Return	Hexagonal	HWR-1, 2, 3, ...
Natural Gas	Octagonal	NG-1, 2, 3, ...

G. Valve Charts:

1. Valve charts shall be provided for Plumbing systems. Charts shall be located in the main mechanical room.
2. Valve charts shall be typed listing all valve tags. List shall include identification number, valve location in system (e.g., Corridor 123, Water Heater WH-1, etc.) and its function (e.g., shut-off, balancing, drain, etc.). Charts shall be mounted in a wooden frame with glass cover.

2.02 LETTERING AND GRAPHICS:

A. General: Coordinate names, abbreviations and other designations used in the mechanical identification work, with the corresponding designations shown, specified or scheduled.

Provide numbers, lettering recommended by manufacturers or as required for proper identifications and operation/maintenance of the mechanical systems and equipment.

- B. Multiple Systems: Where multiple systems of the same generic name are shown and specified, provide identification which indicates the individual system number as well as the service; as examples, Heat Pump No. HP-1, Exhaust Fan No. EF-1.

PART 3 - EXECUTION

3.01 APPLICATION AND INSTALLATION:

- A. Coordination: Where identification is to be applied to surfaces which require insulation, painting and other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering or painting.
- B. Piping System Identification:
 - 1. General: Install pipe markers on each system indicated to receive identification, and include arrows to show normal direction of flow.
- C. Identifying Systems: Install pipe marker on piping of the following piping systems:
 - 1. Gas Piping
 - 2. Domestic Hot and Cold Water Piping
- D. Locate pipe markers as follows wherever piping is exposed to view in mechanical rooms, accessible maintenance spaces (including accessible areas above ceilings) and exterior non-concealed locations:
 - 1. Near each valve and control device.
 - 2. Near each branch, excluding short take-offs for fixtures.
 - 3. Near locations where pipes pass through walls or ceilings, or enter non-accessible enclosures.
 - 4. Near major equipment items and other points of origination and termination.
 - 5. Spaced intermediately at maximum spacing of 50 feet along each piping run, except reduce spacing to 25 feet in congested areas of piping and equipment.
- E. Do not mark piping exposed in finished occupied spaces.
- F. Mechanical Equipment Identification: Install an engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for all major items of mechanical equipment.

END OF SECTION 15015

**SECTION 15016
MECHANICAL WORK CLOSEOUT**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 DOCUMENTATION PROCEDURES:

- A. Signed Commitments: Do not proceed with transfer of mechanical plant to the Owner for operation until warranties, performance certifications and similar commitments to be signed by Contractor and other entities have been executed and transmitted to Architect (for Owner's records).

1.03 RECORD DRAWINGS:

- A. Explanation: Except where otherwise indicated, mechanical drawings (contract drawings) prepared by Architect/Engineer, contract/drawings, are diagrammatic in nature and may not show locations accurately for various components of mechanical systems. Shop drawings, including coordination drawings, prepared by Contractor shall show certain portions of work more accurately to scale and location, and in greater detail.
- B. General Recording Procedure: Maintain a white-print set, blue-line or black-line, of mechanical contract drawings and shop drawings in clean, undamaged condition, for mark-up of actual installations which vary substantially from the work as shown. Mark-up whatever drawings are most capable of showing the installed conditions accurately; however, where shop drawings are marked, record a reference note on appropriate contract drawing. Mark with erasable pencil and use multiple colors to aid in the distinction between work of separate mechanical systems. In general, record every substantive installation of mechanical work which previously is either not shown or shown inaccurately, but in any case record the following:
 - 1. Underground and aboveground piping, both exterior and interior, drawn to scale and fully dimensioned.
 - 2. Mechanical "Project Record" shall be maintained as part of the "Project Record" specified in Division 1.

PART 2 - PRODUCTS

2.01 NOT APPLICABLE:

PART 3 - EXECUTION

3.01 CLOSEOUT PROCEDURES:

- A. General Coordination: Sequence closeout procedures properly, so that work will not be endangered or damaged, and so that every required performance will be fully tested and demonstrated.
- B. System Performance Test Run: At the time of mechanical work closeout, check each item in each system to determine that it is set for proper operation. With Owner's representative and Architect/Engineer present, operate each system in a test run of appropriate duration to demonstrate compliance with performance requirements. During or following test runs, make final corrections or adjustments of system to refine and improve performances wherever possible, including noise and vibration reductions, elimination of hazards, better response of controls, signals and alarms, and similar system performance improvements. Provide testing or inspection devices as may be requested for Architect's/Engineer's observation of actual system performances. Demonstrate that controls and items requiring service or maintenance are accessible. Test run shall be scheduled to coincide with Engineer's final inspection of the mechanical work.
- C. Cleaning and Lubrication: After final performance test run of each mechanical system, clean system both externally and internally. Clean dirt and debris from air handling systems and install new filters. Flush piping system by operating drains and similar means, and clean strainers and traps. Lubricate both power and hand operated equipment and remove excess lubrication. Touch-up minor damage to factory painted finishes and other painting specified as mechanical work; refinish work where damage is extensive.
- D. General Operating Instructions: In addition to specified training of Owner's operating personnel specified in individual mechanical sections, and in addition to preparation of written operating instructions and compiled maintenance manuals specified, provide general operating instructions for the total mechanical plant. Conduct a walk-through explanation and demonstration for orientation and education of Owner's personnel to be involved in continued operation of building and its mechanical plant.
 - 1. Describe each basic mechanical system and how its control system functions, including flow adjustments, temperature control and similar operations.
 - 2. Explain and point out identification system, displayed diagrams, signals, alarms and similar provisions of the work.
 - 3. Describe basic sequencing requirements and interlock provisions for system start-up, phasing, coast-down, shut-down and seasonal operations.
 - 4. Emphasize emergency procedures and safety provisions for protection of equipment and safety of occupants during equipment malfunction, disasters, power failures and similar unusual circumstances, and describe system limitations and precautions including weather adjustments.
 - 5. Outline basic maintenance procedures.
- E. Demonstrate what adjustments have been made and can continue to be made to reduce noise and vibration, improve system output, decrease energy consumption and similar performance improvements.
- F. Point out operational security provisions, safety, unavoidable hazards and similar operator limitations. Display and conduct a "thumb-through" explanation of maintenance manuals,

record drawings, meter readings and similar service items.

- G. Construction Equipment: After completion of performance testing and Owner's operating instructions and demonstrations, remove installers tools, test facilities, construction equipment and similar devices and materials used in execution of the work but not incorporated in the work.

3.02 CONTINUED SYSTEM OPERATIONS:

- A. Final Acceptance: At time of substantial completion of mechanical work, Owner's operating personnel will take over operation of mechanical systems. However, until time of final acceptance, respond promptly with consultation and services on whatever operation or maintenance problems may remain or arise in continued operation of mechanical plant.

END OF SECTION 15016

**SECTION 15060
PIPE, TUBE AND FITTINGS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

A. Industry Standards:

- 1. Qualify welding procedures, welders and operators in accordance with ASME B31.1 for shop and project site welding of piping work.
- 2. Certify welding of piping work using the Standard Procedure Specifications by, and welders tested under supervision of, the National Certified Pipe Welding Bureau.
- 3. Where plastic piping is indicated to transport potable water, provide pipe and fittings bearing approval label by the National Sanitation Foundation (NSF).

B. SUBMITTALS:

- 1. Submit manufacturer's data, welding certifications, test reports, and product warranties as applicable for all piping materials.
- 2. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable style number.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS:

- A. General: Provide pipe and tube of the type, joint type, grade, size and weight (wall thickness or Class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements and comply with governing regulations and industry standards.
- B. Black Steel Pipe: ASTM A 53, Schedule 40.
- C. Galvanized Steel Pipe: ASTM A 53, Schedule 40.
- D. Stainless Steel Pipe: ASTM A 312, Schedule 5S, full finish annealed pipe, certified for use with mechanical fittings.
- E. Copper Tube: ASTM B88-89 Type (wall thickness) as indicated for each service; hard-drawn temper, except as otherwise indicated. Solder for use on domestic water piping shall be lead free type.

- F. Copper Tube DWV: ASTM B 306-88 type.
- G. Hubless Cast-Iron Soil Pipe: CISPI 301 or ASTM A 888 including standards for heavy duty coupling assembly ASTM C 564 and ASTM C 1540. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and be listed by NSF International.
- H. Cast-Iron Hub-and-Spigot Soil Pipe: ASTM A 74 including ASTM C 564 and ASTM C1563 for compression gaskets. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and be listed by NSF International.
- I. Plastic Pipe:
 - 1. PVC-WATER: ASTM D2466-88
 - 2. PVC-DWV: ASTM D2665-88
 - 3. ABS-DWV: ASTM D2661-87
- J. Plastic Pipe - Natural Gas Service:
 - 1. Polyethylene: ASTM D2513
- K. Fiberglass Reinforced Pipe:
 - 1. ASTM D2996 with threaded and bonded joints.

2.02 PIPE/TUBE FITTINGS:

- A. General: Provide factory-fabricated fittings of the type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube valve or equipment connections in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.
- B. Cast-Iron Threaded Fittings for Steel Pipe: ASTM A 126-84 Class 125, plain or galvanized to match pipe.
- C. Welded Fittings for Steel Pipe: ASTM A234.
- D. Cast-Iron Flanged Fittings for Steel Pipe: ASME B16.1, including bolting. Class 125, plain or galvanized to match pipe.
- E. Gaskets for Flanged Joints: ASME B16.21; full-faced for cast-iron flanges.
- F. Gaskets for Hub and Spigot Pipe and Hubless Couplings: ASTM C 564, and ASTM C 1540 for heavy duty couplings, ASTM C 1563 for compression gaskets, and CISPI 310 or ASTM C 1277 for standard duty couplings.
- G. Soldering Materials: Except as otherwise indicated, provide soldering materials as determined by the Installer to comply with installation requirements.

1. Tin-Antimony Solder: ASTM B 32, Grade 95TA.
- H. Mechanical Couplings for IPS Pipe: Coupling housings shall be ductile iron (ASTM A536). Bolts and nuts shall be carbon steel track-type (ASTM A183), minimum tensile 110,000 psi. Gaskets shall be Grade "E" EPDM, for water services from -30 to +230EF. At joints allowing controlled movement, expansion, contraction or deflection, flexible couplings shall be used. At all joints not requiring flexibility, a rigid coupling shall be used. Fittings for pipe 2 inches and smaller shall be the mechanical compression type. Mechanical couplings shall be by Victaulic, Anvil or Grinnell.
1. Rigid Type: Coupling housings cast with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9.
 2. Flexible Type: Use in locations where vibration attenuation and stress relief are required.
 3. Flange Adapter: Flat face, for direct connection to ANSI Class 125 or 150 flanged components.
- I. Grooved End Fittings for Steel Pipe: Fittings shall be ductile iron (ASTM A536) forged steel (ASTM A234); or fabricated from carbon steel pipe (ASTM A53); with pre-grooved ends for use with mechanical couplings of the same manufacturer.
- J. Mechanical Couplings for Hard Copper Tube: Coupling housings shall be ductile iron (ASTM A536), coated with copper colored alkyd enamel and cast with angle-pattern bolt pads for system rigidity. Bolts and nuts shall be carbon steel track-type (ASTM A183), minimum tensile 110,000 psi. Gaskets shall be Grade "E" EPDM FlushSeal® type, for water services from -30 to +230EF. Mechanical couplings shall be by Victaulic, Anvil or Grinnell.
- K. Mechanical Couplings for Copper Pipe: Fittings 2"-4" size shall be wrought copper (ASTM B75 C12200 or ASTM B152 C11000 and ANSI B 16.22). Fittings 5" - 8" size shall be bronze sand casting (ASTM B584-87) or copper alloy CDA844 (81-3-7-9) (ANSI B 16.18). Fittings shall have pre-grooved ends for use with mechanical couplings of the same manufacturer. Fittings shall be manufactured to copper tubing sizes. (Flaring of tube and fitting ends to IPS dimensions is not allowed.)
- L. Solvent Cement for PVC Joints: D2564-88.
- M. Solvent Cement for ABS Joints: D2235-88.
- N. Pipe Sleeves:
1. Iron Pipe Sleeves: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
 2. Sheet Metal Pipe Sleeves: Fabricate from galvanized sheet metal closed with lock-seam joints. For following pipe sizes provide gauge indicated: 3 inch pipe and smaller, 20 gauge; 4 to 6 inch pipe, 16 gauge; over 6 inch pipe, 14 gauge.
 3. Pipe Sleeve Caulking: 3M Fire Barrier Caulk, CP25N/S, except where another caulking system or material is specified or approved.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. General: Install pipe, tube and fittings in accordance with recognized industry practices which will achieve permanently-leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with a minimum of joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance.
1. Comply with ASME B31.1 Code for Pressure Piping.
- B. Locate piping runs as indicated on the drawings. Route vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown, or described by diagrams, details and notations or, if not otherwise indicated, run piping in the shortest route which does not obstruct usable space or block access for servicing the building and its equipment. Where possible, locate insulated piping for 1.0" clearance outside insulation. Changes in direction shall be made with fittings.
- C. Piping System Joints: Provide joints of the type indicated in each piping system.
- D. Threaded Joints: Thread pipe in accordance with ANSI B2.12; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.
- E. Welded Joints: Weld pipe joints in accordance with recognized industry practice and as follows: Weld pipe joints only when ambient temperature is above 0 degrees F. where possible. Bevel pipe ends at a 37.5 degree angle where possible, smooth rough cuts and clean to remove slag, metal particles and dirt. Install welding rings for butt welded joints. Use pipe clamps or tack-weld joints with 1.0" long welds; 4 welds for pipe sizes to 10". Build up welds with a stringer-bead pass, followed by a hot pass, followed by a cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow holes and non-metallic inclusions. Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements. Install forged branch-connection fittings wherever branch pipe is indicated, or install regular "T" fitting (at Contractor's option).
- F. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.
- G. Mechanical Coupling Joints: Square cut pipe ends and deburr. Roll-groove pipe ends to manufacturer's specifications. Lubricate gaskets completely on interior and exterior using a non-petroleum based lubricant. Slide gasket over pipe ends between grooves. Engage coupling housing into grooves and tighten until housing bolt pads are in full contact on each side of joint. For pipes 2 inches and smaller, no groove is required. Mark pipe ends for proper insertion into couplings and fittings. Engage piping into fitting to full depth, indicated by marked pipe ends. Align pipe ends, position compression tool and press trigger until assembly cycle is complete. All grooved couplings, fittings, valves and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified

- as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove and installation of grooved piping products. Factory trained representative shall periodically inspect the product installation. Contractor shall remove and replace any improperly installed products.
- H. Soldered Joints: Solder copper tube and fitting joints where required, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings with steel wool. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens. Use a non-corrosive paste flux and wire solder composed of 95 percent tin and 5 percent antimony.
- I. Hubless Cast-Iron Joints: Comply with the manufacturer's installation instructions, CISPI 310 and local code requirements.
- J. Plastic Pipe/Tube Joints: Comply with manufacturer's instructions and recommendations and with applicable industry standards. Install all storm, soil, waste and vent plastic pipe underground in compliance with ASTM D 2321.
- K. Insulating (Dielectric) Nipples: Comply with manufacturer's instructions for installing nipples in a manner which will prevent galvanic action and stop corrosion where the joining of ferrous and non-ferrous piping occurs.
- L. Pipe Sleeves: Install pipe sleeves of the types specified wherever piping passes through the walls, floors or structural members of the work. Provide sleeves of adequate size, accurately centered in pipe runs. Size sleeves so that piping and insulation will have free movement in the sleeve, including allowance for thermal expansion. Where insulation includes a vapor barrier covering provide sleeve with sufficient clearance for installation of vapor barrier. Install length of sleeve equal to thickness of construction penetrated, except extend floor sleeves 0.25 inches above floor finish. Provide temporary support of sleeves during placement of concrete and other work around sleeves and provide temporary closure to prevent concrete and other materials from entering pipe sleeves.
1. Sleeve Type: At interior partitions and ceilings, install sheet metal sleeves.
 2. Sleeve Type: At exterior penetrations both above and below grade, install iron pipe sleeves.
 3. Sleeve Type: Except as otherwise specified, install steel pipe sleeves.
 4. Caulk pipe sleeves at exterior penetrations and at other locations where indicated. Provide sufficient quantities of oakum and lead to make permanent weather-tight closure between sleeve and piping, slightly recessed at exposed surface.
- 3.02 CLEANING, FLUSHING AND INSPECTING:
- A. General: Clean exterior surfaces of installed piping systems of superfluous materials and prepare for application of specified coatings.

- B. Flush out piping system with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.

3.03 PIPING TESTS:

- A. General: Provide temporary equipment for testing, including pump and gages. Test piping systems before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently, but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating.
 - 1. Required test period is 2 hours.
- B. Unless otherwise specified for specific systems, hydraulically test each pressurized piping system at 150% of operating pressure indicated, but not less than 100 psig test pressure.
- C. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
- D. Repair piping systems sections which fail the required piping test, by disassembly and re-installation, using new materials to the extent required to overcome leakage. Do not use chemicals, stop-leak compound, mastics, or other temporary repair methods. Drain test water from piping systems after repair work and retesting has been completed.

END OF SECTION 15060

**SECTION 15094
HANGERS AND SUPPORTS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties on all items.

PART 2 - PRODUCTS

2.01 HANGERS AND SUPPORTS:

- A. General: Except as otherwise indicated, provide factory-fabricated piping hangers and supports of the type specified complete with bolts and washers. Comply with the manufacturer's published product information. Size hangers and supports properly for piping and weight of the medium being transported. Provide insulation shields for all insulated piping.
- B. Hangers for domestic hot and cold water piping and refrigerant lines shall be copper plated band type with adjusting nut; Grinnell, Fig. CT-69, B-Line Fig. B 3172CT, or equivalent by Michigan Hanger, PHD Manufacturing or Hubbard Enterprises/Holdrite.
- C. Hangers for cast iron or plastic drain and vent piping and natural gas piping shall be Clevis type, B-Line Fig. B 3100, or equivalent by Grinnell, Michigan Hanger, PHD Manufacturing or Hubbard Enterprises/Holdrite.
- D. Special Hangers: Special hangers and attachments shall be as detailed or indicated on the drawings.

PART 3 - EXECUTION

3.01 HORIZONTAL PIPING SUPPORT:

- A. Maximum spacing of hangers and supports for above-ground horizontal pipe and tubing shall be as follows:
 - 1. Cast-iron pipe (all sizes) shall be supported at not more than five foot intervals and near each hub or hubless pipe joint and at multiple fittings as required.

B. Steel Pipe:

Nominal Pipe Size (inches)	Support Spacing (feet)
1-1/4 & smaller	7
1-1/2	9
2	10
2-1/2	11
3 & larger	12

C. Copper Tubing:

Tubing Size (inches)	Support Spacing (feet)
3/4 & smaller	5
1 to 2-1/2	6
3	10
4 and larger	12

D. Plastic Pipe:

Nominal Pipe Size (inches)	Support Spacing (feet)
3/4	3.0
3/4 to 1	3.5
1-1/4 to 1-1/2	4.0
2 to 2-1/2	4.5
3 and larger	5.5

- E. Prevent electrolysis in the support of copper tubing by the use of hangers and supports which are copper plated, or by other recognized industry methods.
- F. Branch piping located in walls, partitions or pipe chases shall be rigidly supported inside the wall or chase.

3.02 VERTICAL PIPING SUPPORT:

- A. Cast Iron Pipe: Support at each floor and support at each base and roof level with pipe clamps.
- B. Plastic Piping: Support at 8 feet maximum intervals and near each joint.
- C. Copper Tubing: Support at riser tops and 5 feet maximum on center for pipe 1-1/2" and larger and 4 feet on center for pipe 1-1/4" and smaller. Use copper plated pipe clamps.
- D. Steel Pipe: Supports at top and bottom of riser and on 10 feet maximum centers.
- E. Fixture Supports: See Fixture Schedule. Provide concealed supports and carriers

recommended by the manufacturer of the fixtures and equipment to suit the structural and finish conditions.

3.03 ADJUSTMENT OF HANGERS AND SUPPORTS:

- A. Adjust hangers and supports to bring piping to proper level, elevations and slopes.

END OF SECTION 15094

SECTION 15200
MECHANICAL SOUND, VIBRATION, WIND AND SEISMIC CONTROL

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. Furnish all labor, materials, tools and equipment and perform all work necessary to complete the installation of the mechanical sound, vibration and wind control systems required by these specifications *and* as detailed on the drawings.
- B. All foundations and supports required for the installation of Division 15 equipment shall be furnished by the Division 15 contractor unless specifically specified otherwise.
- C. This facility is classified as Seismic Design Category “C”, Building Category “III” with Mechanical Component Importance Factor = 1.0. Accordingly, no seismic restraints are required.

1.02 RELATED DOCUMENTS:

- A. The drawings and general provisions of this division of the Contract, including the General and Special Conditions and Division 1 Specifications, apply to this Section.

1.03 QUALITY ASSURANCE:

- A. Codes and Standards: The installation of the mechanical systems shall be installed in accordance with the following codes and standards:
 - 1. *2006 International Building Code (IBC)*
 - 2. ASHRAE
 - 3. *SMACNA Seismic Restraint Manual*
 - 4. *ASTM 488 Anchor Locations*
 - 5. FEMA Standards
- B. The mechanical sound, vibration and wind control equipment and products shall be sized and provided by one of the manufacturers listed below. The manufacturer shall have tested all seismic products provided for the specific intended use and installation.
- C. Basis of design is *Kinetics Noise Control*. The following manufacturers are acceptable: *Mason, Vibro-Acoustics* and *Vibration Mountings and Controls*.
- D. The manufacturer and/or his representative shall select all vibration isolation products in accordance with the Vibration Isolation Schedule listed in these specifications. All products shall provide the specified deflection as indicated based on the actual equipment weights and installation requirements of the approved equipment. The manufacturer shall provide installation instructions for all provided isolators, wind restraints and seismic restraints and bracing. Locations of vibration isolation products shall be coordinated with equipment details shown on the drawings and also as specified in these specifications for maximum support locations for piping and other equipment.

E. Submittals:

1. The contractor shall submit for approval by the engineer all products intended to be used to meet the requirements of these specifications. Submittal data shall include a proposed schedule for vibration isolation products, manufacturer's data and cut sheets of the specific vibration isolation or sound barrier materials. Proposed vibration isolation schedule shall list all equipment specified to be isolated, the equipment weight, proposed isolator type or base type, number of isolators required, spring or isolator color, and deflection of the spring or vibration isolator based on the equipment weight.
2. The contractor shall submit for approval by the engineer, wind anchorage requirements for all equipment and curbs. Anchorage calculations shall be prepared by a registered engineer in the state where the project will be constructed. The engineer shall stamp calculations. Wind anchorage requirements shall be submitted for all curb mounted equipment and roof mounted equipment. Forces due to a 100 MPH wind speed in accordance with the IBC 2006 edition shall be calculated. Fasteners shall be selected and detailed for curb connections to the building structure and also for equipment connections to the curb. Calculations shall be based on the approved equipment for the project.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. All equipment shall be mounted or suspended from approved foundations and supports as specified herein or as detailed on the drawings.
- B. The vibration isolation products and systems shall have a deflection as recommended by the manufacturer but not less than the deflection indicated in the Vibration Isolation Schedule.

2.02 ISOLATOR TYPES:

- A. Type 3: Vibration isolators shall be neoprene, molded from oil-resistant compounds, with a cast-in-the top steel load transfer plate for bolting and leveling equipment. Isolator shall have an integral molded support foot for bolting the isolator to the supporting structure. Neoprene isolator shall have a minimum deflection of 0.4".
- B. Type 4: Vibration isolators shall be free standing, un-housed, laterally stable springs wound from high strength spring steel. Springs shall have a lateral stiffness greater than 0.8 times the rated vertical stiffness and shall be designed to provide up to 50% overload capacity. Springs shall be selected to provide operating static deflections shown on the Vibration Isolation Schedule or as indicated on the project documents. Springs shall be color coded or otherwise identified to indicate load capacity. In capacities up to 5,000 lbs., springs shall be replaceable. In capacities over 5,000 lbs., springs shall be welded to the top and bottom load plate assemblies. Springs shall be assembled between a top and bottom steel load plate. The upper load plate shall be provided with steel leveling bolt lock nut and washer for attachment to the supported equipment. The lower load plate shall have a non-skid noise isolation pad bonded to the bottom and have provisions for bolting the isolator to the supporting structure.

- C. Type 10: Vibration Isolators shall consist of a steel spring and neoprene element in series mounted in a stamped or welded steel bracket for insertion into the hanger rod assembly. The elastomer insert shall be neoprene, molded from oil resistant compounds and shall be color coded to indicate load capacity and selected to operate within its published load range. The steel spring shall consist of large diameter laterally stable steel springs assembled into formed or welded steel housing assemblies designed to limit movement. Springs shall have a lateral stiffness greater than 0.8 times the rated vertical stiffness and shall be designed to provide up to 50% overload capacity. The steel bracket shall be fabricated from steel and provided with a corrosion resistance finished. The hanger bracket shall be designed to carry a 500% overload without failure and to allow a support rod misalignment through a 30-degree arc without metal-to-metal contact or other short circuit. The hanger bracket shall incorporate spring caps with indexed steps, which correspond to the washer diameter of the hanger rod to keep the rod centered in the spring cap.

2.03 BASES, RAILS AND CURBS:

- A. Type A: Equipment bases for roof mounted equipment such as split system heat pump outdoor units and ductless heat pump outdoor units shall be mounted on bases as designed on the architectural plans. This specification section shall require all equipment to be secured to the bases to resist wind forces in accordance with the *International Building Code*.
- B. Type C: Vibration isolation rails shall consist of an extruded aluminum lower support rail, extruded aluminum upper support rail, steel springs located between the support rail and a continuous weatherproof seal located between the upper and lower support rails. Vibration isolation rails shall be fabricated and designed to be installed and secured on top of the roof curb specified below. Isolation rails shall provide continuous support for the roof-mounted equipment. Isolation rails shall be designed and engineered to provide isolation against casing radiated vibration and structure born vibration from rotating equipment. The steel springs shall consist of large diameter laterally stable steel springs that have a lateral stiffness greater than 1.0 times the rated vertical stiffness and shall be designed to provide up to 50% overload capacity. Isolation rails shall have wind restraints fabricated and attached to the isolation rail assembly to resist wind forces in accordance with the *International Building Code*. Restraints shall be certified by the manufacturer and stamped by a registered engineer. Isolation rail assemblies shall include supply and return duct block-outs as an integral part of the isolation rail assembly.
- C. Type E: Roof curbs for roof mounted equipment shall be a minimum of 1 ½” wide and 18” high and be fabricated from G 90 galvanized steel fully welded at each corner. Curbs shall be fabricated from a minimum of 18-gage steel or heavier as required to support the intended equipment and shall have fully mitered corners and base plates to secure curb to the support roof steel. Curbs shall be reinforced with internal steel angles to provide a rigid support for the equipment and shall be insulated with a minimum of 1 ½” thick 3# density, fiberglass insulation. Curbs shall have a 2”x2” wood nailer attached to the curb top for securing the equipment. Curbs shall be wind rated for the installation in accordance with the *International Building Code*. A registered engineer shall stamp submittals. Kitchen hood exhaust fan curbs shall also meet requirements of *NFPA 96*.

2.04 SOUND CONTROL PRODUCTS:

- A. Acoustical Sound Barrier:

1. Acoustical sound barrier material shall be installed within the curb area of all roof top units.
2. Barrier material shall be constructed of a vinyl material with a reinforced fiberglass screen loaded with barium sulfate, 1.0 lb per square foot. Tensile strength shall be 300 lbs per inch and tear strength shall be 100 lbs per in.
3. Install 2 layers of acoustical barrier material inside the roof curb. Barrier material shall be cut and uniformed installed inside the curb area on top of the metal roof deck and around the supply and return air ducts.
4. Barrier material shall be *Kinetics* KNM-100 RB or equal by *Soundown*.

B. Acoustical Duct Wrap Barrier:

1. Acoustic duct wrap barrier shall be fabricated of a composite material consisting of an acoustic barrier material bonded to a thin layer of aluminum foil on one side and a decoupling layer of fiberglass batting material.
2. Acoustic barrier shall be constructed of 0.10” thick barium sulphate loaded limp vinyl.
3. Barrier material shall have a “K” value of 0.29 and STC rating of 28.
4. Barrier material shall have a nominal density of 1 psf.
5. Barrier material shall be *Kinetics* Model 100 ALQ-1 or equal by *Soundown*.

2.06 SCHEDULE FOR MECHANICAL SYSTEMS:

<u>Equipment Type</u>	<u>Isolator Type</u>	<u>Base Type</u>	<u>Deflection</u>
Floor Mounted Air Handling Units	Type 3	None	1.0”
Suspended ERV Units	Type 10	None	1.0”
Roof Mounted Air Conditioning Units	Type 4	Type C/E	1.0”
Roof Mounted Fans	None	Type E	None
Roof Mounted HP Units:	None	Type A	None

PART 3 - EXECUTION

3.01 GENERAL:

- A. If the equipment provided is not furnished with integral structural steel supports, mounting feet or lifting lugs, the contractor shall provide miscellaneous steel shapes as required to install or suspend the equipment and attach the vibration isolation as specified herein.
- B. Support steel shall include but not be limited to rails, brackets, angles, channels, and similar components.
- C. All equipment specified to be isolated shall be installed and isolators shall be attached to the building structure or floor and the vibration isolators shall be adjusted and leveled so that the vibration isolators are performing properly.

- D. All vibration isolation products, sound control products and wind control products shall be installed as outlined in the manufacturer's printed installation instructions.

3.02 VIBRATION ISOLATION CERTIFICATE OF COMPLIANCE:

- A. The manufacturer's representative shall be responsible for providing such assistance and supervision as necessary to assure a correct installation and adjustment of vibration isolation products.
- B. The manufacturer's representative shall visit the installation once all installed items have been completed but prior to the installation of ceilings or walls that may conceal any devices and inspect the installation for compliance with the manufacturer's installation instructions. Upon satisfaction that all devices are installed correctly and systems are isolated properly, the representative shall submit a written report outlining the installation as in compliance with these specifications and also the manufacturer's installation instructions.

END OF SECTION 15200

**SECTION 15250
PIPING SYSTEMS INSULATION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SCOPE:

- A. Piping systems to be insulated include:

1. Domestic Hot and Cold Water Piping, Above Ground
2. Horizontal Roof Drain Piping and Drain Bodies Above Floor (including secondary system)
3. HVAC Refrigerant Piping
4. HVAC Drain Piping

1.03 QUALITY ASSURANCE:

- A. Manufacturers: Provide insulation products produced by one of the following for each type and temperature range of insulation.

1. Certainteed
2. Knauf
3. Manville
4. Owens-Corning
5. Pittsburgh Corning

- B. Flame/Smoke Ratings: Provide composite piping insulation (insulation, jackets, covering, sealers, mastics and adhesives) with flame-spread rating not exceeding 25 and smoke developed rating not exceeding 50, as tested by ASTM E 84 (NFPA 255) method and UL 723.

1.04 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties for all items.

PART 2 - PRODUCTS

2.01 PIPE INSULATION:

- A. Fiberglass Insulation: Insulation shall be preformed, two-piece, heavy density fiberglass with

self sealing ASJ jacket conforming to FS HH-I-558 Form D, Type III, and Class 12. Valves and fittings shall be insulated with fiberglass insulation of the same material thickness as insulation on adjacent pipe and having a molded PVC jacket. Jackets shall be Certainteed Snap-Form or Zeston PVC. Insulation thickness shall be as follows:

1. Domestic Hot & Cold Water Piping: 1 inch thick for all sizes.
 2. HVAC Drain Piping: 1 inch thick for all sizes.
 3. Horizontal Roof Drain Piping: 1 inch thick for all sizes.
- B. Flexible Closed Cell Elastomeric Insulation: Insulation shall comply with ASTM C 534 and shall be Armaflex or equivalent. Provide seal-sealing adhesive strip. Insulation on valves, elbows and fittings shall be pre-formed. Insulation thickness shall be as follows:
1. HVAC Refrigerant Piping: Per HVAC manufacturer's recommendations.
- C. Aluminum Jacket: Corrugated, embossed or smooth sheet, .016 inch nominal thickness, ASTM B 209, temper H14, type 3003, 5005 or 5010. Provide stainless steel bands, minimum width of ½ inch.

PART 3 - EXECUTION

3.01 APPLICATION REQUIREMENTS:

- A. General: Insulate all above ground domestic hot and cold water piping except do not insulate supplies to fixtures unless specifically required. Insulate all HVAC drain piping. Insulate horizontal waste lines receiving the discharge from HVAC drains. Insulate the underside of all roof drains and all roof drain piping installed above conditioned spaces.
- B. Aluminum jackets shall be provided on all exterior insulated pipes including refrigerant piping and HVAC drain piping.
- C. In high abuse areas such as janitor closets and traffic areas in equipment rooms, kitchens and mechanical rooms, aluminum jackets shall be provided. Pipe insulation to the 6 foot level shall be protected.

3.02 INSTALLATION OF PIPING INSULATION:

- A. General: Install insulation products in accordance with the manufacturer's written instructions, and in accordance with recognized industry practices to ensure that the insulation serves its intended purpose. Do not use cut pieces or scraps abutting each other.
- B. Insulation shall be applied on clean dry surfaces. All insulation shall be continuous through wall and ceiling openings and sleeves. Insulation on all cold surfaces, where vapor barrier jackets are used, will be applied with continuous unbroken vapor seal. Seal off ends of insulation on cold piping systems with white vapor barrier coating at valves, flanges, supports and exposed ends. Supports that are secured to cold surfaces shall be insulated and vapor sealed to prevent condensation.
- C. Pipe covering protection shields shall be provided around exterior of pipe insulation at pipe

hangers which fit around pipe insulation. Shields shall be 12 inches long by 180 degrees and shall be 18 gauges galvanized steel sheet. High density isolation inserts shall be provided at pipe saddles.

- D. Unions shall not be insulated.
- E. Cover valves, flanges, fittings and similar items in each piping system.
- F. Extreme care shall be taken to insure a neat, uniform exterior surface on insulation applied to exposed pipes. Insulation in finished areas shall be painted in accordance with the paint specifications.
- G. The body (underside) of roof drains shall be insulated with blanket type fiberglass insulation. Overlap ends of insulation a minimum of 2". Overlap bottom of insulation a minimum of 3" at pipe connection. Adhere insulation to roof drain with 100% coverage of fire retardant adhesive. Tape all joints with 3" wide foil reinforced kraft tape.

3.03 PROTECTION AND REPLACEMENT:

- A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- B. Protection: The Installer of the insulation shall advise the Contractor of required protection for the insulation work during the remainder of the construction period, to avoid damage and deterioration.

END OF SECTION 15250

**SECTION 15320
GAS PIPING SYSTEM**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

A. Industry Standards:

1. Comply with applicable provisions of NFPA Standard No. 54, "National Fuel Gas Code."
2. Material and installation shall comply with applicable provisions of the International Gas Code, 2006 Edition with Georgia Amendments.

1.03 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties as applicable for all items.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS:

- A. General: Comply with the Section 15060 for product requirements of piping materials. For each service, provide the piping materials indicated including pipe, tube, fittings, hangers, supports, anchors, valves, and accessories. Where more than one type is indicated, selection is Installer's option.
- B. Above Ground: Schedule 40 black steel pipe of the size indicated with Class 150 malleable iron threaded fittings.
- C. Below Ground: Plastic pipe and fittings conforming to ASTM D2513, Grade 2406.

2.02 ACCESSORIES:

- A. Gas Pressure Regulators: shall be diaphragm actuated with cast iron body, aluminum diaphragm chamber, and all internal parts designed for use with [natural] [LP] gas. Regulators shall be adjustable, with automatic loading, automatic low pressure cut-off, and full internal relief. The regulator shall be adjusted for outlet pressure indicated on the drawings. The outlet pressure shall not vary more than 1 inch w.c. from the set point at specified capacity. The regulator shall be capable of complete shut-off in the event the supply pressure is interrupted or the gas demand exceeds the regulator capacity and shall

remain off until the regulator is manually reset. The regulator shall have a weatherproof, bug proof, screened vent cap installed in the vent tapping. Regulators shall be:

Regular	3/4" - 1-1/4"	1-1/2" - 2"
1. Sensus (Rockwell)	143-4	243-12-4
2. Fisher	1823B	-----
3. Singer	S-104	S-204
With Full Relief	3/4" - 1-1/4"	1-1/2" - 2"
4. Sensus (Rockwell)	143-6	143-12-6
5. Fisher	1833B	-----
6. Singer	S-106	S-206

- B. Plug Valves: Valves shall have iron body (semi-steel) lubricated type cast bronze plug, and threaded ends rated for 175 psig W.O.G. working pressure. Plug valves shall be Rockwell 142, Walworth 655, or Powell 2200.

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPING SYSTEM:

- A. General: Comply with the requirements of the Section 15060 for installation of basic piping materials. Install piping products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to insure that products serve the intended function.
- B. Use sealants on metal gas piping threads which are chemically resistant to natural gas. Use sealants sparingly and apply to only male threads of metal joints.
- C. Remove cutting and threading burrs before assembling piping.
- D. Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged.
- E. Plug each gas outlet, including valves with a threaded cap or plug immediately after installation and retain until continuing piping or equipment connection is completed.
- F. Ground gas piping electrically and continuously within project, and bond to grounding electrode. Buried bare metal piping is acceptable as a grounding electrode.
- G. Install drip-legs in gas piping at regulator station and other low points in the system.
- H. Grade horizontal lines 1/4 inch in 15 ft. to drip-legs.
- I. Support piping in accordance with the following schedule:
- | | |
|-------------------|-------------------------|
| a. Pipe Size | Maximum Support Spacing |
| b. up to 1/2 inch | 6 ft. |
| c. 3/4 - 1 inch | 8 ft. |
| d. over 1 inch | 10 ft. |

- J. Plastic pipe joints shall be made using the heat-fusion method.
- K. Protection of Gas Piping Against Corrosion: Protect metal gas piping in contact with the earth, or other corrosive material, against corrosion. Protect pipe with corrosion-resistant pipeline coating over a rubber-based primer by Polyken. Joints shall be primed and wrapped with Foster Cold-Applied Pipeline Joint Tape.
- L. Install underground piping with a minimum 18 inches of cover. Trench shall be graded to provide a firm, continuous bearing for pipe. Connections between plastic pipe and steel pipe shall be made only outside, underground, and with approved transition fittings.
- M. Coordinate with gas utility company as necessary to interface gas distribution piping with gas service supply work.
- N. Painting: All exposed metal gas piping shall be primed and painted with dark gray enamel.

3.02 EQUIPMENT CONNECTIONS:

- A. General: Connect gas piping to equipment in accordance with the equipment manufacturer's instructions. Provide ground joint union and accessible cut-off valve at each connection to equipment.

3.03 FIELD QUALITY CONTROL:

- A. Fuel Gas Piping Tightness Test: Prior to initial operation, test gas distribution piping system with air or inert gas at 3 psig or two times operating line pressure, whichever is greater. Do not use oxygen for tests.
- B. Repair or replace fuel gas piping as required to eliminate leaks and retest as specified to demonstrate compliance.

END OF SECTION 15320

**SECTION 15401
DOMESTIC WATER PIPING SYSTEM**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. Code Compliance: Comply with governing regulations which require the products used for domestic water piping work to be selected from lists in certain published standards or codes as indicated therein.

1.03 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties as applicable for all items.
- B. Provide certified copy of contractor's sterilization test.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS:

- A. General: Comply with section 15060 for product requirements of piping materials. For each service, provide the piping materials indicated including, pipe, fitting, hangers supports, anchors, valves and accessories. Where more than one type is indicated, selection is Installer's option. Where type is not otherwise indicated, provide materials complying with governing regulations.

B. Service Water Piping:

- 1. Pipe Sizes 4" and Smaller: Copper tube of the size indicated.
- 2. Wall Thickness: Type K
- 3. Fittings: Wrought copper-solder joint (with lead free solder).

C. Water Distribution Piping:

- 1. Pipe Sizes 4" and Smaller: Copper tube of the size indicated.
- 2. Wall Thickness: Type K (below ground).
Type L (above ground).
- 3. Fittings: Wrought copper-solder joint (with lead free solder).

2.02 ACCESSORIES:

- A. General: Provide factory-fabricated piping products of the size, type, rating and capacity indicated. Where not indicated, provide proper selection as determined by the Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections.
- B. Water Hammer Arrestors: Bellows type; precharged compressor chamber; stainless steel casing and bellows. Provide sizes complying with PDI Standard WH-201. Josam 75000 Series, Jay R. Smith Fig 5000, or Zurn 1700 Series
- C. Exterior Wall Hydrant HB/E: All brass freezeproof automatic draining type with polished brass finish, flush mounting wall box, adjustable packing nut, teflon impregnated packing, vacuum breaker with hose thread and loose key operated. Woodford Manufacturing Co. Model B67, Josam #71000 or Zurn Z-1300.
- D. Interior Wall Hydrant HB/B: All brass with polished brass finish, flush mounting wall box, adjustable packing nut, teflon impregnated packing, vacuum breaker with hose thread and loose key operated. Woodford Manufacturing Co. Model B79, Josam #71020 or Zurn Z-1320.
- E. Roof Hydrant HB/R: Exposed, non-freeze roof hydrant, with coated cast iron head and lift handle with lock option, bronze interior parts, galvanized steel casing, and bronze valve housing with drain port in housing. Complete with coated cast iron roof support sleeve with wide anchoring flange and clamp collar. Zurn Z-1388 or equal by Woodford Manufacturing Co. or Josam.
- F. Domestic Water Piping Strainers: Strainers shall be a "Y" bronze body type with 20 mesh stainless steel screen, and threaded ends, rated for 250 psig wwp at 210 degrees F. Strainers for domestic water shall be Watts Model 777 or equivalent by Wilkins or Sarco.
- G. Flow Control Valves: Valves for domestic hot water return shall have brass and stainless steel bodies, with integral ball valve, ground joint union, and solder ends. Valve shall be rated for 600 psig and flow rate, as shown on drawings. Flow control valves shall be Autoflow Model FU-050, Hayes 2500 or equivalent by Griswold.
- H. Pressure Reducing Valves: Valves shall be bronze body construction with renewable seats and integral check valve and strainer. Pressure reducing valves shall be by Bell & Gossett, Taco, Amtrol, or Armstrong.
- I. Pressure Relief Valves: Valves shall be bronze construction engineered in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code for Heating Boilers. Capacities shall be certified by the National Board of Boiler and Pressure Vessel Inspectors. Valves shall be by Bell & Gossett, Taco, Watts, or Armstrong.
- J. Gate Valves: Valves 3 inches and smaller shall be all bronze, meeting MSS-SP80, inserted bonnet, solid wedge, non-rising stem type and rated at 125 SWP, 200 WOG. Handles shall be malleable iron with bronze stem. Valves shall be by Milwaukee, Nibco, Watts or Red-White.
- K. Globe Valves: Valves 3 inches and smaller shall be all bronze, meeting MSS-SP80, inserted bonnet with integral seat and renewable disc. Valves shall be rated at 125 SWP, 200 WOG.

- Handles shall be malleable iron with bronze stem. Valves shall be by Milwaukee, Nibco, Watts or Red-White.
- L. Check Valves: Valves 2 inches and smaller shall be bronze body with bronze seat and disc and shall be rated at 125 SWP, 200 WOG. Valves shall be by Milwaukee, Nibco, Watts or Red-White.
- M. Ball Valves: Ball valves may be substituted for gate valves at the contractor's option. Ball valves shall have two-piece bronze or brass body, meeting MSS-SP110, full or standard port, blowout-proof stem and adjustable packing nut independent of handle. Valves shall be rated for 150 SWP, 600 WOG or 300 CWP. Valves shall be by Apollo, Milwaukee, Nibco, Victaulic, Watts or Red-White.
- N. Thermometers: Piping systems thermometers shall be the red-reading mercury filled adjustable angle type. Thermometers shall be adjustable to any angle through a 180 degree arc and shall be provided with a locking device. Where possible, thermometers shall be installed not higher than 8 feet above finished floor. Final positioning of each thermometer shall be such that it is readable from the floor and it shall be locked in that position. Thermometers shall have V-cast aluminum case with baked enamel finish and 9 inch scale. Thermometers shall be provided with separable sockets, and where installed on insulated pipes, sockets shall be extension neck type. Thermometer scale range shall be 30 to 300 degrees F for hot water systems. Thermometers shall be by Wika, Terrice, or Weiss.
- O. Pressure Gauges: Gauges shall be connected to the piping system with threaded chrome-plated brass pipe and fittings. Gauges shall be the flangeless type and shall have 4-1/2 inch dials, cast aluminum cases, stainless steel heavy duty rotary gear movements, phosphor bronze bourdon tubes, forged brass rod sockets and tips, 1/2% accuracy of scale range, plexiglass dial covers, and 1/4 inch lower connections. Each gauge shall be provided with chrome plated brass lever handle cock and a stainless steel pulsation dampener. Provide compound gauges for locations which under negative pressure. Range for pressure gauges shall be selected so that the normal operating point for each application falls in the approximate midpoint of the gauge range. Gauges shall be by Wika, Terrice, or Weiss.
- P. Access Panel: Access panels shall be 16 gauge steel door and frame with concealed hinge and vandal resistant latch. Panels shall be flush type. Access panel shall be J. R. Smith 4765-AK or equal by Zurn or Josam.
- Q. Escutcheon Plates: Metal split-ring type units, with nickel or chrome plated finish. Provide units sized to fit closely outside of pipe insulation or bare pipe where no covering is required.
- R. Automatic Air Vents: Provide automatic float type air vents in locations indicated on the drawings. Units shall be suitable for a maximum working pressure of 75 psig and a maximum operating temperature of 240 degrees F. Automatic air vents shall be as manufactured by Taco, Bell & Gossett, Amtrol, Wheatley or Armstrong.
- S. Manual Air Vents: Vents shall consist of a 1/4 inch gauge cock with softdrawn copper discharge tube.
- T. Sheet-Metal Pipe Sleeves: Fabricate from galvanized sheet metal closed with lock-seam joints. For following pipe sizes provide gauge indicated: 3 inch pipe and smaller, 20 gauge; 4 inch to 6 inch pipe, 16 gauge; over 6 inch pipe, 14 gauge.

- U. Pipe Sleeve Caulking: 3M Fire Barrier Caulk, CP25N/S, except where another caulking system or material is specified, or equivalent by Hilti or Tremco.

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPING:

- A. General: Comply with the requirements of section 15060 for installation of basic piping materials.
- B. Expansion Compensation: Except as otherwise indicated, install piping, including mains, branches and runouts with offsets to allow for free expansion and contraction sufficient to prevent leaks and over-stressing of the piping system.
- C. Sterilization: The entire water distribution system shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. The chlorinating material shall be liquid chlorine conforming to Federal Specification BB-C-120. The sterilization solution shall be allowed to remain in the system for a period of 24 hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not greater than 0.2 parts per million. After completion of sterilization water samples shall be sent to the Local Health Department (LDH) for testing. Approval must be received from LDH before the system is put into service.

3.02 INSTALLATION OF ACCESSORIES:

- A. Install premanufactured accessories in accordance with the manufacturer's instructions and recommendations.
- B. Access Panel: Install access panels as shown on drawings. Paint access panels to match walls or ceilings.
- C. Escutcheon Plates: Install escutcheon plates at pipe sleeves where piping is exposed to view in occupied spaces of the building, on the exterior and elsewhere as indicated.
- D. Water Hammer Arrestors: Install units at the top of each riser or as otherwise indicated to comply with PDI Standard WH-201.
- E. Air Vents: Install manual air vents at high points in the system and as shown on the drawings.

END OF SECTION 15401

SECTION 15405
SOIL, WASTE AND VENT PIPING SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties as applicable for all items.

1.03 QUALITY ASSURANCE:

- A. Industry Standards: Comply with local regulations, the Standard Plumbing Code and standards established by the Plumbing and Drainage Institute (PDI) pertaining to floor drains.
- B. General: Provide factory-fabricated drainage piping products of the size and type indicated. Where not indicated, provide proper selection as determined by the Installer to comply with the installation requirements and governing regulations. Contractor shall coordinate drainage products selected with finish conditions encountered.
- C. Cast Iron Pipe: All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS:

- A. General: Comply with the 15060 section of product requirements of piping materials. For each service, provide the piping materials indicated, including pipe, fittings, joints, hangers, supports, anchors and accessories. Where type is not otherwise indicated, provide materials complying with governing regulations.
- B. Watts, Mifab and Wade are approved manufacturers for drainage products.
- C. Soil, Waste and Vent Piping (Belowground):
 - 1. Schedule 40 ABS-DWV or PVC-DWV pipe and fittings. Joints shall be solvent cement socket type.
 - 2. Service weight cast iron hub and spigot pipe and fittings, ASTM A74. Joints in underground cast iron piping shall be made using an ASTM-C564 neoprene elastomeric compression gasket conforming to the requirements of ASTM C 1563.

D. Soil, Waste Drain and Vent Piping (Above Ground):

1. Schedule 40 plastic ABS-DWV or PVC-DWV pipe and fittings. Joints shall be solvent cement socket type above ground. If ABS or DWV pipe and fittings are used aboveground all penetrations of rated walls, floors, and assemblies shall be protected in an approved manner, including penetrations of one side of an assembly.
2. Hub less cast iron pipe and fittings conforming to CISPI 301 or ASTM A888. Joints in above ground cast iron shall be made using heavy-duty ASTM C 1540 and ASTM C 564 stainless steel no-hub couplings or cast iron no-hub couplings.
3. Galvanized steel pipe with threaded cast iron fittings or DWV Type copper pipe with solder joint fittings may be used for waste and vent piping 1-1/2 inch and 1-1/4 inch in size.

E. Storm Drain Piping (Below Ground):

1. Schedule 40 ABS-DWV or PVC-DWV pipe and fittings. Joints shall be solvent cement socket type.
2. Service weight cast iron hub and spigot pipe and fittings, ASTM A74. Joints in underground cast iron piping shall be made using an ASTM-C564 neoprene elastomeric compression gasket conforming to the requirements of ASTM C 1563.

F. Storm Drain Piping (Above Ground):

1. Schedule 40 plastic ABS-DWV or PVC-DWV pipe and fittings. Joints shall be solvent cement socket type above ground. If ABS or DWV pipe and fittings are used aboveground all penetrations of rated walls, floors, and assemblies shall be protected in an approved manner, including penetrations of one side of an assembly.
2. Hub less cast iron pipe and fittings conforming to CISPI 301 or ASTM A888. Joints in above ground cast iron shall be made using stainless steel no-hub standard couplings, CISPI 310, ASTM C 1277 and ASTM C564 or stainless steel no-hub heavy duty couplings, ASTM C 1540 and ASTM C 564.

2.02 FLOOR DRAINS, FLOOR SINKS AND ROOF DRAINS:

A. Drains installed in waterproofed floors and roofs shall be provided with flashing clamps.

B. Floor Drain FD-A: shall have a coated cast iron body with integral pipe stops, flashing collar, seepage flange, vandal-proof screws and 6" diameter round Nikaloy strainer. Where indicated on the drawings, drain shall have a trap primer connection. Drains shall be:

- | | |
|---------------|----------------|
| 1. J.R. Smith | 2010-U-A-P050 |
| 2. Josam | 30000-17-6A-50 |
| 3. Zurn | ZN-415-VP-B-P |

C. Floor Drain FD-B: shall have a coated cast iron body with integral pipe stop, 10"x10" cast iron non-clog strainer, flashing flange, vandal-proof screws and medium deep slotted sediment bucket. Drains shall be:

- | | |
|---------------|-------------|
| 1. J.R. Smith | 2630-F-U |
| 2. Josam | 35440-81-17 |
| 3. Zurn | Z-611-VP |

D. Floor Sink FS-A: shall have a cast iron body with 8" deep porcelain enameled acid resisting interior, flashing collar, drainage flange, aluminum dome strainer and polished nickel bronze anti-tilting ½ strainer. Drains shall be:

- | | |
|---------------|--------------|
| 1. J.R. Smith | 3150-C-12 |
| 2. Josam | 49340A-3 |
| 3. Zurn | ZN-1901-KC-2 |

E. Roof Drains RD-A: shall have a coated cast iron body with adjustable top, clamp ring/gravel stop, large sump, deck clamp, drain receiver, aluminum mushroom dome, and no-hub connection. Drains shall be:

- | | |
|---------------|---------------|
| 1. J.R. Smith | 1010Y-C-R-AD |
| 2. Josam | 21000-Z-3-26 |
| 3. Zurn | ZA-100-NH-C-R |

F. Roof Drains RD-B: shall have a coated cast iron body with adjustable top, clamp ring/gravel stop, large sump, deck clamp, drain receiver, 4" cast iron standpipe, aluminum mushroom dome, and no-hub connection. Drains shall be:

- | | |
|---------------|------------------|
| 1. J.R. Smith | 1070Y-C-R-AD-CIS |
| 2. Josam | 26010-Z-3-26 |
| 3. Zurn | ZA-100-NH-C-R-W4 |

G. Hub drains shall have a pipe hub (or one pipe size increaser if plastic pipe is used) set in the floor with the top 1" above the finished floor. Waste piping from fixtures and equipment shall be connected solid into the hub.

H. Open hub drains shall have a pipe hub (or one pipe size increaser if plastic pipe is used) set in the floor with the top 1" above the finished floor. Indirect waste piping shall terminate 2" above the top of the hub.

2.03 CLEANOUTS:

- A. Cleanout plugs shall be cast bronze or brass countersunk type with taper threads complying with ANSI B2.
- B. Cleanouts on underground drainage shall have piping extended to the floor and finished with cleanout plug and removable floor plate.
- C. Cleanouts shall be the same size as the pipe on which installed, except cleanouts on underground piping shall be a maximum of 4".
- D. Cleanouts in waterproofed floors shall have flashing clamp.
- E. Cleanouts in carpeted floors shall be provided with a carpet marker.
- F. Concrete Floors: Cleanouts shall have cast iron body with integral pipe stop, adjustable round scoriated nickel bronze cover and rim, vandalproof securing screw, and countersunk bronze plug. Cleanouts shall be:

1. J.R. Smith 4025C-U
 2. Josam 58360-VP
 3. Zurn ZN-1400-VP
- G. Quarry Tile or Ceramic Tile Floors: Cleanouts shall have cast iron body with integral pipe stop, adjustable square scoriated nickel bronze cover and rim, vandalproof securing screw, and countersunk bronze plug. Cleanouts shall be:
1. J.R. Smith 4045C-U
 2. Josam 58360-VP
 3. Zurn ZN-1400-T-V
- H. Resilient Tile Floors: Cleanouts shall have cast iron body with integral pipe stop, adjustable square nickel bronze cover recessed for tile, vandalproof securing screw, and countersunk bronze plug. Cleanouts shall be:
1. J.R. Smith 4165C-U
 2. Josam 58360-12-VP
 3. Zurn ZN-1400-TX-VP
- I. Terrazzo Floors: Cleanouts shall have cast iron body with integral pipe stop, adjustable round nickel bronze cover recessed for terrazzo, vandalproof securing screw, and countersunk bronze plug. Cleanouts shall be:
1. J.R. Smith 4188C-U
 2. Josam 58360-12-VP
 3. Zurn ZN-1400-Z-VP
- J. Carpeted Floors: Cleanouts shall have cast iron body with integral pipe stop, adjustable round scoriated nickel bronze cover and rim, bronze carpet marker, and countersunk bronze plug. Cleanouts shall be:
1. J.R. Smith 4025-Y
 2. Josam 58360-14
 3. Zurn ZN-1400-CM
- K. Exterior Areas: Cleanouts to grade shall have cast iron body with integral pipe stop, heavy duty round cast iron tractor cover with vandalproof screw, and countersunk bronze plug. Cleanouts shall be:
1. J.R. Smith 4245C-U
 2. Josam 58500
 3. Zurn ZN-1400-HD-VP
- L. Wall Cleanouts: shall consist of a threaded recessed tapped cleanout tee with tapered thread bronze plug, [vandalproof] securing screw, and round stainless steel wall plate. Cleanout shall be:
1. J.R. Smith 4532S-U
 2. Josam 58600-COT-VP
 3. Zurn ZN-1446-VP

2.04 DRAINAGE ACCESSORIES:

- A. Escutcheon Plates: Metal split-ring type units, with nickel or chrome plated finish. Provide units sized to fit closely outside of pipe insulation or bare pipe where no covering is required.
- B. Downspout Nozzle: Cast Nikaloy downspout nozzle with loose wall flange, insect screen and threaded inlet connection. Nozzle size shall match size of connecting storm drain pipe shown on drawings. Downspout nozzle shall be Josam 25010, J.R. Smith 1770-NB or Zurn ZANB-199.

2.05 DRAINAGE PUMPS:**A. Elevator Sump Pump (SP-1):**

- 1. Sump pump shall be a single stage submersible pump with NEMA 4x weathertight corrosion resistant fiberglass housing, stainless steel sensor probe, single direct plug-in power source. Pump system shall meet the requirements of UL508 and UL778. Pump shall have the capacities shown on the drawings and shall have electrical characteristics shown on the drawings.
- 2. Sump pump system shall include oil monitoring control system and panel. Oil monitoring control system shall include monitoring panel, alarm, light and remote monitoring circuit. Panel shall provide alarms for oil spill, power, high liquid level, overload and pump run. Oil monitoring system shall report to the fire alarm control panel.
- 3. Pump shall be controlled by a float switch mounted directly on the pump. Pump motor and float shall be built as a manufactured unit. Pump and oil monitoring system shall be provided as a packaged unit. Pump shall be Stancor SE Series or equal by Liberty.

PART 3 - EXECUTION**3.01 INSTALLATION OF PIPING:**

- A. General: Comply with the requirements of section 15060 for installation of basic materials.
- B. Testing: The piping of the soil, waste and vent system shall be tested with water before installing fixtures. Water test shall be applied to the soil, waste and venting system either in its entirety or in sections. If the test is applied to the entire system, all openings in the piping shall be closed except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening of the section under test shall be plugged and each section shall be filled with water and tested with at least a 10 foot head of water. In testing successive sections, at least the upper 10 feet of the next preceding section shall be tested so that each joint or pipe in the building except the upper most 10 feet of the system has been submitted to a test of at least 10 foot head of water. The water shall be kept in the system, or in the portion under test, for at least 30 minutes before the inspection starts; the system shall be tight at all joints. Joints that fail the test shall be remade and retested.

- C. Protection: The installer of drains shall advise the Contractor of required protection for the drains during the remainder of the construction periods, to avoid clogging with construction materials and debris to prevent damage from traffic and construction work.
- D. During construction all pipe openings shall be capped or plugged, when not being worked on, to prevent foreign objects and construction debris from entering system.
- B. Horizontal drainage piping 2-1/2" and smaller shall be graded at a minimum of 1/4 inch per foot, unless noted otherwise. Horizontal drainage piping 3" and larger shall be graded at a minimum of 1/8 inch per foot, unless noted otherwise.
- C. Horizontal roof and overflow drainage piping shall be insulated using 1" thick jacketed fiberglass insulation as specified in Section 15250. The underbody of roof drains shall also be insulated as specified in Section 15250.
- D. All underground plastic soil, waste and vent and storm drainage piping shall be installed in compliance with ASTM D 2321.

3.02 INSTALLATION OF ACCESSORIES:

- A. Install escutcheon plates at pipe sleeves where piping is exposed to view in occupied spaces of the building, on the exterior and elsewhere as indicated.
- B. Cleanouts in vertical piping shall be roughed-in with the centerline 18" above the finished floor.
- C. Install drains in accordance with manufacturer's written instructions and in locations indicated.
- D. Coordinate with soil and waste piping as necessary to interface drains with drainage piping system.
- E. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.
- F. Install drains at low points of the surface areas to be drained. Set tops of drains flush with finished floor or deck.
- G. The installer shall advise the General Contractor of required protection for drains and cleanouts during the remainder of the construction period, to prevent damage from traffic and construction work.
- H. After installation, cover the tops of drains with duct tape or some other strong material during the remainder of the construction process, to avoid clogging with construction materials and debris.

END OF SECTION 15405

**SECTION 15424
WATER HEATERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

A. Industry Standards:

1. Provide electric water heaters which have been listed and labeled by Underwriters' Laboratories.
2. Comply with National Electrical Code (NFPA 70) as applicable to installation and connection to electric water heaters.
3. Provide water heaters which have been listed and labeled by National Sanitation Foundation (NSF).
4. Provide water heaters with safety relief valves bearing ASME valve markings, all heaters.
5. Comply with American Gas Association (AGA) as applicable to certification of gas-fired water heaters.
6. Heaters(s) shall meet the requirements of ASHRAE 90.1-2004, state energy requirements, and the BOCA Energy Conservation Code.

1.03 SUBMITTALS:

- A. Provide manufacturer's data, test reports, certifications and product warranties on all items.

PART 2 - PRODUCTS

2.01 ELECTRIC WATER HEATERS:

- A. Electric Water Heater WH-1, WH-2 & WH-3: Provide electric type factory assembled and wired vertical storage type water heaters. Provide with glass-lined welded steel tank, thermally insulated with foam type or fiberglass insulation and encased in corrosion resistant steel jacket with baked-on white enamel finish. Equip with drain valve, immersion heater, magnesium anode, emergency high limit cut-off switch to prevent over-heating, automatic thermostat with temperature range from 120 degrees F to 170 degrees F, and temperature and pressure relief valve. Heater shall carry manufacturer's standard warranty and shall meet or exceed the requirements of ASHRAE 90.1. Water heaters shall be as follows:

1. Bradford White LD Utility Series
2. Rheem EGSP Series

3. Equivalent by Ruud

2.02 ACCESSORIES:

- A. Domestic Hot Water Circulation Pump: Pump shall be the in-line centrifugal type designed for 125 psi working pressure with bronze body and impeller, mechanical seals and stainless steel impeller shaft. The pump motor shall be the open drip-proof design with sleeve bearings, built-in thermal over-load protectors, and shall operate at 1750 RPM. Pump shall have the capacities as shown on the drawings. Pump shall be:
1. Bell & Gossett - Booster Series
 2. Taco - Circulation Series
 3. Thrush - Circulator Series
 4. Grundfos - UP Circulator Series
- B. Thermal Expansion Tanks: Provide bladder type captive air expansion tanks with tank volume as indicated on the drawings. The shell shall be fabricated steel designed and constructed per ASME Section VIII. Tanks shall be suitable for potable water systems and maximum working pressure of 125 psig and a maximum operating temperature of 240 degrees F. Tanks shall be by Taco, Amtrol, Watts, or Wheatley.
- C. Thermal Expansion Valve: Provide calibrated pressure relief valve with an adjustable range of 50-175 lbs. Thermal expansion valve shall be Watts 530, Cash-Acme Type FWC, or Wilkins P1500.
- D. Vacuum Relief Valve: Provide a vacuum relief valve for automatic venting of a closed system to atmosphere when a vacuum is created. Valve shall be tested and rated under ANSI Z21.22. Vacuum relief valve shall be a Watts N36, Cash-Acme FRM-V, or Wilkins VR10.
- E. Suspended Equipment Platform: Platform shall be a wall mounted pre-manufactured unit designed to support up to 600 pounds. Platform shall include a 12 gauge galvanized steel pan, 14 gauge galvanized steel corner brackets, 16 gauge galvanized steel C-brackets, 12 gauge galvanized steel 45° brackets, 3/8" zinc plated threaded rods, 1" PVC drain, and water-tight corners. Platform shall be by Holdrite Quick Stand series or equal.
- F. Water Heater Pan: Water heater pan shall be aluminum alloy pan with 2½" high sides, 1" PVC drain, zinc plated steel lock nut and neoprene flange gasket. Water heater pan shall be by Holdrite Quick Pan series or equal.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install water heaters and accessories where shown, in accordance with equipment manufacturer's written instructions and with recognized industry practices. Comply with requirements of state and local codes and applicable NFPA and ASME Boiler and Pressure Vessel Code Standards.
- B. Flush water heaters upon completion of installation in accordance with manufacturer's instructions.

- C. Start-up water heaters in accordance with manufacturer's written procedures, upon completion of heater installation and demonstrate compliance with requirements.

3.02 FIELD QUALITY CONTROL:

- A. Test assembled water heater and accessories in accordance with applicable sections of ASME Boiler and Pressure Vessel Code.

END OF SECTION 222210

**SECTION 15450
PLUMBING FIXTURES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. Industry Standards: Comply with ANSI Standards pertaining to plumbing fixtures and systems.
- B. Comply with ANSI A117.1 standard pertaining to plumbing fixtures for handicapped.
- C. Comply with standards established by Plumbing and Drainage institute (PDI) pertaining to plumbing fixture supports.
- D. Comply with applicable Federal Standard FS WW-P-541/Series sections pertaining to plumbing fixtures.

PART 2 - PRODUCTS

2.01 PLUMBING FIXTURES:

- A. General: Provide factory-fabricated fixtures of the type, style and material indicated. For each type of fixture, unless otherwise specified, provide fixture manufacturer's standard trim, carrier seats and valves as indicated by their published product information, either as designed and constructed, or as recommended by the manufacturer, and as required for a complete installation. Where more than one type or manufacturer is indicated, selection is Installer's option.

2.02 MATERIALS:

- A. General: Unless otherwise specified, comply with applicable Federal Specification WW-P-541/series sections pertaining to plumbing fixtures, fittings, trim, metals and finishes. Comply with requirements of WW-P-541/specification relative to quality of ware, glazing, enamel, composition and finish of metals, air gaps and vacuum breakers, even though some plumbing fixtures specified in this section are not described in WW-P-541.
- B. Unless otherwise specified, faucets shall comply with National Sanitation Foundation International NSF Standard 61, and where applicable NSF Standard 61, Section 9. Faucets shall be NSF certified, and bear the NSF mark.

- C. Provide materials which have been selected for their surface flatness and smoothness. Exposed surface which exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration or other surface imperfections on finished units are not acceptable.
- D. Where fittings, trim and accessories are exposed or semi-exposed, provide bright chrome-plated or polished stainless steel units.
- E. Vitreous China: High quality, free from fire cracks, spots, blisters, pinholes and speck; glaze exposed surfaces and test for crazing resistance in accordance with ASTM C 554.
- F. Vitreous China and Enamel Iron Fixtures shall be white unless specified otherwise.
- G. Comply with additional fixture requirements contained in the fixture schedule.
- H. Kohler, American Standard, Eljer, Crane, Chicago, Zurn, Sloan, T & S Brass, Symmons, Speakman, Elkay and Just are approved manufacturers for all lavatory, service sink, can wash and sink faucets.
- I. Eljer is an acceptable manufacturer for all water closets, urinals and lavatories.
- J. Zurn One and Sloan are acceptable manufacturers for all vitreous china and cast iron plumbing fixtures.
- K. Flush valves shall be the size, roughing height, and flow rate specified hereinafter for each fixture. Flush valve shall be a diaphragm actuated type with chrome plated exterior, angle stop with cover, vacuum breaker, adjustable tailpiece, and cast escutcheon with setscrew. Where shown on the drawings provide a trap primer connection in the valve tailpiece. All flush valves specified to be 24" roughing shall be provided with wall brace.
- L. All low voltage wiring, sensors, and transformers shall be provided under this section with the hardwired flush valves and/or faucets.
- M. Toilet seats shall be same color as fixture. Seats shall be open front without cover, and solid molded plastic with self-sustaining check hinge. Seats shall be for elongated bowl unless specified otherwise.
- N. Carriers shall be commercial grade and selected to match the fixtures for which they are used. Carriers shall be floor mounted and designed to transfer any fixture loading to the floor and not the wall unless specified otherwise. Carriers provided for wall hung urinals shall be two plate type. Carriers for wall hung water closets and urinals shall be provided with chrome plated mounting hardware.
- O. Fixture stops shall be provided for all fixtures and shall be chrome plated with cast escutcheons with set screws. Stops for flush valves shall be by the flush valve manufacturer. Stops for shower valves shall be either angle or straight type and shall be concealed behind the shower cover plate. Stops for lavatories and sinks shall be loose key or wheel handle type as specified for each fixture.
- P. Fixture drains shall be by the same manufacturer as the lavatory and sink faucets, with a matching finish. Lavatory and sink drains shall be pop-up, grid, or crumb cup type as specified for each fixture. Drains shall be chrome plated brass or stainless steel unless noted otherwise. Drain tailpieces shall be minimum 17 gauge chrome plated cast brass.

- Q. All p-traps, continuous wastes and fixture drain piping shall be 17 gauge chrome plated cast brass and of the size indicated in the fixture schedule on the plumbing drawings.
- R. Insulation kits shall be provided for all handicap lavatories and sinks with exposed supply and waste piping. Insulation kits shall include covers for fixture drains, p-traps and supplies.

2.03 PLUMBING FIXTURE SCHEDULE:

- A. Water Closet P-1A : shall be a floor mounted, floor outlet, vitreous china, siphon jet water closet with elongated bowl (designed for 1.28 gallon flush), 1-1/2" top spud, floor bolts, bolt caps, and outlet gasket. The water closet shall be fitted with a white seat and 1-1/2" (11-1/2" roughing) flush valve. Flush valve shall be a battery powered infrared operated diaphragm actuated type with manual override button and chrome plated exterior. Water closet and trim shall be:

	AMERICAN STD.	KOHLER	ZURN
	Madera	Wellworth	
Water Closet:	3451.001	K-4406	Z5655
Flush Valve:	SLOAN	DELANY	Included
Seat:	BENEKE	BEMIS	Included

- B. Water Closet P-1B: shall be an ADA compliant floor mounted, floor outlet, vitreous china, siphon jet water closet with elongated bowl (designed for 1.28 gallon flush), 1-1/2" top spud, floor bolts, bolt caps, and outlet gasket. The water closet shall be fitted with a white seat and 1-1/2" (11-1/2" roughing) flush valve. Flush valve shall be a battery powered infrared operated diaphragm actuated type with manual override button and chrome plated exterior. Water closet and trim shall be:

	AMERICAN STD.	KOHLER	ZURN
	Madera ADA	Highline	
Water Closet:	3461.001	K-4405	Z5665
Flush Valve:	SLOAN	DELANY	Included
Seat:	BENEKE	BEMIS	Included

- C. Urinal P-2A: shall be a wall hung, vitreous china, washout urinal (designed for 0.5 gallon flush), 2" outlet, 3/4" top spud and wall hangers. The urinal shall be fitted with a 3/4" (11-1/2" roughing) flush valve and back plate. Flush valve shall be a battery powered infrared operated diaphragm actuated type with manual override and chrome plated exterior. Urinal shall be:

	AMERICAN STD.	KOHLER	ZURN
Urinal:	Washbrook 6590.505	Bardon K-4904	Equivalent
Flush Valve:	SLOAN 8186-0.5	K-13519	Equivalent

- D. Urinal P-2B: shall be the same as urinal P-2A except for mounting height. Refer to the Plumbing Fixture Schedule on the drawings for mounting height.
- E. Lavatory P-3: shall be a wall hung, 20" x 18" vitreous china lavatory with back splash and punched for 4" centers. The lavatory shall be fitted with a chrome plated, battery powered, ADA compliant center-set sensor faucet with above deck mixer and low flow aerator (0.5

gpm), off-set perforated grid drain, 1-1/4" p-trap, loose key angle supplies, chair carrier with concealed arm supports and insulation kit. Lavatory and trim shall be:

	AMERICAN STD.	KOHLER	CRANE
Lavatory:	Lucerne	Greenwich	Harwich
	0355.012	K-2032	1412V
Faucet:	CHICAGO	ZURN	MOEN COMMER.
	Equivalent	Z6915-ADM-F	Equivalent
Drain:	McGUIRE	ZURN	WATTS
P-trap:	McGUIRE	ZURN	WATTS
Supplies:	McGUIRE	ZURN	WATTS
Insulation Kit:	McGUIRE	TRUEBRO	SKAL-GUARD
Carrier:	J.R. SMITH	JOSAM	ZURN

- F. Mop Sink P-4A: shall be a 24" x 24" molded stone mop basin with 10" high sides and integral 3" chrome plated dome drain. The mop sink shall be fitted with vinyl bumper guards, a chrome plated faucet with vacuum breaker, a hose with hose bracket, and stainless steel wall guards. Mop sink shall be white and the faucet shall be mounted on the wall 36 inches above the floor. Mop basin shall be:

	STERN-WILLIAMS	FLORESTONE	FIAT
Basin:	SBC-1500	85	TSB-100
Bumperguards:	V-70	Equivalent	Equivalent
Faucet:	T-10-VB	ZURN SF	830-AA
Hose/Bracket:	T-35	ZURN HH	832-AA
Wall Guards:	BP-2-24	Equivalent	MSG2424

- G. Condensate Drain Box P-5: shall be a recessed flush mounting painted steel box with plugged 2" drain outlet and tamper resistant cover plate. Condensate Drain Box shall be GUY GRAY, OATEY or PLASTIC ODDITIES.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install plumbing fixtures of types indicated where shown and at indicated heights or where not shown in accordance with manufacturer's written instruction, roughing-in drawings and with recognized industry practices.
- B. Install all low voltage wiring, sensors, and transformers furnished with the hardwired flush valves and/or faucets. 120V power connections for the low voltage transformers shall be connected by the Division 16 contractor in accordance with specification section 16111. All low voltage wiring and needed pathways shall be provided under this section. Provide needed pathway/chase to form an accessible pathway from each sensor location to a point within 6" of low voltage transformer, and terminate with insulated throat bushing. Wiring installed in an open plumbing chase can be installed without conduit.
- C. Fasten plumbing fixtures securely to indicated supports or building structure, and ensure that fixtures are level and plumb and tight against mounting surface.

- D. Seal the outer perimeter of wall mounted lavatories and urinals and water closets to the wall and floor mounted water closets to the floor with a smooth bead of white silicone compound.
- E. All fixtures provided under another division of the specifications shall be roughed-in and connected under this section. Provide individual shut-off valves or supply stops to all fixtures with a water or gas supply. Provide p-traps and extensions to waste stack in wall or to drain, as shown on the drawings, if not provided by the fixture supplier. Supply stops and p-traps shall be McGUIRE, EBC, or BRASS-CRAFT.

3.02 FIELD QUALITY CONTROL:

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test and adjust fixtures for proper operation.

END OF SECTION 15450

**SECTION 15455
WATER COOLERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

A. Industry Standards:

1. Provide drinking-water coolers which have been listed and labeled by Underwriters' Laboratories (UL399)
2. Provide drinking-water coolers which are rated and certified in accordance with Air Conditioning and Refrigeration Institute (ARI) Standard 1010.
3. Provide wheelchair water coolers which comply with ANSI A117.1-2003 and ADA guidelines.
4. Provide drinking-water coolers which are manufactured using lead-free components and solder in all waterways.

1.03 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties as applicable.

PART 2 - PRODUCTS

2.01 ELECTRIC WATER COOLER "EWC-1":

- A. Provide wall mounted wheelchair type water coolers with integral water chiller capable of delivering 7.5 gph of 50 degrees water at 90 degrees F ambient temperature and 80 degrees F entering water temperature. Units shall have hermetically sealed refrigerant system complete with 120V/1PM/60HZ compressor and air cooled condenser. Cabinet, receptor, and back shall be stainless steel. Bubbler operator shall be a soft touch vandal proof bar full across the front of the unit. The water cooler shall be fitted with cast brass p-traps, a valved 1/2" cold water supply, and chair carrier. Units shall be OASIS P8AM, HALSEY-TAYLOR HAC-8FS, SUNROC NWCA-8 or ELKAY EZS8. Chair carrier shall be J.R. Smith, Josam or Zurn.

2.02 ELECTRIC WATER COOLER "EWC-2":

- A. Unit shall be the same as electric water cooler EWC-1 except for the mounting height. Refer to plumbing drawings for mounting height.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. General: Install water coolers in accordance with manufacturer's written instructions and in accordance with the National Electrical code and recognized industry practices.
- B. After water coolers are mounted on wall, bolt a 1-1/2 inch steel angle bracket to bottom of unit and attach to wall. Paint to match wall.

3.02 FIELD QUALITY CONTROL:

- A. Test operates installed water coolers to demonstrate compliance with the requirements.

END OF SECTION 15455

**SECTION 15720
AIR TREATMENT SYSTEMS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE

- A. Manufacturers: Equipment manufactured by *Global Plasma Solutions* and *Bioclimatic* that meets performance and other requirements of the design documents shall be accepted.
- B. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of twelve months after shipment or eighteen months from owner acceptance, whichever occurs first. Labor to replace equipment under warranty shall be provided by the owner or installing contractor

1.03 SUBMITTALS

- A. Provide manufacturer's data, test reports, and product warranties. The following information shall be included in the submittal:
 - 1. Schedule of air treatment systems indicating unit designation and number of each type required for each unit/application.
 - 2. Data sheet for each type of air treatment systems and accessories furnished indicating construction, sizes, and mounting details.
 - 3. Performance data for each type of air treatment system furnished.
 - 4. Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 to validate acceptable indoor air quality at the quantity of outside air scheduled.
 - 5. Product drawings detailing all physical, electrical and control requirements.

1.04 DESCRIPTION OF WORK

- A. This section describes the design, performance and installation of an air treatment system intended for use as part of another manufacturer's air handling unit or mounted on the duct as shown on the plans, details and equipment schedules.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT:

- A. General: Air treatment systems shall be the needle-point bi-polar ionization type of the size,

- arrangement and capacity indicated and required by the unit furnished and shall be of the manufacturer specified.
- B. Each piece of air handling equipment so designated on the plans, details, equipment schedules and/or specifications shall contain an air treatment system with bi-polar ionization output as described here within.
 - C. The Bi-Polar Ionization system shall be capable of:
 - 1. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
 - 2. Controlling gas phase contaminants generated from human occupants, building structure and furnishings.
 - 3. Capable of reducing static space charges.
 - 4. Increasing the interior ion levels, both positive and negative, to a minimum of 1000 ions/cm³
 - D. The air treatment system shall be designed such that it may fit into any scheduled mounting configuration including ductless mini-split units. If the ionization device is to be mounted in the ductless mini-split units, the air treatment system shall be powered from the ductless mini-split control board without having to require revised fusing in ductless mini-split device.
 - E. The air treatment system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable. The quantity of air exchange shall not be increased due to requirements of the air treatment system. The air treatment system shall not have a maximum velocity profile.
 - F. Air treatment systems shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100% shall not cause damage, deterioration or dangerous conditions within the air treatment system. Air treatment systems shall be capable of wash down duty.
 - G. Each air treatment system with bi-polar ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. A minimum of one electrode pair per 2400 CFM of airflow shall be provided.
 - H. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating. Internal circuitry shall be provided to sense airflow across the electrode output.
 - I. HVAC Units: Where so indicated on the plans and/or schedules, air treatment systems shall be supplied and installed. The mechanical contractor shall mount the air treatment system and wire it to the HVAC control power (24VAC) as instructed by the air treatment manufacturer's instructions. Each unit shall be designed with a stainless steel casing; integral illuminated on/off switch, two 2.5mm DC power jacks, high voltage output indication light and dry contacts to prove ion output is operating properly. The dry contacts shall close to prove the air treatment system is working properly and may be daisy chained in series such that only one dry contact per unit is required to interface to the BAS.
 - J. Ionization Requirements: Air treatment systems with bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above. The air treatment system shall consist of bi-polar plasma generator and power supply. The air treatment system shall be installed where indicated on the plans or specified to be

- installed. The device shall be capable of being powered by DC power or 24VAC or 94VAC to 264VAC without the use of an external transformer. Air treatment systems requiring isolation transformers shall not be acceptable. The ionization output shall be controlled such that an equal number of positive and negative ions are produced. Imbalanced levels shall not be acceptable. Ionization output from each electrode shall be a minimum of 5 million ions/sec when tested at 2” from the ionization generator.
- K. Ozone Generation: The operation of the electrodes or bi-polar ionization units shall conform to ASHRAE Standard 62.1 with respect to ozone generation. There shall be no ozone generation during any operating condition, with or without airflow.
- L. Electrical Requirements: Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Plasma generator shall accept an electrical service of 24 VAC or 100 VAC to 240VAC, 1 phase, 50/60 Hz. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.
- M. Control Requirements:
1. All air treatment systems shall have internal short circuit protection, overload protection, and automatic fault reset.
 2. Integral airflow sensing shall modulate the plasma output as the airflow varies or stops.
 3. The installing contractor shall mount and wire the air treatment system within the air-handling unit specified or as shown on the plans. The contractor shall follow all manufacturer IOM instructions during installation.
 4. All air treatment systems shall have a means to interface with the BAS system. Either a 0-10VDC output or dry contacts shall be acceptable to prove there are ions being produced.

PART 3 - EXECUTION

3.01 GENERAL:

- A. The Contractor shall be responsible for maintaining all air treatment systems until the Owner accepts the building.

3.02 INSTALLATION:

- A. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the owner, architect, and engineer.
- B. Any material damaged by handling, the mechanical contractor, at no cost to the owner, shall replace water or moisture.
- C. All equipment shall be protected from dust and damage on a daily basis throughout construction.

3.03 TESTING

- A. Upon completion of installation of equipment and system, start-up and operate system to demonstrate compliance with design requirements.
- B. A qualified representative from the manufacturer shall inspect the installation of the air treatment system to ensure installation in accordance with manufacturer's recommendation.

3.04 TRAINING

- A. A manufacturer's authorized representative shall provide training of owner's personnel in the proper operation and maintenance of all equipment.

END OF SECTION 15720

**SECTION 15760
ELECTRIC HEATERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. Manufacturers: Provide equipment produced by one of the following:

1. Berko
2. Chromalox
3. Markel
4. Qmark
5. Reddi
6. Raywall
7. Warren

- B. Industry Standards: Each unit shall be U.L. listed.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT:

- A. Wall Heaters: Wall heaters shall be the surface mounted fan-forced type. Provide accessory mounting kits as applicable. The heating section shall consist of a steel chassis with heating element, fan and motor, fan control, thermostat, and thermal cutout. Heater section shall be completely prewired. The element shall be the fin-tube type enclosed in a steel sheath. The fan motor shall be impedance protected, permanently lubricated type totally enclosed motor. Fan control shall be bi-metallic, snap-action type delay switch. Thermal cutout shall also be bi-metallic, snap-action type. The front cover shall be heavy gauge steel with a baked enamel finish. Heaters shall have built-in thermostat and disconnect switch.
- B. Cabinet Unit Heaters: Cabinet unit heaters shall be blow-thru type with front discharge and front inlet. Cabinet shall be heavy gauge steel with baked enamel finish, configured for fully recessed ceiling mounting. Provide mounting flange. Motor and fans shall be direct drive connected and mounted as a single assembly on a rigid frame. Motors shall be 2-speed, resiliently mounted with automatic reset motor overload protection. Heating elements shall be fin-tube type with steel sheath. Provide fan-delay switch, built-in circuit breakers, and built-in low voltage transformer. Provide integral thermostat.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install heaters in accordance with the manufacturer's instructions.

END OF SECTION 15760

**SECTION 15775
SPLIT SYSTEM HEAT PUMPS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

A. Manufacturers:

- 1. Split system equipment manufactured by Carrier, Trane and Johnson shall be acceptable for Base Bid. As Alternate No. A-2 (Additive), provide equipment by Carrier or Trane.
- 2. Ductless split system equipment manufactured by Carrier, Mitsubishi, Trane and Sanyo and shall be acceptable for Base Bid. As Alternate No. A-2 (Additive), provide equipment by Mitsubishi.

B. Industry Standards:

- 1. Comply with applicable provisions of NFPA Standard 90A pertaining to construction and installation of air conditioning units.
- 2. Provide units which shall comply with applicable portions of UL 465, and with electrical components that bear UL labels.
- 3. Units shall be rated and certified in accordance with ARI Standard 240, 270 or 380 as applicable.
- 4. Comply with installation requirements of ANSI/ASHRAE 15; "Safety Code for Mechanical Refrigeration".

- C. Extended Warranty: In addition to the standard one-year warranty on all components, compressors shall bear an additional four-year manufacturer's warranty against material and design defects.

1.03 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties for all items as applicable.

PART 2 - PRODUCTS

2.01 SPLIT SYSTEM HEAT PUMP UNITS:

- A. General: Indoor and outdoor units shall be a matched pair of one manufacturer rated for operation together by the manufacturer's published literature. The system shall be furnished complete with packaged indoor unit, packaged outdoor unit, refrigerant lines and all

- necessary controls and accessories for a complete, operational system.
- B. Outdoor units shall consist of hermetic or semi-hermetic compressors(s) with crankcase heaters, automatically reversible oil pump, internal and external motor protection, outdoor fan(s) of the propeller type with direct drive factory lubricated motor(s) and outdoor coil all housed in a heavy duty steel casing with baked enamel factory-applied finish. Provide units with single point power connection and condenser coil guards. Systems scheduled on the plans for Staged Air Volume shall be equipped with minimum 2-stage control.
 - C. Indoor units (air handlers) shall be the vertical type complete with statically and dynamically balanced centrifugal direct drive or belt driven fan, indoor coil, electric heater, pleated minimum MERV 7 filters, expansion valves and relays, and controls all housed in a factory-fabricated and insulated steel housing with galvanized finish. Provide units with single point power connection. Systems scheduled on the plans for Staged Air Volume shall be equipped with variable frequency drives and inverter duty fan motors.
 - D. Unit controls and protective devices shall include high pressure stat, loss of charge pressure stat, suction line accumulator and pressure relief device. Motor compressors shall have a thermal and current sensitive overload device. The outdoor unit shall have short cycle protection and safety lock-out compressor protection. Automatic defrost controls shall be provided. On multiple circuit units only one circuit shall be allowed to defrost at a time and the other circuit shall be used to temper the air during the defrost cycle. Dual compressor units shall also have a time delay relay to prevent simultaneous startup. Provide low ambient head pressure control. Factory charge with HFC refrigerant.
 - E. See 15955 for controls information.
 - F. Refrigerant piping shall be hard drawn seamless copper tubing suitable for a working pressure of 300 psig. Fittings shall be wrought copper or brass suitable for use with high temperature solder and designed for 300 psig working pressure. See 15250 for pipe insulation.
 - G. HVAC drain piping shall be Schedule 40 PVC pipe with socket type fittings and solvent cement joints. See 15250 for pipe insulation.

2.02 DUCTLESS SPLIT SYSTEM HEAT PUMP UNITS:

- A. General: Indoor and outdoor units shall be a matched pair of one manufacturer rated for operation together by the manufacturer's published literature. The system shall be furnished complete with packaged indoor unit, packaged outdoor unit, refrigerant lines and all necessary controls and accessories for a complete, operational system.
- B. Outdoor units shall consist of hermetic or semi-hermetic rotary compressors(s) with crankcase heaters, automatically reversible oil pump, internal and external motor protection, outdoor fan(s) of the propeller type with direct drive factory lubricated motor(s) and outdoor coil all housed in a heavy duty steel casing with baked enamel factory-applied finish. Indoor units (air handlers) shall be the horizontal wall mounted type complete with statically and dynamically balanced centrifugal direct drive fan, indoor coil, electric heater, standard filters, expansion valves and relays, and controls all housed in a factory-fabricated and insulated steel housing with baked enamel finish. Provide single point power connection.

- C. Unit controls and protective devices shall include high pressure stat, loss of charge pressure stat, suction line accumulator and pressure relief device. Motor compressors shall have a thermal and current sensitive overload device. The outdoor unit shall have short cycle protection and safety lock-out compressor protection. Automatic defrost controls shall be provided. Factory charge with HFC refrigerant.
- D. See 15955 for control. Provide all controls and accessories needed to interface with the Automated Logic Controls EMCS.
- E. Refrigerant piping shall be hard drawn seamless copper tubing suitable for a working pressure of 300 psig. Fittings shall be wrought copper or brass suitable for use with high temperature solder and designed for 300 psig working pressure. See 15250 for pipe insulation.
- F. HVAC drain piping shall be Schedule 40 PVC pipe with socket type fittings and solvent cement joints. See 15250 for pipe insulation.

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Installer must examine areas and conditions under which heat pumps are to be installed and notify the Contractor in writing of conditions detrimental to the proper completion of the work. Do not proceed with the work until the unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF HEAT PUMP UNITS:

- A. Install heat pump units where shown, in accordance with equipment manufacturer's written instructions and recognized industry practices, to insure that units comply with requirements and serve intended purposes.
- B. Coordinate with other work, including structural, ductwork, piping and electrical work, as necessary to interface installation of heat pump units with other work. Control wiring and devices for complete, operable systems shall be provided and installed under the Mechanical specifications. Wiring shall be installed in conduit provided and installed under the Electrical specifications.
- C. Piping: Refrigerant line joints shall be brazed with silver solder. Lines shall be sized, installed and insulated in accordance with equipment manufacturer's instructions. Suction line insulation joints shall be sealed with an adhesive recommended by the insulation manufacturer. All refrigerant line insulation exposed to weather shall be protected with a weatherproof coating supplied by the insulation manufacturer. Suction and hot gas line sets shall be secured together with plastic ties. Tape or coated wire shall not be allowed. Hot gas lines located within walls shall also be insulated for vibration isolation. Bare copper piping shall not be allowed to come in contact with masonry, mortar, or steel items. Condensate lines shall be installed with traps and vents in each line. Pipe supports shall be on maximum 6 foot centers on horizontal lines. Open ends of lines and connection fittings of equipment shall be properly capped or plugged during construction to protect from damage and entry of dirt

or foreign material.

3.03 TESTING:

- A. Upon completion of installation of heat pump units and connection to the completed air distribution system, start-up and test equipment in accordance with the manufacturer's recommendations. Operate units to demonstrate capability and compliance with requirements. Where possible, field-correct malfunctioning units, then retest to demonstrate compliance.

END OF SECTION 15775

**SECTION 15776
ROOFTOP AIR CONDITIONERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

A. Manufacturers:

- 1. Rooftop equipment manufactured by Aeon, Carrier, Trane and Johnson shall be acceptable as Base Bid. As Alternate No. A-2 (Additive), provide equipment by Carrier or Trane.

B. Industry Standards:

- 1. Comply with applicable provisions of NFPA Standards 90A pertaining to construction and installation of air conditioning units.
- 2. Provide units which shall comply with applicable portions of UL 465, and with electrical components that bear UL labels.
- 3. Units shall be rated and certified in accordance with ARI Standard 210 and 270 as applicable.
- 4. Comply with installation requirements of ANSI/ASHRAE 15; "Safety Code for Mechanical Refrigeration".
- 5. Extended Warranty: In addition to the standard one-year warranty on all components, compressors shall bear an additional four-year manufacturer's warranty against material and design defects.

1.03 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties for all items as applicable.

PART 2 - PRODUCTS

2.01 ROOFTOP AIR CONDITIONERS:

- A. General: Units shall be one-piece construction, UL certified, complete with refrigerant and ready to operate as year-round air conditioning systems. Units shall be complete with compressors, coils, fans, casings, filters, controls, and gas heat.
- B. Compressor(s) shall be the reciprocating hermetic or semi-hermetic type and shall be provided with crankcase heaters and constant pressure lubrication. Compressor(s) shall be

- isolated from the frame by resilient mounts. Provide low ambient controls. Factory charge with HFC refrigerant. Systems scheduled on the plans for Staged Air Volume shall be equipped with minimum 2-stage control.
- C. Indoor and outdoor coils shall be constructed of copper tubes with aluminum fins mechanically bonded to the tubes. The coils shall be factory pressure and leak tested at not less than 425 psig. Provide integral hot gas reheat coil.
 - D. Fans shall be balanced statically and dynamically, and fan bearings shall be permanently lubricated types. Fan motors shall have built-in overload protection. Outdoor fans shall be the direct-drive propeller type. Indoor fans shall be the centrifugal belt-driven type mounted on vibration isolators. Systems scheduled on the plans for Staged Air Volume shall be equipped with variable frequency drives and inverter duty fan motors.
 - E. Outdoor unit casings shall be constructed of galvanized sheet steel and of modular construction, rigidly braced and reinforced with steel angle framework and of sufficient strength to prevent bending during rigging. Treat surface and finish corrosive-resistant steel panels with manufacturer's standard baked seal against weather and air leakage with gaskets. Thermally insulate the interior casing in contact with the airstream with 1 inch glass fiber. Design top panels for proper drainage. Fasten top panels to be easily individually removable for complete access to components from the top of the unit and seal the top against air and water leakage with gasketing. Provide drains on both sides of the condenser section and provide a utility connection opening within unit curb connections. Connectors occurring in wet areas such as the outdoor fan section shall be factory or field weatherproofed. Provide units with condenser coil guards.
 - F. Roof curbs shall be furnished under Section 15200.
 - G. Air filters shall be located inside the air conditioning unit casing and shall be pleated minimum MERV 7.
 - H. Units shall come equipped with a motorized outdoor air damper.
 - I. Provide units with controls equipped with time-delay devices with the capability to prevent short cycling of compressor(s) and to ensure staged starting of dual compressor units. Provide units with 24 volt internal control wiring with plug-in type relays for reliability and ease of maintenance. Each unit shall have high pressure stats, low pressure stats, loss of charge protection, indoor coil freeze stats and current and temperature-sensitive overload devices.
 - J. Gas-fired heaters shall be the induced draft combustion type for use with natural gas. Heat exchanger and burners shall be aluminized steel. Gas burner controls shall include automatic safety pilot, redundant automatic gas valves, manual gas cock, and pressure regulator. Ignition shall be direct spark type with intermittent pilot with 100% shutoff. Induced draft blower shall provide prepurge and shall be provided with a proving switch to prevent burner operation if venter is not in operation. Provide fan switch and limit control to delay the fan until heat is available and to continue fan operation until heat is dispersed. Limit switch shall shut the burners down in case of failure of operating controls.
 - K. See 15955 for controls information.

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Installer must examine areas and conditions under which air conditioning units are to be installed and notify the Owner in writing of conditions detrimental to the proper completion of the work. Do not proceed with the work until the unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF AIR CONDITIONERS:

- A. Install units where shown, in accordance with equipment manufacturer's written instructions and recognized industry practices, to insure that units comply with requirements and serve intended purposes.
- B. Coordinate with other work, including structural, ductwork, piping and electrical work, as necessary to interface installation of units with other work. Control wiring and devices for complete, operable systems shall be provided and installed under the Mechanical specifications. Wiring shall be installed in conduit provided and installed under the Electrical specifications.

3.03 TESTING:

- A. Upon completion of installation of air conditioning units and connection to the completed air distribution system, start-up and test equipment in accordance with manufacturer's recommendations. Operate units to demonstrate capability and compliance with requirements. Where possible, field-correct malfunctioning units, then retest to demonstrate compliance.

END OF SECTION 15776

**SECTION 15820
FANS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. Manufacturers: Provide products manufactured by one of the following for each type of fan:
 - 1. Acme
 - 2. Carnes
 - 3. Cook
 - 4. Greenheck
 - 5. PennBarry
 - 6. Stanley
 - 7. Twin City
- B. Industry Standards:
 - 1. Provide fans which bear Air Movement and Control Association (AMCA) certified performance rating seals.
 - 2. Provide fan components which have been listed and labeled by Underwriters' Laboratories.
 - 3. Comply with applicable portion of National Electrical Manufacturer's Association standards for motors.

1.03 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties on all items.

PART 2 - PRODUCTS

2.01 CEILING EXHAUST FANS:

- A. Provide ceiling exhaust fans, in types and sizes indicated; locate where shown. Provide direct-driven fans with permanently lubricated, continuous duty, thermally protected, ball bearing motor. Construct fan housing of sheet steel with enamel finish, lined with sound absorbing acoustical insulation securely fastened to walls of housing. Provide a true centrifugal wheel with air outlet perpendicular to inlet and with statically and dynamically balanced wheel. Provide a white plastic ceiling grille. Equip motor with integral thermal overload protection and with terminal box mounted on housing with cord, plug and receptacle

inside housing. Provide matching brick vent with dark bronze finish.

2.02 ROOF MOUNTED CENTRIFUGAL EXHAUST FANS:

- A. Provide roof mounted centrifugal fans of the size and type as scheduled on the drawings. Fans shall be constructed with watertight housing capable of resisting 100 MPH winds and shall be direct or belt-driven as indicated. Motor shall be in a compartment out of the air stream. Housings shall be minimum 16 gauge spun aluminum. Fan wheel shall be of aluminum, dynamically and statically balanced, non-overloading backward-curved blades mounted on steel shaft. Equip with self-aligning heavy-duty bearings designed for end thrust and lubricated for a minimum of 10 years usage at operating temperatures of -65 to 100 degrees F. Provide vibrationless lubricated ball bearing motor with integral thermal overload protection and electrical disconnect switch under ventilator cap. Provide bird screen and backdraft dampers. Roof curbs shall be furnished under Section 15200.

2.03 KITCHEN HOOD EXHAUST FAN / MAKEUP AIR UNIT PACKAGE:

- A. See section 15880.

PART 3 - EXECUTION

3.01 INSTALLATION OF FANS:

- A. General: Except as otherwise shown or specified, install fans in accordance with manufacturer's written instructions and in accordance with National Electrical Code (NEC) and recognized industry practices.

3.02 TESTING:

- A. After installation of fans has been completed, test each unit to demonstrate proper operation at performance requirements specified, including, but not limited to, proper rotation of impeller. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

END OF SECTION 15820

**SECTION 15840
DUCTWORK AND ACCESSORIES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

A. Industry Standards:

1. Comply with SMACNA (Sheet Metal and Air Conditioning Contractor's National Association) recommendations for fabrication, construction and details and installation procedures, except as otherwise indicated.
2. Comply with ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) recommendations, except as otherwise indicated.
3. Provide composite ductwork insulation (insulation, coverings, sealers, mastics and adhesives) with flame-spread rating of 25 or less and a smoke-developed rating of 50 or less, as tested by ASTM E84 (NFPA 255) method.
4. Provide duct connectors which comply with applicable portion of UL 181 and bear label of Underwriter's Laboratories.

1.03 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties as applicable for all items.

PART 2 - PRODUCTS

2.01 ABOVE GROUND DUCTWORK:

- A. General: Galvanized steel ductwork shall be used for all supply, return, exhaust, and ventilation ducts except as indicated otherwise by the contract documents. Black steel shall be used for kitchen hood exhaust ductwork. Fabric duct shall be used in the Gymnasium. Preinsulated flexible duct shall be used to make final concealed connections to diffusers, registers, and grilles. Length of flexible duct shall not exceed five feet.
- B. Galvanized Steel Ductwork: Ducts shall be fabricated from G90 galvanized sheet steel complying with ASTM A527 and A525, lockforming quality. Concealed round ducts shall be the spiral seam type or snap-lock type with matching fittings. Round supply ducts which are exposed shall be the double wall spiral seam type with solid inner wall and 1" thick internal insulation with matching fittings.
- C. Black Steel Ductwork: Ducts shall be fabricated from 16 gauge black steel.

- D. All exposed ducts (rectangular and round) shall have a "paint-grip" finish.
- E. Flexible Ducts: Flexible ducts shall be U.L. Listed as Class 1 Flexible Air Duct Material and shall comply with NFPA Standards 90A and 90B. Duct shall be a factory fabricated assembly composed of a polymeric liner duct bonded permanently to a coated spring steel wire helix and supporting a fiberglass insulating blanket with a minimum R-value of 4.2. Low permeability outer vapor barrier of fiberglass reinforced film laminate shall complete the assembly. Duct shall be suitable for low and medium pressure systems and shall carry a full 5-year warranty. For all flexible duct connections to diffusers, registers and grilles, provide rigid elbow brace accessory with one duct diameter centerline radius. Acceptable manufacturers are Atco, Flexmaster, Genflex and Thermaflex.
- F. Fabric Ducts: Duct material shall be polyester, UL classified as an air distribution device in accordance with the flammability requirements of NFPA 90A. Provide discharge nozzles in the fabric that throw air perpendicular to the length of the duct. Fabric shall be heat set and permeability stabilized, and shall not shrink more than 0.5% when washed per the manufacturer's instructions. Fabric duct must be suitable for continuous operation at a temperature range of -40°F to +140°F. Provide duct in sections connected by zippers, with lengths optimized to fit in commercial washing machines. Zippers must provide complete closure around the circumference with minimum 1 inch overlap. Provide matching mounting hardware system including extruded aluminum rails, integral flexible cords, snap-on suspension pieces, and adjustable threaded rods. Provide matching full length cylindrical tensioning accessory to keep ductwork taut and fully round at all times and to prevent sudden inflation damage. Provide stainless steel duct inlet clamp. Fabric duct color shall be selected by the architect from the manufacturer's standard colors. Acceptable manufacturers are DuctSox, KE Fibertec and FabricAir.

2.02 DUCTWORK ACCESSORIES:

- A. General: Except as otherwise indicated for each ductwork accessory, provide metal type, gauge, weight, construction and reinforcing as required by size limitations, and applicable SMACNA standards, including fittings, supports and appurtenances.
- B. Flexible Connectors: Provide flexible connectors between supply and return duct connections to equipment and as otherwise indicated on the drawings. Flexible connector shall be constructed of neoprene permanently attached to 3 inch wide metal bands. Connector shall be UL listed and shall be as manufactured by Durodyne, Ventfabrics, or Young Regulator.
- C. Balancing Dampers: Provide single blade dampers for round ducts and rectangular ducts less than 12" as indicated on the drawings. Dampers shall be constructed of galvanized steel. Damper shall be installed complete with locking quadrants. For rectangular ducts 12" and wider, provide opposed-blade type dampers constructed of galvanized steel mounted in a galvanized steel channel frame. Blade spacing shall not exceed 6" and the top and bottom edges of the blades shall be crimped to stiffen the blades. Damper blades shall be interconnected by rods and linkages to provide simultaneous operation of all blades. Damper shall be provided with an extended rod to permit installation of a damper regulator. Dampers shall be as manufactured by Air Balance, Arrow, Dowco, Jer-Air, National Controlled Air, Ruskin, Phillips-Aire, Safe-Air and United.

- D. Round Take-Offs: Take-offs shall be made using collars constructed of galvanized steel equipped with a manual balancing damper. Do not furnish extractors or air scoops. The damper shaft must have a 2 inch standoff. Spin-in collar shall be by Celcon, Crown, Flexmaster, Jer-Air, Metalcraft, Thermaflex and United.
- E. Fire Dampers (Walls and Floors): Provide curtain type, hinged blade, vertical and/or horizontal mounting fire dampers, suitable for duct penetration or opening protection as required on the drawings. Style A dampers shall be used at wall register/grille locations. Style B dampers shall be used at duct penetrations. Dampers shall meet the requirements of NFPA 90A and UL-555. Frame shall be minimum 20 gauge galvanized steel with 165 degree F fusible link. Blades shall be minimum 24 gauge galvanized steel. Dampers shall be as manufactured by Air Balance, Greenheck, Nailor, National Controlled Air, Phillips-Aire, Prefco, Ruskin, Safe-Air and United.
- F. Smoke Dampers: Provide UL Classified Low Leakage smoke dampers suitable for duct penetration or opening protection as required on the drawings. Dampers shall meet the requirement of NFPA 90A and UL-555S. Frame shall be minimum 16 gauge galvanized steel. Blades shall be minimum 14 gauge galvanized steel airfoil design with silicon rubber edge seals, Leakage Class 1. The assembly shall include a 120 VAC 2-position actuator, power-to-open, spring-to-close. Interlock with the building fire alarm system to close on an alarm condition. At each smoke damper location, install a smoke detector in the ductwork within five feet of the damper with no air outlets or inlets between the detector and the damper. Smoke detectors must be compatible with the building fire alarm system. Dampers shall be as manufactured by Air Balance, Greenheck, Nailor, National Controlled Air, Phillips-Aire, Prefco, Ruskin, Safe-Air and United.
- G. Combination Fire/Smoke Dampers: Provide UL Classified Low Leakage fire/smoke dampers suitable for duct penetration or opening protection as required on the drawings. Dampers shall meet the requirement of NFPA 90A, UL-555 and UL-555S. Frame shall be minimum 16 gauge galvanized steel. Blades shall be minimum 14 gauge galvanized steel airfoil design with silicon rubber edge seals, Leakage Class 1. The assembly shall include a 120 VAC 2-position actuator, power-to-open, spring-to-close. Interlock with the building fire alarm system to close on an alarm condition. At each damper location, install a smoke detector in the ductwork within five feet of the damper with no air outlets or inlets between the detector and the damper. Smoke detectors must be compatible with the building fire alarm system. Damper shall also have a controlled closure device actuated at 165 degrees F. Dampers shall be as manufactured by Air Balance, Greenheck, Nailor, National Controlled Air, Phillips-Aire, Prefco, Ruskin, Safe-Air and United.
- H. Access Doors: Duct access doors shall be provided at all fire dampers, smoke dampers, combination fire/smoke dampers, and at control items mounted within ducts. Access doors shall be the double-wall insulated type constructed of galvanized steel not less than 24 gauge for the door and 22 gauge for the frame. Insulation shall be 1 inch thick and shall be rigid and self-sealing. Doors shall have cam locks on at least two sides. Frame shall have knockover edges for attachment to duct by preening and a vinyl gasket shall be provided between duct and frame. Doors shall be as large as possible and as close as possible to the item served. Door shall be by Air Balance, Greenheck, Nailor, National Controlled Air, Phillips-Aire, Prefco, Ruskin, Safe-Air and United.

2.03 DUCTWORK INSULATION:

- A. General: Refer to the mechanical plans for duct insulation types and locations. Insulation shall be as manufactured by Certainteed, Knauf, Manville and Owens Corning.
- B. Duct Wrap: Type "A" Duct wrap shall be 2" thick, 0.75 pcf density, blanket type fiberglass insulation with vapor barrier and minimum R-Value of 6.7.
- C. Duct Liner: Type "A" Duct liner shall be 1" thick, 1.5 pcf density, flexible black fiberglass with minimum R-Value of 3.6.
- D. Kitchen Hood Exhaust Duct Insulation: All kitchen hood exhaust ductwork shall be insulated with two layers of flexible fire-rated duct wrap suitable for zero clearance to combustibles.
- E. Ductwork Insulation Accessories: Provide mechanical fasteners as recommended by the insulation manufacturer.
- F. Ductwork Insulation Compounds: Provide cement, adhesives, coatings, sealers, protective finishes, and similar compounds as recommended by the insulation manufacturer for the applications indicated.

2.04 MISCELLANEOUS MATERIALS:

- A. General: Provide miscellaneous materials and products of the types and sizes indicated and where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
- B. Duct Sealant: Duct Sealant for above ground ductwork shall be a mastic suitable for the pressure classification in accordance with SMACNA "HVAC Duct Construction Standards". All joints and seams shall be sealed.
- C. Ductwork Support Materials: Provide hot-dipped galvanized steel rods, fasteners, anchors, straps, angles and trim for support of ductwork. Wires shall not be acceptable.

2.05 DUCT FABRICATION:

- A. Shop fabricate ductwork in 4, 8, 10, or 12 foot lengths, unless otherwise indicated or required to complete runs. Pre-assemble in the shop to the greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to the extent necessary for shipping and handling. Match-mark sections for re-assembly and coordinated installation.
- B. Fabricate ductwork with joints, seams and reinforcements as required in the latest edition of SMACNA "HVAC Duct Construction Standards", 2" static pressure rating.
- C. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Elbows shall be either the curved radius type or the square type with turning vanes. Curved radius elbows shall have a centerline radius equal to 1.5 times the duct width. Curved radius elbows with square throats shall not be acceptable.
- D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Where ducts are specified to lined, make allowances for the thickness of the liner.

Duct sizes shown on the drawings are clear, inside dimensions.

- E. Kitchen hood exhaust ductwork joints and seams shall have liquidtight continuous external welds per NFPA-96.

PART 3 - EXECUTION

3.01 INSTALLATION OF DUCTWORK:

- A. General: Assemble and install ductwork in accordance with the latest edition of SMACNA "HVAC Duct Construction Standards" and with recognized industry practices which will achieve air tight noiseless systems, capable of performing each indicated service. Install each run with a minimum of joints. Align ductwork accurately at connections, and with internal and external surface smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of the type which will hold ducts true-to-shape and prevent buckling. Hanger locations shall be coordinated with the building structure and finish conditions.
- B. Complete fabrication of work at the project as necessary to match shop fabricated work and accommodate installation requirements.
- C. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by plans, diagrams, details and notations or, if not otherwise indicated, run ductwork in the shortest route which does not obstruct usable space or block access for servicing the building and its equipment. Coordinate the layout with piping, lighting layouts and similar finished work and plumbing risers. Duct layouts shown are diagrammatic and actual location of duct shall be field verified and coordinated by the duct fabricator prior to beginning fabrication of duct systems.
- D. Duct collars shall be provided where ducts pass through walls and partitions which extend full height to the underside of the roof structure. Collars shall be fabricated from 22 gauge galvanized steel sheet. Duct collars shall be provided on both sides of walls and partitions, except collar shall be omitted on that side of the wall where registers and grilles are installed. Flanges shall be installed tight against the wall. The space between the duct and the wall shall be packed with mineral wool.
- E. Route kitchen hood ductwork as directly as possible. Horizontal ductwork must slope minimum $\frac{1}{4}$ " per foot to drain toward the hoods. Do not create dips and traps which can collect residue. Provide NFPA-96 removable duct access doors every twelve feet and at changes in direction. Access doors shall be sized to permit duct cleaning. Conform to NFPA-96 for locations and installation details. At each exhaust fan, install an NFPA-96 approved flexible duct connection.

3.02 INSTALLATION OF INSULATION:

- A. Duct Wrap: Wrap shall be wrapped around duct work with all circumferential joints butted and longitudinal joints overlapped a minimum of 2". Adhere insulation to duct with 4" strips of fire resistant adhesive at 8" on centers. On circumferential joints, the 2" flange on the facing shall be taped with minimum of 3" wide foil reinforced Kraft tape. On longitudinal joints the overlap shall be taped with a minimum 3" wide foil reinforced Kraft tape. On ends

- of insulation use 3" wide foil reinforced Kraft tape to fasten insulation ends to duct. For duct widths 24" and greater, provide additional mechanical fasteners on 18" centers on the bottom of the duct to prevent sagging. Insulate that part of the supply diffusers above the ceiling so that there is no uncovered metal surface subject to condensation. Provide taped-on 12"x12" squares of insulation over damper regulators located above ceilings.
- B. Duct Liner: Liner shall be applied to the flat sheet with 100% coverage of fire resistant adhesive. The duct liner shall be cut to assure snug corner closing joints. The black surface of the liner shall face the air stream. On horizontal runs, tops of ducts over 12" in width and sides over 16" in height shall be additionally secured with welded pins and speed clips or gripnails spaced on a maximum of 16" pin centers. On vertical runs, welded pins and speed clips or gripnails shall be spaced on maximum 16 inch pin centers on all widths over 12". Pins shall start within 2" of the leading edge of each section. Pins shall be cut close to the speed clip. Clips shall be drawn flush only and not so as to compress the liner. Coat all exposed edges and the leading edge of all cross joints with fire resistant sealant.

3.03 CLEANING AND PROTECTION:

- A. Clean ductwork internally, unit-by-unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of the metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
- B. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at the time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent the entrance of dust and debris.

END OF SECTION 15840

**SECTION 15870
AIR DISTRIBUTION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. Industry Standards: Comply with National Fire Protection Association Standard No. 90A, as applicable to construction and installation of required devices.

1.03 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties for all items as applicable.

PART 2 - PRODUCTS

2.01 GRILLES, REGISTERS, AND DIFFUSERS:

- A. General: Except as otherwise indicated, provide manufacturer's standard devices where shown; of the size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation. Provide devices that have, as a minimum, the temperatures and velocity traverse, throw, and drop, and meet noise criteria ratings for each size device as listed in manufacturer's current data. Provide Grilles, Registers, and Diffusers manufactured by one of the following:

1. Carnes
2. Krueger
3. Metalaire
4. Nailor
5. Price
6. Titus

- B. Ceiling Diffusers: Surface mounted style diffusers shall be the louvered face type with flanged frame and one way, two way, three way, or four way throw as indicated. Diffusers shall be of extruded aluminum construction with white finish and with opposed blade damper.

- C. Ceiling Diffusers: T-bar lay-in style diffusers shall be the louvered face type with one way, two way, three way, or four way throw as indicated. Diffusers shall be of extruded aluminum construction with white finish and 2'x2' white aluminum panel. Do not furnish dampers.

- D. Ceiling Return/Exhaust Grilles and Registers: Eggcrate grilles and registers shall be all aluminum construction with ½" square eggcrate louvers, 1" deep, with white finish. All 1'x2', 2'x2', and 2'x4' grilles in lay-in ceilings shall be the lay-in type. All other sizes shall have a flanged frame. Registers shall have an opposed blade damper.
- E. Heavy Duty Return/Transfer Grilles: Heavy duty grilles shall have minimum 18 gauge steel frames and 1/8 inch face bars at 40 degree deflection with white finish.

2.02 LOUVERS:

- A. Manufacturers: Provide louvers manufactured by one of the following:
 - 1. Arrow
 - 2. Penn Ventilator
 - 3. Greenheck
 - 4. Louvers & Dampers
 - 5. Ruskin
 - 6. Industrial Louvers
 - 7. National Controlled Air
 - 8. Airstream
 - 9. Vent Products
 - 10. Cesco
- B. Stationary Exhaust Louvers: Louvers shall be the drainable-blade type of minimum 0.081" thick extruded aluminum construction, 6" deep, with a full jamb section and channel frame. Blades shall be set at 40E on 5 inch centers. Provide a removable aluminum insect screen on the inside face of the louver. Finish shall be anodized dark bronze. Louver shall be sized to match associated wall exhaust fan.
- C. Operable Intake Louvers: Louvers shall be the combination stationary/adjustable drainable-blade type of extruded aluminum construction, 6 inches deep, with a full jamb section and channel frame. The frame and stationary blades shall be minimum 0.081" thick, and the adjustable blades shall be minimum 0.125" thick. Stationary blades shall be set at 40E on 5 inch centers. Units shall have silicon blade seals and stainless steel jamb seals for low leakage. Operation shall be two-position (full open and full closed) and shall be motor driven to the open position and spring return to close. Provide 120 volt electric motor operator, linkage and mounting brackets. The entire motor/bracket assembly shall not protrude beyond the interior face of the wall where the louver is installed. Louvers shall be AMCA certified for water penetration and air performance. Pressure drop shall be less than 0.15" wg at 1000 fpm. Louver sizes shown on the drawings are for zero water penetration. Louvers shall be complete with a removable aluminum insect screen on the inside face of the louver. Finish shall be anodized dark bronze.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install devices as detailed on the drawings and in accordance with manufacturer's written instructions and in accordance with recognized industry practices.

- B. Coordinate with other work, including ductwork and ductwork accessories and ceiling system as necessary to interface installation of grilles and diffusers properly with other work.
- C. Ceiling mounted devices to be installed in lay-in tile ceilings shall be compatible with 24"x24" or 24"x48" T-bar grid as applicable. Refer to Architectural Reflected Ceiling Plans for exact locations of grilles, registers and diffusers. For flush mounted devices in T-bar ceilings, special care shall be taken to install devices in the center of ceiling tiles. Sagging will not be permitted. Provide rear sheet metal angle bracing.

END OF SECTION 15870

**SECTION 15880
KITCHEN HOODS AND ACCESSORIES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. Manufacturers: Equipment by *Captive-Air*, *Greenheck*, *Spring Air* or *Grease Master* shall be acceptable.
- B. Industry Standards:
 - 1. Hoods shall be ETL Listed and NSF Listed.
 - 2. Provide components and assemblies which have been labeled by *Underwriter's Laboratories* (UL).
 - 3. Comply with the requirements of the *National Fire Protection Association* (NFPA) for fabrication and installation. Specifically comply with NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operation* and with NFPA 17A, *Wet Chemical Extinguishing System*.

1.03 SUBMITTALS:

- A. General: Provide manufacturer's data, certificates, test reports, and product warranties as applicable for all items.
- B. Shop Drawings: Submit dimensioned fabrication drawings for equipment including plans, elevations, and sections, at minimum scale of 3/4" = 1' -0", showing materials and gauges used. Submit dimensioned shop drawings for installation of hood fire protection system. Submit wiring diagrams.

PART 2 - PRODUCTS

2.01 KITCHEN HOODS:

- A. Type I Grease Filter Exhaust Hoods: The hood shall be, where exposed, stainless steel type 304 with #4 finish. All joints and seams shall have full liquid tight external welds. Visible welds shall be ground smooth, and if stainless steel, be polished to a #4 finish. The hood shall be the box type with vertical sides. The hood shall have integral exhaust duct collar(s). Each hood shall have a filter housing of the same material as the hood complete with ETL Listed stainless steel 2 inch thick panel type grease filters the full length. Filters shall be a single-stage baffle design with minimum 90% grease extraction efficiency at 7 microns. The filter housing shall be equipped with a pitched drip tray the full length of the hood with

grease cups for easy removal and daily cleaning. Hoods with ceiling makeup air plenum shall have double wall insulated front.

2.02 KITCHEN EXHAUST FAN / MAKEUP AIR UNIT PACKAGE:

- A. General: Except as otherwise indicated, provide manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by the manufacturer, and as required for a complete installation. Exhaust fan and makeup air unit shall be mounted on a common roof curb to match the roof slope. Package shall be constructed with watertight housing capable of resisting 100 MPH winds. Roof curbs shall be furnished under Section 15200.
- B. The exhaust fan shall be U.L. listed for grease duct use and shall be the upblast type of spun aluminum construction with belt-driven fan with backward-inclined or airfoil blades only, containing a built-in grease trough and having a completely isolated motor compartment and hinged frame. No birdscreens or backdraft dampers will be permitted per NFPA96. Furnish an 18 gauge galvanized curb, minimum 18 inches high, to raise fan discharge 40 inches above the roof surface. The fan shall be complete with external mounted disconnect switch.
- C. The makeup air unit shall be U.L. Listed and shall be the direct-fired, outdoor power vented type. Casing and frames shall be galvanized steel with standing seam roof joints and complete weather seals. Provide hinged access doors. Supply fans shall be centrifugal, DWDI, mounted on a common base with internal vibration isolation. Blower wheels shall be balanced. Motors shall be energy efficient, permanently lubricated, heavy duty type matched to the fan load. Drives shall be sized for 150% of driven horsepower with adjustable drive pulley. Provide manufacturer's stainless steel burners and drip pan. Heaters shall be CSA certified for natural gas operation. Units shall be complete with factory-installed power venter and sealed collection chamber, overheat control, automatic gas valve, safety pilot with 100% shut-off, pressure regulator, and manual shut-off valve. Controls shall include automatic electric pilot re-ignition and built-in low-voltage transformer. Power vented units shall also have a combustion air pressure safety switch. Provide V-bank filter section, motorized 2-position intake damper and galvanized weatherhood with birdscreen. Provide a prewired control center with exhaust and supply fan motor starters, control circuit fusing, control voltage transformer, disconnect switch, overload protection and phase protection.
- D. Controls: The package on/off operation shall be controlled by the kitchen hood fan switch. Supply air temperature controls shall be by electronic burner modulation with ductstat. Provide a solid state control system, providing close temperature control through regulated manifold pressure. On a call for heat from a unit mounted ductstat, controls shall modulate the burner between 50% and 100%, as required. Ductstat shall be set at 65 degrees F. Provide a BACnet interface for connection to the BAS.

2.03 ACCESSORIES:

- A. Electrical: U.L. listed, four foot, two-lamp, recessed fluorescent light fixtures for grease use shall be installed on six or seven foot centers and completely wired to a J-box on the top of the hood. A prewired switch plate shall be installed on the face of the hood and shall include a fan switch with pilot light and a light switch. Exhaust fan and supply fan shall be controlled by one switch. Exhaust and supply fan starters shall be provided with the exhaust fan / makeup air unit package and shall be prewired. Provide an integral heat sensor and associated controls to automatically turn on and off fans based on demand.

- B. Duct Collars: The U.L. Labeled exhaust duct collars must be installed at the factory and it is the responsibility of the contractor to verify the location of the duct collars to avoid interference with the structure or other obstructions. The exhaust ducts shall fit inside the duct collars of the hood and be seated, but not welded, into the holding clips provided.
- C. Makeup Air / AC Plenum: Provide a matching ceiling mounted stainless steel makeup air / air conditioning air plenum with full length perforated face discharge panels, internal insulation and supply air duct collars for up to 90% makeup air. Discharge velocity shall be in the range of 140-160 fpm.
- D. Panels: Furnish a stainless steel fascia panel around entire hood to extend the hood surface 6 inches above the finished ceiling. Panel finish shall match the hood finish.
- E. Ductwork: The exhaust duct shall be sized to have a minimum velocity of 1500 FPM and shall remain the same net area from the duct collar to the exhaust fan. It shall be constructed of 16 gauge galvanized steel, welded liquid tight to comply with NFPA 96. The supply duct shall be standard construction galvanized steel with 2 inch thick fiberglass duct wrap.
- F. Fire Protection System:
 - 1. Furnish a wet chemical system providing complete fire protection of duct, hood, and cooking equipment surfaces. Installation shall be in compliance with chemical manufacturer's U.L. Listing. All piping run inside the hood is to be concealed. Piping extending up through chase to duct and hood nozzles shall be fitted with sleeves forming grease tight joints. Exposed piping of surface protection nozzles shall have stainless steel sleeves with chrome plated elbows.
 - 2. System shall be activated by fusible links connected to an automan release. Fit automan release with an electric double-pole, double-throw microswitch for control circuit. Makeup Air Unit supply fan is to be shut down when fire protection system is activated, leaving the exhaust fan running.
 - 3. Provide a U.L. listed mechanical gas valve, to provide automatic gas fuel shutoff for all gas operated appliances protected by the system. The valve shall incorporate a manual reset.
 - 4. Provide auxiliary factory installed relays to automatically trip shunt trip safety devices for electrically operated appliances protected by the system. The devices shall be as indicated on the electrical drawings. Also provide a relay to automatically signal the building fire alarm system.
 - 5. The chemical cylinders and controls can be located in fire control cabinet built into the side of the hood. Provide a remote manual pull station and interlock with system.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Installer shall examine roughed-in mechanical and electrical services, and installation of floors, walls, columns, ceilings, and other conditions under which food service equipment work is to be installed; verify dimensions of services and substrates before fabricating work. Notify Contractor of unsatisfactory conditions for proper installation of equipment. Do not proceed with fabrication and installation until unsatisfactory dimensions and conditions have been corrected in a manner satisfactory to the installer. Control wiring and devices for

complete, operable systems shall be provided and installed under the Mechanical specifications. Wiring shall be installed in conduit provided and installed under the Electrical specifications.

3.02 TESTING:

- A. Test each item of operational equipment to demonstrate that it is operating properly, and that controls and safety devices are functioning. Repair or replace equipment found to be defective in its operation including units below capacity or operating with excessive noise or vibration. At the time of installation, an authorized dealer of the chemical system shall complete and certify the system.

END OF SECTION 15880

SECTION 15901
ENERGY RECOVERY VENTILATION UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. Manufacturers: Equipment conforming to this specification by Greenheck, PennBarry, Semco and Carnes shall be acceptable.
- B. Industry Standards:
 - 1. Comply with applicable provisions of NFPA 90A pertaining to construction and installation of air conditioning units.
 - 2. Comply with applicable provisions of UL 465, and provide UL labels for electrical components.
 - 1. Units shall be rated and certified in accordance with applicable ARI and ASHRAE Standards.

1.03 SUBMITTALS:

- A. Provide manufacturer's data, test reports, and product warranties.

PART 2 - PRODUCTS

2.01 ENERGY RECOVERY VENTILATION UNITS:

- A. Ventilation unit shall be a packaged type consisting of a cabinet, energy recovery wheel, exhaust fan, supply fan, motors, filters and controls. The cabinet frame and panels shall be galvanized steel construction with sealed seams, hinged access panels, 1 inch rigid board internal insulation with foil facing tested to meet UL 181, and baked enamel finish. The cabinet shall have duct collars and be configured for suspended mounting or base mounting as indicated on the plans. Exhaust outlet shall have an automatic backdraft damper.
- B. Energy Recovery Wheel: Wheel shall be the enthalpy type for both sensible and latent heat recovery and be designed to ensure laminar flow. Energy transfer ratings must be ARI Certified to Standard 1060 and bear the ARI certification symbol for ARI Air-to-Air Energy Recovery Ventilation Equipment Certification Program based on ARI 1060. Desiccant shall be silica gel permanently bonded to wheel media. Wheel shall be constructed of lightweight polymer material mounted in a stainless steel rotor. Wheels greater than 26 inch diameter shall have removable segments. Wheel drive belt shall be high strength urethane factory

- installed in a pre-stretched state. Provide a slide-out track for wheel maintenance.
- C. Fans: Centrifugal fans shall be DWDI, single fan, forward curved type. Blower wheel shall be statically and dynamically balanced. Steel shafts shall be mounted in permanently lubricated, sealed ball bearing pillow blocks. Bearing life shall be minimum (L10) life in excess of 100,000 hours at maximum speed. Belt driven fans less than 10 hp shall have adjustable sheaves. Direct drive fans shall speed controllers. Provide neoprene isolators in fan base. Fans shall be in a draw-through position relative to the energy recovery wheel.
 - D. Motors and Drives: Motors shall comply with EPACT standards for single speed ODP and TE enclosures. Motors shall be permanently lubricated, heavy-duty type. Drives shall be sized for 150% of driven horsepower. Energy wheel motors and direct drive motors shall have integral overload protection.
 - E. Filters on the supply air and exhaust air shall be the pleated type, minimum MERV 7. Provide dirty filter sensors with indicator lights. Provide wheel rotation sensor with indicator light.
 - F. Electrical: All internal electrical components shall be factory wired for single point power connection. All electrical components shall be UL Listed, Approved or Classified where applicable and wired per NEC. Provide disconnect switch and motor starters. Control box shall include motor starters, control circuit fusing, control transformer for 24 VAC circuit and safety disconnect. Provide dirty filter sensors and wheel rotation sensor with indicator light.
 - G. See 15955 for controls information.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install ventilation units in accordance with the manufacturer's instructions. Each ERV shall be interlocked with its associated air handler.

END OF SECTION 15901

SECTION 15955
BUILDING AUTOMATION SYSTEM (BAS) SPECIFICATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 OVERVIEW:

- A. Base Bid: The system shall provide the Direct Digital Control (DDC), Energy Management and Building Automation System (BAS) for the HVAC systems and shall interface with other microprocessor based building subsystems as specified herein. Base Bid manufacturers shall be Automated Logic Controls, Siemens Controls, Johnson Controls, Carrier and Trane. Provide a complete, operable system including Central Maintenance Office front end computer, front end software, graphics and web-accessible system.
- B. Alternate No. A-3 (Additive): The proposed system shall be an extension of the existing Automated Logic Controls Energy Management and Building Automation System (BAS) in Dalton Middle School and throughout the Dalton Public School System. All modifications to the existing system in the Middle School and the building graphics are to incorporate the work described under this project specification shall be included. This shall include updating the Dalton Public School system map, Dalton Middle School building floor plans and applicable indexes. The proposed system for the Middle School should be the newest version of web based software that is available. Upgrade of the entire Dalton Public School WebCTRL system to the newest version available shall be provided in this proposal.
 - 1. The Building Automation System shall be as herein specified and as manufactured and furnished by Automated Logic. Contact: Tricia Smith, Automated Logic - Georgia (770)421-3280.
 - 2. The Native BACnet BAS shall be capable of total integration of the facility infrastructure systems with user access to all system data either locally over a secure Intranet within the building or by remote access via a standard Web Browser over the Internet. User shall be able to make global modifications of various points and schedules for the new addition as well as existing equipment through one entry into the existing system to affect all associated points.
 - 3. The Web Based System for the new addition shall be integrated into the existing BAS database and be capable of communicating with the existing web-based controls currently installed throughout the Dalton Public School system. The existing BAS shall be able to view all information residing in the web based system as well as make adjustments to set-points and schedules, view trend information, establish alarms and provide troubleshooting capability for the new addition. The BAS shall be able to make

programming changes to the control logic residing in the new and existing BAS routers and controllers. In addition, all required control strategies such as heating and cooling requests, group and individual scheduling for the new HVAC equipment shall be incorporated into the existing BAS programming for scheduling purposes as well as proper operation of the central plant controls.

4. Complete point and click color thermo-graphic floor plans for the existing school including the new addition as well as the existing equipment shall be provided. Any interface required for the new addition to interface with the existing system in the school and to the overall city school system will be provided. There will be no additional costs to the owner to achieve complete interface including ability to use ALC graphics to control and monitor all operating parameters in Dalton Middle School and across the Dalton Public School System.
5. Upon system completion the existing BAS system shall be updated to the most current available software version.

1.03 INSTRUCTIONS TO BIDDERS:

- A. The system specified in this document shall be native BACnet architecture providing full operator access via the Internet or Local Area Network utilizing only a browser for full operator access and control through a thin-client architecture. The requirements are described in this specification. No deviations from this specification are acceptable. All Graphics and software shall appear seamless with the Building Automation System.
- B. The control system shall consist of a high-speed, peer-to-peer network of DDC controllers and a web-based operator interface. Depict each mechanical system and building floor plan by a point-and-click graphic. A web server with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all operator functions through the web browser interface and there shall be unlimited simultaneous users included in this bid.
- C. All Bidders shall submit a Technical Compliance Statement stating full and complete compliance with the Technical Specification or any and all deviations or exceptions to the Technical Specification. Failure to supply this required Technical Compliance Statement with the Bid shall render the Bidder's Bid Non-Responsive.
- D. Also, Bidder is cautioned that the Owner reserves the right to reject any Bidder's bid which, in the Owners sole judgment, takes meaningful deviation or exception to the Technical Specification in the Technical Compliance Statement.

1.04 SCOPE OF WORK:

- A. Contractor's Responsibilities:

1. The Contractor shall furnish and install all necessary software and hardware, wiring, and computing equipment in compliance with this specification. Any variances from this specification or related documentation shall be submitted in writing at the time of bid.
- B. System Requirements:
1. Standard Material/Products. All material and equipment used shall be standard components, regularly manufactured and available, and not custom designed especially for this project
 2. Modular Design. The system architecture shall be fully modular permitting expansion of application software, system peripherals, and field hardware.
 3. Performance. The system, upon completion of the installation and prior to acceptance of the project, shall perform all operating functions as detailed in this specification.
- C. Equipment:
1. System Hardware: The Contractor shall provide the following:
 - a. PC's, PDA's, server(s), routers, modems and control modules as specified.
 - b. All sensing devices, relays, switches, indicating devices, and transducers required to perform the functions as listed in the sequence of operations.
 - c. All monitoring and control wiring.
 2. System Software:
 - a. The Controls Contractor shall provide all software identified in Part 2 of this specification, including the BAS Server, fully configured database, graphics, reports, alarm/events. The Graphical User Interface (GUI) shall be completely Web based as specified herein and shall be manufactured by the same company as the DDC controllers. No exceptions.
 - b. The system as specified shall monitor, control and calculate all the points and perform all the functions as listed in "Sequence of Operation" in this specification.
- D. Codes and Regulations:
1. Standards Authority. All electrical equipment and material, and its installation, shall conform to the current requirements of the following authorities:
 - a. Occupational Safety and Health Act (OSHA)
 - b. National Electric Code (NEC)
 - c. National Fire Code
 - d. Uniform Mechanical Code
 - e. Uniform Building Code
 - f. Uniform Plumbing Code
 2. Product Applicable Standards: All distributed, standalone and unitary controllers supplied shall be in compliance with the following listings and standards:
 - a. UL916 for Open Energy Management (for U.S. and Canada)
 - b. FCC Part 15, Sub-Part B, Class A

c. CE Electro Magnetic Compatibility

3. Manufacturer's Quality System. The control system manufacturer shall be ISO9001 listed for design and manufacture of environmental control systems for precise control and comfort, indoor air quality, HVAC plant operation, energy savings and preventative maintenance. ISO Certification shall be by a registrar that is accredited by an internationally recognized organization such as RAB. Copy of ISO9001 certificate shall be submitted with bid.
4. Conflict of Codes. Where two or more codes conflict, the most restrictive shall apply. Nothing in this specification or related documentation shall be construed to permit work not conforming to applicable codes.

1.05 GENERAL CONDITIONS:

A. Changes in Scope of Work:

1. Any changes in the scope of work must be authorized by a written Change Order.

B. Correction of Work:

1. Contractor's Responsibility: The Contractor shall promptly correct all work found defective or failing to conform to the Contract Documents. The Contractor shall bear all cost of correcting such work.
2. During Warranty: If, within the warranty period required by the Contract Documents, any of the work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice to do so.

C. Coordination of Work During Construction:

1. The Contractor shall coordinate any necessary changes in work scheduling to minimize disruption.
 - a. The Contractor shall protect the installed works by other trades.
 - b. The Contractor shall coordinate with other trades.
 - c. The Contractor shall repair any damage caused by his work to building(s) and equipment at no additional cost to the owner.

D. Warranty:

1. The Contractor shall warrant, from the date of final acceptance, that all systems, subsystems, component parts, and software are fully free from defective design, materials, and workmanship for a period of one year.

1.06 SUBMITTALS, DOCUMENTATION, ACCEPTANCE AND TRAINING:

A. Submittals:

1. Shop Drawings. A minimum of six (6) copies of shop drawings shall be submitted and shall consist of a complete list of equipment, materials, manufacturer's technical literature, cut-sheets, and installation instructions. Drawings shall contain proposed layout, complete wiring,

routing, schematic diagrams, tag number of devices, software descriptions, calculations, installation details, and any other details required to demonstrate that the system will function properly.

2. Graphical Programming Documentation: The Contractor shall provide a printout of all Graphical Programs, identifying the specific HVAC or mechanical/electrical subsystem being controlled.
 3. Drawing Approval. Shop drawings shall be approved before any equipment is installed. Controls contractor shall allow a minimum of fourteen (14) days for drawing approval.
 4. As Built Drawings. All drawings shall be reviewed after the final system checkout and updated or corrected to provide 'as-built' drawings to show exact installation. All shop drawings will be acknowledged in writing before installation is started and again after the final checkout of the system. The system will not be considered complete until the 'as-built' drawings have received their final approval. The Contractor shall deliver six (6) sets of 'as-built' drawings.
- B. Documentation:
1. Operating and Maintenance (O&M) manuals for the system shall be made available electronically using Acrobat (PDF) format and include the following categories: Workstation User's Manual, Project Engineering Handbook, Software Documentation.
 2. BAS User's Manual shall contain as a minimum:
 - a. System overview
 - b. Networking concepts
 - c. Launching a web browser from a networked PC/PDA and login
 - d. Graphical User Interface (GUI) screen menus and their definitions
 - e. Creating, modifying or deleting schedules
 - f. Uploading and downloading software to the field hardware
 - g. Creating historical trends, collecting trend data and generating trend graphs
 - h. Enabling and assigning alarms and messages to reporting actions/groups
 - i. Report generation and 'third party software'
 - j. Backing up software and data files
 3. Project Engineering Manual shall contain as a minimum:
 - a. System architecture overview
 - b. Hardware cut-sheets and product descriptions
 - c. The Contractor shall deliver six (6) sets of 'as-built' drawings. All drawings shall be reviewed after the final system checkout and updated to provide 'as-built' drawings. The system will not be considered complete until the 'as-built' drawings have received their final approval.
 - d. Installation, mounting and connection details for all field hardware and accessories

- e. Commissioning, setup and backup procedures for all control modules/accessories, BAS server software, and database.
 - f. Listing of basic terminology, alarms/messages, error messages and frequently used commands or shortcuts.
4. BAS Software Documentation shall contain as a minimum:
- g. The Contractor shall provide a printout all Graphical Programs, detailing their application to specific HVAC equipment and electrical/mechanical subsystems, together with a glossary or icon symbol library detailing the function of each graphical icon. Revisions made as a result of the submittal process, during the installation, start-up or acceptance portion of the project, shall be accurately reflected in the "as-builts".
 - h. Graphical representation of the mechanical equipment hierarchy for the project including all equipment controlled by the BAS.
 - i. Detailed listing of all alarm and event messages programmed for designated mechanical/electrical equipment and required operator action.
- C. Acceptance Test:
- 1. Acceptance Testing. Upon completion of the installation, the Contractor shall start up the system and perform all necessary calibration, testing, and debugging operations. The Contractor in the presence of the Owner's representative shall perform an acceptance test.
 - 2. Notice of Completion. When the system performance is deemed satisfactory, the system parts will be accepted for beneficial use and placed under warranty. At this time, a "notice of completion" shall be issued and the warranty period shall start.
- D. System Training:
- 1. System Use Instructions: Controls Contractor shall provide (16) Hours of onsite training for designated personnel in the operation, maintenance, and programming of the system.
 - 2. Provide minimum three-day Operator Training Class at BAS Manufacturer's Headquarters and Main Training Center.
 - 3. Provide Audio Visual Training CDs.

PART 2 – SYSTEM SOFTWARE AND OPERATOR INTERFACE

2.01 SYSTEM OVERVIEW:

- A. The BAS contractor shall provide system software based on a server/thin-client architecture, designed around the open standards of web technology. The BAS server shall communicate using ASHRAE's BACnet/IP protocol. Server shall be accessed using a web browser over the DDC system intranet provided under this contract and remotely over the Internet. Operator shall monitor, control, and reprogram the system from any computer on the Owners network or from anywhere a web browser is available. Systems requiring going to the controlled facility to view system information or to make any program, schedule, or operation changes are unacceptable.

- B. The intent of the thin-client architecture is to provide the operator(s) complete access to the BAS system via a web browser. The thin-client web browser Graphical User Interface (GUI) shall be browser and operating system agnostic, meaning it will support Microsoft Internet Explorer browsers (6.x or later versions), and Windows as well as non-Windows operating systems. No special software, (active-x components or fat java clients) shall be required to be installed on the PCs / PDAs used to access the BAS via a web browser.
- C. The BAS server software must support at least the following server platforms (Windows NT, Sun Solaris and Linux). The BAS server software shall be developed and tested by the manufacturer of the system standalone controllers and network controllers/routers. Third party manufactured and developed BAS software is not acceptable.
- D. The web browser GUI shall provide a completely interactive user interface and must offer the following features as a minimum:
1. Trending all system physical , software and calculated points
 2. Scheduling
 3. Downloading Memory to field devices
 4. Real time 'live' Graphic Program Diagnostics for troubleshooting
 5. Tree Navigation
 6. Parameter change of properties
 7. Setpoint Adjustments
 8. Alarm / Event information
 9. Configuration of operators
 10. Execution of global commands
 11. Color coded graphics to system setpoints
 12. System commissioning
 13. Environmental Index Indication
 14. Energy Reports
 15. Building Performance Dashboards
 16. Reports- Standard and Custom
 17. Location Dependent Security and Access
- E. Software Components: All software components of the BAS system software shall be installed and completed in accordance with the specification. BAS system components shall include:
1. Server Software, Database and Web Browser Graphical User Interface
 2. System Configuration Utilities for future modifications to the system
 3. Graphical Programming
 4. Direct digital control software
 5. Application Software
- F. BAS Server Database: The BAS server software shall utilize a Java DataBase Connectivity (JDBC) compatible database such as: MS Access, MS SQL 7.0, Oracle 8i or IBM DB2. BAS systems written to Proprietary databases are **NOT** acceptable.
- G. Database Open Connectivity: The BAS server database shall be Java DataBase Connectivity (JDBC) compatible, allowing real time access of data via the following standard mechanisms:

1. Common Object Request Broker Architecture (CORBA)
 2. OLE/OPC (for Microsoft Client's/Server platform only)
 3. Import/Export of the database from or to XML (extensible Mark-up Language)
- H. Communication Protocol(s): The native protocol for the BAS server software shall be BACnet as defined by ASHRAE standard SPC135. In addition, the software shall be able to support concurrent operation of multiple standard and non-standard protocols such as:
6. MODBUS
 7. SMNP
- C. Cross Platform Capability: The BAS system software (client and server) shall be operating system and hardware agnostic, being able to run on Windows 98, Windows 2000, Windows NT, Sun Microsystems Solaris and Red Hat Linux.
- D. Thin Client – Web Browser Based : The GUI shall be thin client or browser based and shall meet the following criteria:
1. Web Browser for PCs: Only a 6.x browser (Explorer/Navigator) will be required as the GUI, and a valid connection to the server network. No installation of any custom software shall be required on the operator's GUI workstation/client. Connection shall be over an intranet or the Internet. A firewall shall be installed (as necessary) to protect the customer's Intranet.
 2. Secure Socket Layers: Communication between the Web Browser GUI and BAS server shall be encrypted using 128-bit encryption technology within Secure Socket Layers (SSL). Communication protocol shall be Hyper-Text Transfer Protocol (HTTP).
 3. PDAs: BAS Server software must support other browsers used by Personal Digital Assistants like 3Com Palm Pilots and other Internet appliances specified herein.

2.02 WEB BROWSER GRAPHICAL USER INTERFACE:

- A. Web Browser Navigation: The Thin Client web browser GUI shall provide a comprehensive user interface. Using a collection of web pages, it shall be constructed to "feel" like a single application, and provide a complete and intuitive mouse/menu driven operator interface. It shall be possible to navigate through the system using a web browser. The Web Browser GUI shall (as a minimum) provide a Navigation Pane for navigation, Action Pane for display of animated graphics, schedules, alarms/events, live graphic programs, active graphic setpoint controls, configuration menus for operator access, reports, and reporting actions for events.
- B. Login: On launching the web browser and selecting the appropriate domain name or IP address, the operator shall be presented with a login page that will require a login name and password. Navigation in the system shall be dependent on the operator's role privileges, and geographic area of responsibility.
- C. Navigation Pane: The Navigation Pane shall comprise a Navigation Tree which defines a geographic hierarchy of the proposed BAS system. Navigation through the GUI shall be accomplished by clicking on appropriate level of a navigation tree (consisting of expandable and collapsible tree control like Microsoft's Explorer program), and/or by selecting dynamic links to other system graphics. Both the navigation tree and graphic pane shall be displayed

simultaneously, enabling the operator to select a specific system or equipment, and view the graphic corresponding to the highlighted position in the navigation tree. The navigation tree shall as a minimum provide the following views: Geographic, Network, Groups and Configuration.

1. Geographic View shall display a logical geographic hierarchy of the system including cities, sites, buildings, building systems, floors, equipment and BACnet objects.
 2. Network View shall display the hierarchy of the actual BACnet IP Intranet network. This can include: Systems, Site, Networks, Routers, Half-Routers, Devices, Equipment and all the BACnet Objects in a device.
 3. Groups View shall display Scheduled Groups and custom reports.
 4. Configuration View shall display all the configuration categories (Operators, Schedule, Event, Reporting and Roles).
- D. Action Pane: The Action Pane shall provide several functional views for each HVAC or mechanical/electrical subsystem specified. By clicking on a button, an operator shall be able to select the following system page, corresponding to the highlighted area/equipment in the navigation tree:
1. Graphics: Using animated gifs or other graphical format suitable for display in a web browser, graphics shall include aerial building/campus views, color building floor-plans, equipment drawings of each individual piece of equipment with live variable statuses, active graphic setpoint controls, web content, and other valid HTML elements. The data on each graphic page shall automatically refresh at a rate defined by the operator.
 2. Properties: Shall include graphic controls and text for the following: Locking or overriding BACnet objects, demand strategies, and any other valid data required for setup. Changes made to the properties pages shall require the operator to depress a 'accept/cancel' button.
 3. Schedules: Shall be used to create, modify/edit and view schedules based on the systems geographical hierarchy using the navigation tree.
 4. Events: Shall be used to view alarm event information geographically (using the navigation tree), acknowledge events, sort events by category, actions and verify reporting actions.
 5. Trends: Shall be used to display associated trend and historical data, modify colors, date range, axis and scaling
 6. Logic - Live Graphic Programs: Shall be used to display a 'live' graphic program of the control algorithm for the mechanical/electrical system selected in the navigation tree. All control outputs and inputs shall be displayed on the program giving real-time statuses for use in operator troubleshooting.

The following actions shall be accomplished by clicking appropriate buttons/menu in the graphic window: Log In/Out, Print and Hide/Show Navigation Pane.

- E. Color Graphics: The Web Browser GUI shall make extensive use of color in the graphic pane to communicate information related to setpoints and comfort. Animated gif's, active setpoint graphic controls and valid web content (like local weather forecast) shall be used to enhance usability:
1. Display Size: The GUI workstation software shall graphically display in 1024 by 768 pixels 24 bit True Color.
 2. General Graphic: General area maps shall show locations of controlled buildings in relation to local landmarks.

3. Color Floor Plans: Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors, which provide a visual display of temperature relative to their respective setpoints (see section 3.2 F below). The colors shall be updated dynamically as a zone's actual comfort condition changes in real-time. Locations of space sensors shall also be shown for each zone. The intent of the specification is to enable the operator to readily assess problems at a glance.
 4. Lighting floor plan graphics shall indicate the status in each zone controlled by the system. Use dynamic colors to indicate if the system is on, dimmed or off.
 5. Mechanical Components: Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability.
 6. Minimum System Color Graphics: Color graphics shall be selected and displayed via a web browser for the following:
 1. Each piece of equipment monitored or controlled including each terminal unit
 2. Each building
 3. Each floor and zone controlled
 4. Floor plans for lighting
- F. Zone Setpoint Adjustments: Color floor plans displayed via a web browser shall utilize a contiguous band of colors, each corresponding to actual zone temperatures relative to the desired heating and cooling setpoints. The ideal temperature shall be shown as a green color band. Temperatures slightly warmer than ideal shall be shown in yellow, and even warmer temperature band shall be shown in orange. Temperatures slightly cooler than ideal shall be light blue, and even cooler temperatures shall be shown as dark blue. All alarm colors shall be in red.
- G. Hierarchical Schedules: Utilizing the Navigation Tree displayed in the web browser GUI, an operator (with password access) shall be able to define a Normal, Holiday or Override schedule for an individual piece of equipment or room, or choose to apply a hierarchical schedule to the entire system, site or floor area. All schedules that affect the system/area/equipment highlighted in the Navigation Tree shall be shown in a summary schedule table and graph.
1. BACnet Schedules: Schedules shall comply with the BACnet standard, (Schedule Object, Calendar Object, Weekly Schedule property and Exception Schedule property) and shall allow events to be scheduled based on:
 - a. Types of schedule shall be Normal, Holiday or Override
 - b. A specific date
 - c. A range of dates
 - d. Any combination of Month of Year (1-12, any), Week of Month (1-5, last, any), Day of Week (M-Sun, Any)
 - e. Wildcard (example, allow combinations like second Tuesday of every month).
 2. Schedule Categories: The system shall allow operators to define and edit scheduling categories (different types of “things” to be scheduled; for example, lighting, HVAC occupancy, etc.). The categories shall include name, description, icon (to display in the hierarchy tree when icon option is selected) and type of value to be scheduled.

3. Schedule Groups: In addition to hierarchical scheduling, operators shall be able to define functional Schedule Groups, comprised of an arbitrary group of areas/rooms/equipment scattered throughout the facility and site. For example, the operator shall be able to define an 'individual tenant' group – who may occupy different areas within a building or buildings. Schedules applied to the 'tenant group' shall automatically be downloaded to control modules affecting spaces occupied by the 'tenant group'
 4. Schedules shall be minimum control occupancy modes on HVAC systems. Schedules shall control occupied, unoccupied and special modes (security, cleaning etc.) for lighting system. System shall allow the operator to designate a common occupancy schedule to be used for both HVAC and lighting.
 5. Intelligent Scheduling: The control system shall be intelligent enough to automatically turn on any supporting equipment needed to control the environment in an occupied space.
 6. Partial Day Exceptions: Schedule events shall be able to accommodate a time range specified by the operator.
 7. Schedule Summary Graph: The schedule summary graph shall clearly show Normal versus Holiday versus Override Schedules, and the net operating schedule that results from all contributing schedules. Note: In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.
 8. Schedule Distribution: For reliability and performance, instead of maintaining a single schedule in a field device that writes over the network to notify other devices when a scheduled event occurs, field devices will only keep their part of the schedule locally. The BAS server software shall determine which nodes a hierarchical schedule applies to and will create/modify the necessary schedule objects in each field device as necessary.
- H. Events (and Alarms): Events and alarms associated with a specific system, area, or equipment selected in the Navigation Tree, shall be displayed in the Action Pane by selecting an 'Events' view. Events, alarms, and reporting actions shall have the following capabilities:
1. Events View: Each event shall display an Event Category (using a different icon for each event category), date/time of occurrence, current status, event report, and a URL link to the associated graphic for the selected system, area or equipment. The URL link shall indicate the system location, address and other pertinent information. An operator shall easily be able to sort events, edit event templates and categories, acknowledge or force a return to normal in the Events View as specified in this section.
 2. Event Categories: The operator shall be able to create, edit or delete event categories such as HVAC, Maintenance, Fire, or Generator. An icon shall be associated with each Event category, enabling the operator to easily sort through multiple events displayed using a built-in filter.
 3. BACnet Event Templates: BACnet Event template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of event, acknowledgement requirements, high/low limit and out of range information.
 4. Event Areas: Event Areas enable an operator to assign specific Event Categories to specific Event Reporting Actions.
 5. Event Time/Date Stamp: All events shall be generated at the DDC control module level and comprise the Time/Date Stamp using the standalone control module time and date.

6. Event Configuration: Operators shall be able to define the type of events generated per BACnet object. A 'network' view of the Navigation Tree shall expose all BACnet objects and their respective Event Configuration. Configuration shall include assignment of event, alarm, type of Acknowledgement and notification for return to normal or fault status.
7. Event Summary Counter: The view of events in the Graphic Pane shall provide a numeric counter, indicating how many events are active (in alarm), require acknowledgement, and total number of events in the BAS Server database.
8. Persistent Data. The system shall allow for external systems to access the event instance data. Event data shall be stored and queried in the database in a relational manner. At a minimum, the fields to be stored in the database are:
 - Event Source
 - Event Generation Time
 - Acknowledge Required Flag
 - Delivery Priority
 - BACnet Event Type
 - Event Message Text
 - BACnet Event Parameter
 - Classification of Event
 - Event Acknowledgement Time
 - Return to Normal Time
 - Operator Comments
 - Who Acknowledged the Event
9. Event Auto-Deletion: Events that are acknowledged and closed shall be auto-deleted from the database and archived to a text file after an operator defined period.
10. Event Reporting Actions: Event Reporting Actions specified shall be automatically launched (under operator defined conditions) after an event is received by the BAS server software. Operators shall be able to fully define these Reporting Actions using the Navigation Tree and Graphic Pane in the web browser GUI. Reporting Actions shall be as follows:
 - a. Print: Alarm/Event information shall be printed to the BAS server's PC or a networked printer.
 - b. Email: Email shall be sent via any POP3-compatible e-mail server (most Internet Service Providers use POP3). Email messages may be copied to several email accounts.
 - c. File Write: The ASCII File write reporting action shall enable the operator to append operator defined alarm information to any alarm through a text file. The alarm information that is written to the file shall be completely definable by the operator. The operator may enter text or attach other data point information (such as AHU discharge temperature and fan condition upon a high room temperature alarm).
 - d. Write Property: The write property reporting action updates a property value in a hardware module.
 - e. SNMP: The Simple Network Management Protocol (SNMP) reporting action sends an SNMP trap to a network in response to receiving an event.
 - f. Run External Program: The Run External Program reporting action launches specified program in response to an event.
11. Event Simulator: The web browser GUI user shall provide an Event Simulator to test assigned Reporting Actions. The operator shall have the option of using current time or scheduling a specific time to generate the Event. Utilizing the Navigation Tree and drop-down menus in the

Graphic Pane, the operator shall be able to select the Event Type, Status, Notification, Priority, Message, and whether acknowledgement is required.

12. External Injection of Events. The BAS server software shall provide a CORBA interface for external injection of events, allowing the system to receive/report events generated from external source other than the BAS system.
- I. Trends: Trends shall conform to the BACnet Trend Log Object specification. The system shall be able to trend and display graphically all analog, digital or calculated points simultaneously. A trend log's properties shall be editable using the Navigation Tree and Graphic Pane.
 1. Viewing Trends: The operator shall have the ability to view trends by using the Navigation Tree and selecting a Trends button in the Graphic Pane. The system shall allow y- and x-axis maximum ranges to be specified and shall be able to simultaneously graphically display multiple trends per graph.
 2. Local Trends: Trend data shall be collected locally by Multi-Equipment/Single Equipment general-purpose controllers, and periodically uploaded to the BAS server if historical trending is enabled for the BACnet object. Trend data, including run time hours and start time date shall be retained in non-volatile module memory
 3. Resolution. Sample intervals shall be as small as one (0.1) second. Each trended point will have the ability to be trended at a different trend interval. When multiple points are selected for display that have different trend intervals, the system will automatically scale the axis.
 4. Dynamic Update. Trends shall be able to dynamically update at operator-defined intervals.
 5. Zoom. It shall be possible to zoom-in on a particular section of a trend for more detailed examination.
 6. Numeric Value Display. It shall be possible to pick any sample on a trend and have the numerical value displayed.
 - J. Security Access: Secure access from the web browser GUI to BAS server shall require a Login Name and Password. Access to different areas of the BAS system shall be defined in terms of Roles, Privileges and geographic area of responsibility as specified:
 1. Roles: Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of easily understood English language' privileges. Roles shall be defined in terms of View, Edit and Function Privileges. Systems that use cryptic Boolean numbers to define system access are not acceptable.
 - a. View Privileges shall comprise Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.
 - b. Edit Privileges shall comprise Setpoint, Tuning and Logic, Manual Override, and Point Assignment Parameters.
 - c. Function Privileges shall comprise Alarm/Event Acknowledgement, Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print, and Alarm/Event Maintenance.
 2. Geographic Assignment of Roles: Roles shall be geographically assigned using a similar expandable/collapsible navigation tree.

2.03 GRAPHICAL PROGRAMMING:

- A. The system software shall include a Graphic Programming Language (GPL) for all DDC control algorithms resident in standalone control modules. Any system that does not use a drag and drop method of graphical icon programming as described herein shall be unacceptable. GPL is a method used to create a sequence of operations by assembling graphic microblocks that represent each of the commands or functions necessary to complete a control sequence of operation. Microblocks represent common logical control devices used in conventional control systems, such as relays, switches, high signal selectors, etc., in addition to the more complex DDC and energy management strategies such as PID loops and optimum start. Each microblock shall be interactive and contain the programming necessary to execute the function of the device it represents.
- B. Graphic programming shall be performed while on screen and using a mouse; each microblock shall be selected from a microblock library and assembled with other microblocks necessary to complete the specified sequence. Microblocks are then interconnected on screen using graphic "wires," each forming a logical connection. Once assembled, each logical grouping of microblocks and their interconnecting wires then forms a graphic function block which may be used to control any piece of equipment with a similar point configuration and sequence of operation.
- C. Graphic Sequence: The clarity of the graphic sequence must be such that the operator has the ability to verify that system programming meets the specifications, without having to learn or interpret a manufacturer's unique programming language. The graphic programming must be self-documenting and provide the operator with an understandable and exact representation of each sequence of operation.
- D. Simulation: Full simulation capability shall be provided with the graphic programming. Operator shall be able to fully simulate the constructed control sequence prior to downloading into field control modules. Simulation capabilities shall include step-by-step, accelerated time, and operator defined simulation criteria like outside weather, demand, and communication status. Multiple graphic programs shall be simulated and displayed in split screens at the same time.
- E. GPL Capabilities: The following is a minimum definition of the capabilities of the Graphic Programming software:
 - 1. Function Block (FB): Shall be a collection of points, microblocks and wires which have been connected together for the specific purpose of controlling a piece of HVAC equipment or a single mechanical system.
 - 2. Logical I/O: Input/Output points shall interface with the control modules in order to read various signals and/or values or to transmit signal or values to controlled devices.
 - 3. BACnet Points: Shall be points that comply with the BACnet structure as defined in the BIBB's Addendum B1/B2, and the BACnet standard.
 - 4. Microblocks: Shall be software devices that are represented graphically and may be connected together to perform a specified sequence. A library of microblocks shall be submitted with the control contractors bid.

5. Wires: Shall be graphical elements used to form logical connections between microblocks and between logical I/O. Different wire types shall be used depending on whether the signal they conduct is analog or digital.
6. Labels: Labels shall be similar to wires in that they are used to form logical connections between two points. Labels shall form a connection by reference instead of a visual connection; i.e. two points labeled 'A' on a drawing are logically connected even though there is no wire between them.
7. Parameter: A parameter shall be a value that may be tied to the input of a microblock.
8. Properties: Dialog boxes shall appear after a microblock has been inserted which has editable parameters associated with it. Default parameter dialog boxes shall contain various editable and non-editable fields and shall contain 'push buttons' for the purpose of selecting default parameter settings.
9. Icon: An icon shall be graphic representation of a software program. Each graphic microblock has an icon associated with it that graphically describes its function.
10. Menu-bar Icon: Shall be an icon that is displayed on the menu bar on the GPL screen, which represents its associated graphic microblock.
11. Live Graphical Programs: The Graphic Programming software must support a 'live' mode, where all input/output data, calculated data, and setpoints shall be displayed in a 'live' real-time mode. For each piece of HVAC equipment, the graphic program shall be complete and viewed on one screen. For example, a graphic program used for an Air Handling Unit shall not be broken down into separate components and require an operator to view only one component at any one time.

2.04 SYSTEM TOOLS:

- A. System shall provide the following functionality to authorized operators as an integral part of the operator interface.
- B. Automatic System Database Configuration: Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.
 1. Controller Memory Download: Operators shall be able to download memory from the system database to each controller.
 2. System Configuration: Operators shall be able to configure the system.
 3. Online Help: Context-sensitive online help for each tool shall assist operators in operating and editing the system.
 4. Security: System shall require a user name and password to view, edit, add, or delete data.
 - a. Operator Access: Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object. Authorized operators shall be able to vary and deny each operator's accessible functions based on equipment or geographic location.

- b. Automatic Log Out: Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.
 - c. Encrypted Security Data: Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.
 5. System Diagnostics: System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).
 6. Alarm Processing: System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in "Sequences of Operation." Alarms shall be BACnet alarm objects and shall use BACnet alarm services.
 7. Alarm Messages: Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.
 8. Alarm Reactions: Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate. The send e-mail alarm action should be able to run a report and attach it to the e-mail. The e-mail should use SSL to secure the communications between the system server and the mail server.
 9. Alarm Maintenance: Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.
 10. Trend Configuration: Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Configure trends as specified in "Sequences of Operation." Trends shall be BACnet trend objects.
 11. Object and Property Status and Control: Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.
- C. Reports and Logs: Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.
 1. Standard Reports: Furnish the following standard system reports:
 - a. Objects: System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.
 - b. Alarm Summary: Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.
 - c. Logs: System shall log the following to a database or text file and shall retain data for an adjustable period:
 - i. Alarm History.

- ii. Trend Data. Operator shall be able to select trends to be logged.
 - iii. Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.
2. Custom Reports: Operator shall be able to create custom reports that retrieve data, including archived trend data, from the system, that analyze data using common algebraic calculations, and that present results in tabular or graphical format. Reports shall be launched from the operator interface.
3. Energy Reports: System shall include an easily configured energy reporting tool that provides the capabilities described in this section.
 - a. The energy reporting tool shall be accessible through the same user interface (Web browser or operator workstation software) as is used to manage the BAS.
 - b. The energy reporting tool shall be preconfigured by the Contractor to gather and store energy demand and consumption data from each energy source that provides metered data to the BAS. Meter data shall be stored at 5 minute intervals unless otherwise specified in the Sequence of Operation provided in Appendix A. This data shall be maintained in an industry standard SQL database for a period of not less than five years.
 - c. The energy reporting tool shall allow the operator to select an energy source and a time period of interest (day, week, month, year, or date range) and shall provide options to view the data in a table, line graph, bar graph, or pie chart. The tool shall also allow the operator to select two or more data sources and display a comparison of the energy used over this period in any of the listed graph formats, or to total the energy used by the selected sources and display that data in the supported formats.
 - d. The energy reporting tool shall allow the operator to select an energy source and two time periods of interest (day, week, month, year, or date range) and display a graph that compares the energy use over the two time periods in any of the graph formats listed in the previous paragraph. The tool shall also allow the operator to select multiple energy sources and display a graph that compares the total energy used by these sources over the two time periods.
 - e. The energy reporting tool shall allow the operator to easily generate the previously described graphs "on the fly," and shall provide an option to store the report format so the operator can select that format to regenerate the graph at a future date. The tool shall also allow the user to schedule these reports to run on a recurring basis using relative time periods, such as automatically generating a consumption report on the first Monday of each month showing consumption over the previous month. Automatically generated reports shall be archived on the server in a common industry format such as Adobe PDF or Microsoft Excel with copies e-mailed to a user editable list of recipients.
 - f. The energy reporting tool shall be capable of collecting and displaying data from the following types of meters:
 - i. Electricity
 - ii. Gas
 - iii. Heating and cooling degree days. (May be calculated from sensor data rather than metered.)
 - iv. Electricity

- g. The user shall have the option of using Kw (Kwh) or Btu/hr (Btu) as the units for demand and consumption reports. Multiples of these units (MWH, kBtu, etc.) shall be used as appropriate. All selected sources shall be automatically converted to the selected units. The user shall similarly have the option of entering facility area and occupancy hours and creating reports that are normalized on an area basis, an annual use basis, or an occupied hour basis.
 - h. The user shall have the option of entering benchmark data for an individual facility or a group of facilities.
 - i. The user shall have the option of displaying any or all of the following data on any chart, line, or bar graph generated by the energy reporting tool:
 - i. Low/High/Average value of the metered value being displayed.
 - ii. Heating and/or Cooling Degree Days for the time period(s) being displayed.
 - iii. The Environmental Index for the facilities and time periods being displayed.
- D. Building Performance: System shall monitor all occupied zones and compile an index that provides a numerical indication of the environmental comfort within the zone. As a minimum, this indication shall be based upon the deviation of the zone temperature from the heating or cooling setpoint. If humidity is being measured within the zone then the environmental index shall be adjusted to reflect a lower comfort level for high or low humidity levels. Similarly, if carbon dioxide levels are being measured as an indication of ventilation effectiveness then the environmental index shall be adjusted to indicate degraded comfort at high carbon dioxide levels. Other adjustments may be made to the environmental index based upon additional measurements. The system shall maintain a trend of the environmental index for each zone in the trend log. The system shall also compute an average comfort index for every building included in this contract and maintain trend logs of these building environmental indices. Similarly, the system shall compute the percentage of occupied time that comfortable conditions were maintained within the zones. Through the UI the user shall be able to add a weighting factor to adjust the contribution of each zone to the average index based upon the floor area of the zone, importance of the zone, or other static criteria.
- E. Graphics Generation: Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.
- 1. Graphics Library: Complete library of standard HVAC equipment graphics. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.
- F. Custom Application Programming: Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:
- 1. Language: Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks.

2. Programming Environment: Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.
 3. Independent Program Modules: Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.
 4. Debugging and Simulation: Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.
 5. Conditional Statements: Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
 6. Mathematical Functions: Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.
 7. Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.
 - i. Time Variables: Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.
 - ii. System Variables: Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.
- G. Portable Operator's Terminal: Provide all necessary software to configure an IBM-compatible laptop computer for use as a Portable Operator's Terminal. Operator shall be able to connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.

PART 3 - PRODUCTS HARDWARE

3.01 BAS SERVER HARDWARE:

- A. Computer Configuration (One BAS server to be provided by control contractor under this project, unless there is an existing BAS Server furnished by this Contractor.)
 1. Central Server. The BAS Contractor shall provide a server configuration that includes the following components as a minimum:
 - a. Server Class computer ie:Dell Poweredge SC430
 - b. Operating system-Windows 2003 Server
 - c. Processor – 3GHZ P4, minimum 3 GB RAM

- d. 100GB HDD, SCSI
 - e. CD – CDRW
 - f. 19” Monitor
 - g. SVGA Display card capable of 1024 X 768 resolution in true Color (32bit)
 - h. 10/100 Ethernet NIC
 - i. IE 6.0 or later
 - j. Database engine – MS Access Db < 500MB,MSDE, MS SQL Server
2. Standard Client (Hardware Independent): The thin-client browser interface shall be hardware agnostic, meaning it will support Microsoft browser (6.x versions) as well as most common server platforms (Windows NT, Sun Solaris and Linux). No special software, (active-x components or fat Java clients) shall be required to be installed on the PC’s / PDA’s used to access the BAS via a web browser. The following is the minimum suggested hardware requirements for a Windows/Intel client:
- a. 700Mhz, PIII or higher CPU
 - b. 256Mb of RAM minimum
 - c. 20 gigabyte hard disk, SVGA Card with 1024 x 768, 24-bit True Color, 24X CD Rom Drive, 17” SVGA Color Monitor
 - d. Operating system for the computer operator workstation server shall be Microsoft Windows XP,2000 or RedHat Linux 6.0 or Sun Solaris 7.0
 - e. Internet Explorer 6.x
 - f. Connection to the Intranet/Internet
3. No client hardware is required under this project if the BAS server can act as client in addition to the BAS server applications. Any owner/customer computers may act as client if the client computer has a 6.X browser and has connection capability to the DDC intranet/server.

3.02 COMMUNICATION:

- A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135-2004, BACnet. No exceptions acceptable.
- B. Install new wiring and network devices as required to provide a complete and workable control network. Use existing Ethernet backbone for network segments marked "existing" on project drawings.
- C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.
- D. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
 - 1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.

2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified in Section 15900 Part 5 Sequences of Operation. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.
- E. Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated controller via the internetwork. System shall automatically adjust for daylight saving and standard time.
 - F. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.
 - G. System shall support Web services data exchange with any other system that complies with XML (extensible markup language) and SOAP (simple object access protocol) standards specified by the Web Services Interoperability Organization (WS-I) Basic Profile 1.0 or higher. Web services support shall as a minimum be provided at the workstation or web server level and shall enable data to be read from or written to the system.
 1. System shall support Web services read data requests by retrieving requested trend data or point values (I/O hardware points, analog value software points, or binary value software points) from any system controller or from the trend history database.
 2. System shall support Web services write data request to each analog and binary object that can be edited through the system operator interface by downloading a numeric value to the specified object.
 3. For read or write requests, the system shall require user name and password authentication and shall support SSL (Secure Socket Layer) or equivalent data encryption.
 4. System shall support discovery through a Web services connection or shall provide a tool available through the Operator Interface that will reveal the path/identifier needed to allow a third party Web services device to read data from or write data to any object in the system which supports this service.

3.03 NETWORK ROUTERS AND BRIDGES:

- A. The DDC/BAS controller network shall use BACnet as its native communication protocol. Network bridges and routers must be of a modular design to ensure reliability and system performance.
- B. BACnet Router: The central system shall use the DDC/BAS Local Area Network (LAN) provided under this contract for communication. The communication between the central server and the controllers shall be BACnet/IP. A router shall be provided, as required, to bridge BACnet/IP and the data link used between the controllers (BACnet ARCNET and BACnet MS/TP). Proprietary networks and proprietary protocols are not acceptable.
 1. Firmware Updates: The BACnet Router must utilize FLASH memory to allow firmware updates to be performed remotely.

3.04 STANDALONE CONTROLLERS:

- A. General Purpose Multiple Application Controllers: BACnet BIBBS: General Purpose Multiple Application controllers shall use BACnet as the native communication protocol between controllers.
1. Communication Speed: Controllers shall communicate at a minimum of 156 Kbps using ARCNET implemented over EIA-485 using an unshielded twisted pair at the Data Link Layer.
 2. General Specification: Each General Purpose Multiple Application Controller shall be a standalone direct digital operation utilizing its own 32 bit processor, non-volatile flash memory, input/output, 12 bit A to D conversion, hardware clock/calendar and voltage transient and lightning protection devices. A separate co-processor shall be used for communications to the controller network. All non-volatile flash memory shall have a battery backup of at least five years. Firmware revisions to the module shall be made from the BAS server or remotely over the Intranet or Internet. Controllers that require component changes to implement firmware revisions are not acceptable.
 3. Point Expansion: The General Purpose Multiple Application Controllers shall be expandable to the specified I/O point requirements. Each controller shall accommodate multiple I/O Expander Modules via a designated expansion I/O bus port. These expander modules shall expand the total point capacity of each controller up to 192 points where specified. The controller, in conjunction with the expansion modules, shall act as one standalone controller.
 4. Point Programming: All point data, algorithms and application software within a controller shall be custom programmable from the operator workstation.
 5. Program Execution: Each General Purpose Multiple Application Controller shall execute application programs, calculations, and commands via a 32-bit microcomputer resident in the controller. All operating parameters for application programs residing in each controller shall be stored in read/writeable nonvolatile flash memory within the controller and will be able to upload/download to/from the BAS Server.
 6. Self-Test Diagnostics: Each controller shall include self-test diagnostics, enabling the controller to report malfunctions to the router and BAS Server.
 7. PID Loops: Each General Purpose Multiple Application Controller shall contain both software and firmware to perform full DDC Proportional, Integral, Derivative (PID) control loops and programs.
 8. Input-Output Processing:
 - a. Digital Outputs shall be relays, 24 Volts AC or DC maximum, 3-amp maximum current. Each configured as normally open or normally closed using jumpers and either dry contact or bussed. Each output shall have a manual Hand-Off-Auto switch to allow for override and an LED to indicate the operating mode of the output. Triac outputs are unacceptable.
 - b. Universal Inputs shall be Thermistor (BAPI Curve II) 10K Ohm at 77°F (25°C), 0-5VDC, 10K Ohm maximum source impedance, 0-20mA - 24 VDC loop power, 250 Ohm input impedance, dry contact - 0.5mA maximum current.
 - c. Analog Output shall be electronic, voltage mode 0-10VDC or current mode 4-20mA.
- B. General Purpose Single Application Controllers:

1. BACnet BIBBS: The General Purpose Single Application Controllers must use BACnet as the native communication protocol between controllers.
2. Communication Speed: Controllers shall communicate at a minimum of 156 Kbps using ARCNET implemented over EIA-485 using an unshielded twisted pair at the Data Link Layer.
3. General Specification: General Purpose Single Application controllers must be capable of stand-alone DDC operation utilizing its own 32 bit processor, nonvolatile flash memory, input/output, 8 bit A to D conversion, hardware clock/calendar and voltage transient protection devices. A separate co-processor shall be used for communications to the controller network. All RAM memory shall have a battery backup of at least five years. Firmware revisions to the module shall be made from the BAS server or remote locations over the Internet. Controllers that require component changes to implement Firmware revisions are not be acceptable.
4. Point Programming: All point data, algorithms, and application software within the controllers shall be custom programmable from the Operator Workstation.
5. Program Execution: Each General Purpose Single Application Controller shall execute application programs, calculations, and commands via a 32-bit microcomputer resident in the controller. All operating parameters for the application program residing in each controller shall be stored in read/writeable nonvolatile flash memory within the controller and will be able to upload/download to/from the Operator Workstation.
6. Self-Test Diagnostics: Each controller shall include self-test diagnostics, enabling the controller to report malfunctions to the router and BAS Server input.
7. PID Loops: Each General Purpose Single Application Controller shall contain both software and firmware to perform full DDC PID control loops.
8. Rooftop Mounting: The General Purpose Single Application Controllers shall be capable of being mounted directly in or on rooftop AHU equipment.
9. Operating Temperature: The General Purpose Single Application Controllers shall be capable of proper operation in an ambient temperature environment of -20°F to +150°F.
10. Input-Output Processing:
 - a. Digital Outputs shall be relays, 24 Volts AC or DC maximum, 3 amp maximum current. Each output shall have a manual Hand-Off-Auto switch to allow for override and an LED to indicate the operating mode of the output. Triac outputs are unacceptable.
 - b. Universal Inputs shall be Thermistor (BAPI Curve II) 10K Ohm at 77°F, 0-5VDC - 10K Ohm maximum source impedance, 0-20mA - 24 VDC loop power, 250 Ohm input impedance, Dry Contact - 0.5mA maximum current.
 - c. Analog Electronic Outputs shall be voltage mode 0-10VDC or current mode 4-20mA.

3.05 FIELD HARDWARE/INSTRUMENTATION:

A. Temperature Sensing Devices:

1. Type and Accuracy: Temperature sensors shall be of the type and accuracy indicated for the application. Sensors shall have an accuracy rating within 1% of the intended use temperature range.

2. Outside Air Temperature Sensors: Outside air temperature sensors accuracy shall be within $\pm 1^{\circ}\text{F}$ in the range of -52°F to 152°F .
 3. Room Temperature Sensors: Room temperature sensors shall have an accuracy of $\pm 0.36^{\circ}\text{F}$ in the range of 32°F to 96°F .
- B. Pressure Instruments:
1. Differential Pressure and Pressure Sensors: Sensors shall have a 4-20 MA output proportional signal with provisions for field checking. Sensors shall withstand up to 150% of rated pressure, without damaging the device. Accuracy shall be within $\pm 2\%$ of full scale. Sensors shall be manufactured by Leeds & Northrup, Setra, Robertshaw, Dwyer Instruments, Rosemont, or be approved equal.
 2. Pressure Switches: Pressure switches shall have a repetitive accuracy of $\pm 2\%$ of range and withstand up to 150% of rated pressure. Sensors shall be diaphragm or bourdon tube design. Switch operation shall be adjustable over the operating pressure range. The switch shall have an application rated Form C, snap-acting, self-wiping contact of platinum alloy, silver alloy, or gold plating.
- C. Humidity Sensors: Sensors shall have an accuracy of $\pm 25\%$ over a range of 20% to 95% RH.
- D. Current Sensing Relays: Relays shall monitor status of motor loads. Switch shall have self-wiping, snap-acting Form C contacts rated for the application. The setpoint of the contact operation shall be field adjustable.
- E. Output Relays: Control relay contacts shall be rated for 150% of the loading application, with self-wiping, snap-acting Form C contacts, enclosed in dustproof enclosure. Relays shall have silver cadmium contacts with a minimum life span rating of one million operations. Relays shall be equipped with coil transient suppression devices.
- F. Solid State Relays: Input/output isolation shall be greater than 10 billion ohms with a breakdown voltage of 15 V root mean square, or greater, at 60 Hz. The contact operating life shall be 10 million operations or greater. The ambient temperature range of SSRs shall be 20°F - 140°F . Input impedance shall be greater than 500 ohms. Relays shall be rated for the application. Operating and release time shall be 10 milliseconds or less. Transient suppression shall be provided as an integral part of the relays.
- G. Damper Actuators:
1. Electronic Direct-Coupled: Electronic direct-coupled actuation shall be provided.
 2. Actuator Mounting: The actuator shall be direct-coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The fastening clamp assembly shall be of a 'V' bolt design with associated 'V' shaped toothed cradle attaching to the shaft for maximum strength and eliminating slippage. Spring return actuators shall have a 'V' clamp assembly of sufficient size to be directly mounted to an integral jackshaft of up to 1.05 inches when the damper is constructed in this manner. Single bolt or screw type fasteners are not acceptable
 3. Electronic Overload Sensing: The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the entire rotation of the

actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable.

4. Power Failure/Safety Applications: For power failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation are not acceptable.
 5. Spring Return Actuators: All spring return actuators shall be capable of both clockwise or counterclockwise spring return operation by simply changing the mounting orientation.
 6. Proportional Actuators: Proportional actuators shall accept a 0 to 10VDC or 0 to 20mA control input and provide a 2 to 10VDC or 4 to 20mA operating range. An actuator capable of accepting a pulse width modulating control signal and providing full proportional operation of the damper is acceptable. All actuators shall provide a 2 to 10VDC position feedback signal.
 7. 24 Volts (AC/DC) actuators: All 24VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 10VA for AC or more than 8 watts for DC applications. Actuators operating on 120VAC power shall not require more than 10VA. Actuators operating on 230VAC shall not require more than 11VA.
 8. Non-Spring Return Actuators: All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb torque shall have a manual crank for this purpose.
 9. Modulating Actuators: All modulating actuators shall have an external, built-in switch to allow reversing direction of rotation.
 10. Conduit Fitting and Pre-Wiring: Actuators shall be provided with a conduit fitting and a minimum 3ft electrical cable, and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
 11. U.L. Listing: Actuators shall be Underwriters Laboratories Standard 873 listed and Canadian Standards Association Class 4813 02 certified as meeting correct safety requirements and recognized industry standards.
- H. Control Dampers: Provide automatic control low leakage, opposed blade dampers, with damper frames not less than formed 13-gauged galvanized steel. Provide mounting holes for enclosed duct mounting. Provide damper blades not less than formed 16-gauged galvanized steel, with maximum blade width of 8-inch. Equip dampers with motors of proper rating of each application.
1. Secure blades to ½ inch diameter zinc-plated axles using zinc-plated hardware. Seal off against spring stainless steel blade bearings. Provide blade bearings Nylon and provide thrust bearings at each end of every blade. Construct blade linkage hardware of zinc-plated steel and brass. Submit leakage and flow characteristics plus size schedule for controlled dampers.
 2. Operating Temperature Range: From –20° to 200°F.
 3. For low leakage application or opposed blade design (as selected by manufacturers sizing techniques) with inflatable steel blade edging or replaceable rubber seals, rated for leakage less than 10 cfm per square foot of damper area, AR differential pressure of 4-inch w.g. when damper is being held by torque 50 inch-pounds.
 4. Provide unit ventilator outside air dampers with adjustable minimum settings so that ventilation can be adjusted for each space or room.

PART 4–DDC SOFTWARE

4.01 OVERVIEW:

- A. The system shall continuously perform Direct Digital Control (DDC) functions at the local control module in a stand-alone mode. The operator shall be able to design and modify the control loops to meet the requirements of the system being operated. The operators shall use system provided displays for tuning of PID loops. These displays shall include the past three input variable values, the setpoint for the loop as well as the sample interval and the results of the proportional, integral and derivative effects on the final output.
- B. Minimum Function: Each control module shall perform the following functions:
 - 1. Identify and report alarm conditions
 - 2. Execute all application programs indicated on the I/O Summary table
 - 3. Execute DDC algorithms
 - 4. Trend and store data
- C. Control Failure Mode: In the event of a control module failure, all points under its control shall be commanded to the failure mode as indicated on the I/O Summary Table. All DDC software shall reside in the respective control module.
 - 1. Orderly Shutdown: Power failures shall cause the control module to go into an orderly shutdown with no loss of program memory.
 - 2. Automatic Restart: Upon resumption of power, the control module shall automatically restart and print out the time and date of the power failure and restoration at the respective Workstation system.
 - 3. Automatic Restart: The restart program shall automatically restart affected field equipment. The operator shall be able to define an automatic power up time delay for each piece of equipment under control.

PART 5 - APPLICATIONS SOFTWARE

5.01 GENERAL:

- A. The following applications software shall be provided for the purpose of optimizing energy consumption while maintaining occupant comfort:
- B. Time of Day Scheduling (TOD): The system shall be capable of the following scheduling features:
 - 1. Schedule by Type: Scheduling by building, area, zone, groups of zones, individually controlled equipment and groups of individually controlled equipment. Each schedule shall provide beginning and ending dates and times (hours: minutes). A weekly repeating schedule, i.e. between 8:00 a.m. and 5:00 p.m., Monday through Friday shall constitute one schedule, not five.
 - 2. Schedule in Advance: Dated schedules shall be entered up to nine (9) years in advance.

3. Self-Deleting: Schedules shall be self-deleting when effective dates have passed.
 4. Leap Year: Leap years shall be adjusted automatically without operator intervention.
- C. Optimum Start/Stop (OSS)/Optimum Enable/Disable (OED): This application provides software to start and stop equipment on a sliding schedule based on the individual zone temperature and the heating/cooling capacity in °F/hour of the equipment serving that zone. The heating/cooling capacity value shall be operator adjustable. Temperature compensated peak demand limiting shall remain in effect during morning start up to avoid setting a demand peak.
- D. Source Temperature Optimization (STO): The system shall automatically perform source optimization for all HVAC equipment in response to the needs of other downstream pieces of equipment, by increasing or decreasing supply temperature setpoints using owner defined parameters. In addition to optimization, the STO capability shall also provide for starting and stopping primary mechanical equipment based on zone occupancy and/or zone load conditions.
- E. Demand Limiting (DL) - Temperature Compensated: The DL application shall be programmable for a minimum of six separate time of day KW demand billing rate periods. The system shall be capable of measuring electrical usage from multiple meters serving one building and each piece of equipment being controlled on the LAN shall be programmable to respond to the peak demand information from its respective meter.
1. Sliding Window: The demand control function shall utilize a sliding window method with the operator being able to establish the kilowatt threshold for a minimum of three adjustable demand levels. The sliding window interval shall be operator selectable in increments of one minute, up to 60 minutes. Systems that incorporate rotating shed tables will not be acceptable.
 2. Setpoints for Defined Demand Level: The operator shall have the capability to set the individual equipment temperature setpoints for each operator defined demand level. Equipment shall not be shed if these reset setpoints are not satisfied; rather the setpoint shall be revised for the different established demand levels. The system shall have failed meter protection, such that when a KW pulse is not received from the utility within an operator adjustable time period, an alarm will be generated. The system software will automatically default to a predetermined fail-safe shed level.
 3. Information Archiving: The system shall have the ability to archive demand and usage information for use at a later time. System shall permit the operator access to this information on a current day, month to date and a year to date basis.
- F. Day/Night Setback (DNS): The system shall allow the space temperature to drift down and up within a preset adjustable unoccupied temperature range. The heating and cooling shall be activated upon reaching either end of the DNS range and shall remain activated until the space temperature returns to the DNS range.
- G. Timed Local Override (TLO): The system shall have TLO input points that permit the occupants to request an override of equipment that has been scheduled OFF. The system shall turn the equipment ON upon receiving a request from the local input device. Local input devices shall be push button (momentary contact), wind-up timer or ON/OFF switches as desired by the Owner.
- H. Space Temperature Control (STC): There shall be two space temperature setpoints, one for cooling and one for heating, separated by a dead band. Only one of the two setpoints shall be

operative at any time. The cooling setpoint is operative if the actual space temperature has more recently been equal to or greater than the cooling setpoint. The heating setpoint is operative if the actual space temperature has more recently been equal to or less than the heating setpoint. There are two modes of operation for the setpoints, one for the occupied mode (example: heating = 72°F, cooling = 76°F) and one for the unoccupied mode (example: heating = 55°F, cooling = 90°F).

1. Schedule: The occupied/unoccupied modes may be scheduled by time, date, or day of week.
 2. Color Code: One of seven colors shall be generated to represent the comfort conditions in the space, and shall be displayed graphically at the operator station.
 - a. If the actual space temperature is in the dead band between the heating setpoint and the cooling setpoint, the color displayed shall be green for the occupied mode, representing ideal comfort conditions. If in the unoccupied mode, the color displayed shall be gray representing 'after-hours' conditions.
- I. If the space temperature rises above the cooling setpoint, the color shall change to yellow. Upon further rise beyond the cooling setpoint plus an offset, the color shall change to orange. Upon further rise beyond the cooling setpoint plus the yellow band offset, plus the orange band offset, the color shall change to red indicating unacceptable high temperature conditions. At this point an alarm shall be generated to notify the operator.
- J. When space temperature falls below the heating setpoint, the color shall change to light blue. Upon further temperature decrease below the heating setpoint minus an offset, the color shall change to dark blue. Upon further space temperature decrease below the heating setpoint minus the light blue band offset minus the dark blue band offset the color shall change to red indicating unacceptable low temperature conditions. At this point an alarm shall be generated to notify the operator.
1. Operator Definable: All setpoints and offsets shall be operator definable. When in the occupied mode, start-up mode, or when heating or cooling during the night setback unoccupied mode, a request shall be sent over the network to other equipment in the HVAC chain, such as to an AHU fan that serves the space, to run for ventilation. The operator shall be able to disable this request function if desired.
 2. Additional Cooling: When comfort conditions are warmer than ideal, indicated by the colors yellow, orange, and high temperature red, a request for additional cooling shall be sent over the network to other cooling equipment in the HVAC chain, such as a chiller. This information is to be used for optimization of equipment in the HVAC chain. The operator shall be able to disable this function if desired.
 3. Additional Heating: When comfort conditions are cooler than ideal; indicated by the colors light blue, dark blue, and low temperature red; a request for additional heating shall be sent over the network to other heating equipment in the HVAC chain, such as a boiler. This information is to be used for optimization of equipment in the HVAC chain. The operator shall be able to disable this function if desired.
 4. Cooling/Heating Setpoints: The cooling and heating setpoints may be increased or decreased under demand control conditions to reduce the cooling (heating) load on the building during the demand control period. Up to three levels of demand control strategy shall be provided. The operator may predefine the amount of setpoint increase or decrease for each of the three levels. Each space temperature sensor in the building may be programmed independently.

5. Optimum Start: An optimum start-up program transitions from the unoccupied setpoints to the occupied setpoints. The optimum start-up algorithm considers the rate of space temperature rise for heating and the rate of space temperature fall for cooling under nominal outside temperature conditions; it also considers the outside temperature; and the heat loss and gain coefficients of the space envelope (AI: Space Temperature).

PART 6- EXECUTION

6.01 HARDWARE INSTALLATION:

- A. Utility Company Equipment: Owner shall arrange installation of electric billing meters and gas meters with demand signal pulses, as indicated.
- B. Wiring:
 1. The Contractor shall install wires for the room temperature sensors (from sensor to the appropriate control module).
 2. The Contractor shall install all sensing devices and the wiring to modules.
 3. The Contractor shall install all control and monitoring wiring in Mechanical Room.
 4. Low voltage wire shall be not less than 18 AWG. All line voltage wire shall be THHN/TFFN, 600 volt rated.
 5. Control and interlock wiring and installation shall comply with national and local electrical codes, Division 16, and manufacturer's recommendations.
 6. NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by NEC and Division 16.
 7. Low-voltage wiring shall meet NEC Class 2 requirements. Subfuse low-voltage power circuits as required to meet Class 2 current limit.
 8. NEC Class 2 (current-limited) wires not in raceway but in concealed and accessible locations such as return air plenums shall be UL listed for the intended application.
 9. Install wiring in raceway where subject to mechanical damage and all exposed locations such as mechanical, electrical, or service rooms.
 10. Install Class 1 and Class 2 wiring in separate raceways. Boxes and panels containing high-voltage wiring and equipment shall not be used for low-voltage wiring except for the purpose of interfacing the two through relays and transformers.
 11. Run exposed Class 2 wiring parallel to a surface or perpendicular to it and tie neatly at 6 ft. intervals.
 12. Use structural members to support or anchor plenum cables without raceway. Do not use ductwork, electrical raceways, piping, or ceiling suspension systems to support or anchor cables.
 13. Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes shall not be hung on or attached to ductwork, electrical raceways, piping, or ceiling suspension systems.

14. Size raceway and select wire size and type in accordance with manufacturer's recommendations and NEC requirements.
15. Include one pull string in each raceway 1 in. or larger.
16. Use color-coded conductors throughout.
17. Conceal raceways except within mechanical, electrical, or service rooms. Maintain minimum clearance of 6 in. between raceway and high-temperature equipment such as steam pipes or flues.
18. Adhere to requirements in Division 16 where raceway crosses building expansion joints.
19. Install insulated bushings on raceway ends and enclosure openings. Seal top ends of vertical raceways.
20. Terminate control and interlock wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations.
21. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 18 inches in length and shall be supported at each end. Do not use flexible metal raceway less than ½ in. electrical trade size. Use liquid-tight flexible metal raceways in areas exposed to moisture including chiller and boiler rooms.
22. Install raceway rigidly, support adequately, ream at both ends, and leave clean and free of obstructions. Join raceway sections with couplings and according to code. Make terminations in boxes with fittings. Make terminations not in boxes with bushings.
23. Communication wiring shall be low-voltage Class 2 wiring.
24. Install communication wiring in separate raceways and enclosures from other Class 2 wiring.
25. During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.
26. Verify entire network's integrity following cable installation using appropriate tests for each cable.
27. Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.
28. Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.
29. Label communication wiring to indicate origination and destination.
30. Ground coaxial cable according to NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

6.02 SMOKE DETECTORS:

- A. Smoke detectors approved for duct installation shall be provided by Division 16 for all air systems of 2000 cfm capacity or above or as indicated on the drawings, to automatically shut down the supply fan and close all smoke dampers (as required). Each detector shall have an integral relay.
- B. Smoke detectors shall be furnished by Division 16 and installed under Division 15. All wiring between detector and fire alarm system shall be provided and installed under Division 16.

6.03 CONTROL PANELS:

- A. Furnish formed sheet metal control panels as required with locking door and hinges. All necessary relays, switches and peripheral devices shall be located inside panels. All multi-equipment main panels shall have a laminated control point diagram identifying all control points and monitoring points associated with the control module(s) contained within the panel. Each panel shall be identified with an attached identifying phenolic tag. All electric devices shall be connected to numbered terminal strips. All control panels shall be centrally located.

6.04 SEQUENCE OF OPERATION:

A. Rooftop Air Conditioning Units (RAC):

1. Roof Mounted Air Conditioners shall be controlled by space temperature and relative humidity sensors. During occupied hours, supply fans shall run continuously, outside air dampers shall be open, and cooling and heating modes shall cycle as needed. During unoccupied hours, supply fans shall run intermittently and outside air dampers shall be closed. Units shall operate in dehumidification mode whenever indoor relative humidity exceeds 60% (adjustable) and force the unit into full cooling until the indoor relative humidity falls below 55% (adjustable). During dehumidification mode, hot gas reheat shall operate to maintain the indoor setpoint. Where scheduled on the plans, provide Staged Air Volume control. BAS shall monitor fan mode, unit operation mode, discharge air temperature, space air temperature, space %relative humidity and unit alarms. Provide full DDC control. Provide BAS contact for associated air treatment system.

B. Split System Heat Pumps (SSHP):

1. Split System Heat Pumps shall be controlled by space temperature and relative humidity sensors. During occupied hours, supply fans shall run continuously, outside air dampers shall be open, and cooling and heating modes shall cycle as needed. During unoccupied hours, supply fans shall run intermittently and outside air dampers shall be closed. Units shall operate in dehumidification mode whenever indoor relative humidity exceeds 60% (adjustable) and force the unit into full cooling until the indoor relative humidity falls below 55% (adjustable). During dehumidification mode, AHU electric heat shall operate to maintain the indoor setpoint. Where scheduled on the plans, provide Staged Air Volume control. BAS shall monitor fan mode, unit operation mode, discharge air temperature, space air temperature, space %relative humidity and unit alarms. Provide full DDC control. Provide BAS contact for associated air treatment system.

C. Ductless Heat Pumps (DHP):

1. Ductless Heat Pumps shall be controlled by space temperature sensors. Units shall cycle on and off as needed to satisfy temperature setpoint. BAS shall monitor fan mode, unit operation mode, discharge air temperature, space air temperature, and unit alarms. Provide full DDC control.

D. Energy Recovery Ventilation Units (ERV):

1. ERV fans and energy recovery wheels will run continuously during the Occupied Mode and be shut down during Unoccupied Mode. The BAS will provide a start/stop signal. The BAS will provide remote monitoring and alarm for smoke detectors, supply fan status, exhaust fan status, energy wheel rotation, and filter pressure drop.
- E. Electric Heaters:
1. Electric heaters shall be controlled by integral thermostats and shall not be connected to BAS.
- F. Fans:
1. Restroom exhaust fans shall run continuously during Occupied Mode and be shut down during Unoccupied Mode. The BAS will provide a start/stop signal. The BAS will provide remote monitoring and alarm for fan status.
 2. Kitchen hood exhaust fan / makeup air unit shall be controlled by the kitchen hood fan switch. Integral heater controls shall control the gas heater. The BAS will provide remote monitoring and alarm for status and heater discharge air temperature.
 3. Pulper Room transfer fans shall run continuously during Occupied Mode and be shut down during Unoccupied Mode. The BAS will provide a start/stop signal. The BAS will provide remote monitoring and alarm for fan status.

END OF SECTION 15955

**SECTION 15990
MECHANICAL TESTING, ADJUSTING AND BALANCING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE:

- A. General: An independent test agency shall perform the TAB work as described herein. The agency shall have a minimum of 3 years of successful TAB experience on projects of similar size and scope. The name of the test agency and proof of satisfactory performance on 5 previous projects in the form of projects referenced shall be submitted to the Architect for approval within 30 days after receipt of the construction contract.
- B. Test Agency: A firm with membership in the *Associated Air Balance Council (AABC)* or certified by the *National Environmental Balancing Bureau (NEBB)* in those testing and balancing disciplines similar to those required for this project, who is not the Installer of the system to be tested, and is otherwise independent of the project.
- C. Compliance: Comply with AABC standards or NEBB's *Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems* as applicable to mechanical air systems and associated equipment apparatus.
- D. Industry Standards: Comply with ASHRAE (*American Society for Heating, Refrigeration and Air Conditioning Engineers, Inc.*) recommendations pertaining to measurements, instruments, and testing, adjusting, and balancing except as otherwise indicated.

1.03 SUBMITTALS:

- A. Submit 5 copies of a certified test report signed by the TAB supervisor who performed the TAB work. Test reports shall be submitted prior to the final inspection of mechanical work.
- B. Include identification and types of instruments used and their most recent calibration date with submission of final test report.
- C. In addition to Air Balance and operational data required to be submitted, the report shall include any observation of unusual noise or vibration observed and any malfunction of adjustable devices encountered during the TAB work.

1.04 JOB CONDITIONS:

- A. Do not proceed with testing, adjusting and balancing work until the work to be TAB'ed has been completed and is operable. Do not proceed until work scheduled for TAB'ing is clean

and free from debris, dirt, and discarded building materials.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS:

- A. Except as otherwise indicated, use the same products as used by original Installer for patching holes in insulation, ductwork and housing which may have been cut or drilled for test purposes, including access for test instruments, attaching jigs and similar purposes.

2.02 TEST INSTRUMENTS:

- A. Utilize test instruments and equipment for the TAB work required, of the type, precision and capacity as recommended in AABC standards or NEBB's Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems.

PART 3 - EXECUTION

3.01 TESTING:

- A. Tester must examine the installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Notify the Contractor in writing of conditions detrimental to the proper completion of the test-adjusting-balancing work. Do not proceed with the TAB work until unsatisfactory conditions have been corrected in a manner acceptable to Tester.
- B. Test, adjust, and balance mechanical air systems and water systems. At a minimum, the report shall document the following:
 - 1. CFM for all diffusers, grilles and registers.
 - 2. CFM for all AH Units.
 - 3. CFM for all RAC Units.
 - 4. CFM for all ERV Units.
 - 5. CFM for all fans.
 - 6. Entering air / leaving air temperatures (DB/WB) for all cooling coils.
 - 7. Calculated cooling coil capacities.
 - 8. Entering air / leaving air temperatures for all heating coils.
 - 9. Calculated heating coil capacities.
- C. Airflows shown on drawings are provided as a guide to achieve uniform room temperature throughout the building. Field correct as required to suite room condition. Any substantial alteration shall be called to the engineer's attention.
- D. Perform a cooling season T&B and heating season T&B.
- E. Prepare a report of test results, including instrumentation calibration reports, in the form recommended by the applicable standards.

- F. Patch holes in insulation, ductwork and housing, which have been cut or drilled for test purposes, in a manner recommended by the original Installer.
- G. Mark equipment settings, including manual damper control positions, and similar controls and devices, to show final settings at completion of TAB work. Provide marking with paint or other suitable permanent identification materials.

END OF SECTION 15990

**SECTION 15995
MECHANICAL COMMISSIONING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY:

- A. This Section includes general requirements that apply to implementation of commissioning.
- B. Systems to be Commissioned:
 - 1. All HVAC systems in their entirety.
 - 2. All domestic water heaters and associated equipment.

1.03 DEFINITIONS:

- A. CxA: Commissioning Authority.
- B. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.
- C. TAB: Testing, Adjusting and Balancing.

1.04 COMMISSIONING TASKS:

- A. Develop and implement a Commissioning Plan.
- B. Develop and incorporate commissioning requirements into the Construction Documents.
- C. Conduct a commissioning design review prior to mid-construction documents.
- D. Review Contractor submittals applicable to commissioned systems.
- E. Verify installation and performance of commissioned systems.
- F. Verify O&M Manuals are completed for commissioned systems.
- G. Verify that training requirements are completed.
- H. Complete a summary Commissioning Report.

1.05 COMMISSIONING TEAM:

- A. Members Appointed by Architect and Owner:
 - 1. CxA: The designated person that plans, schedules, and coordinates the commissioning team to implement the commissioning process.
 - 2. Representatives of the facility user and operation and maintenance personnel.
 - 3. Architect and Engineering design professionals.
- B. Members Appointed by Contractor: Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of the Contractor, including project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

1.06 OWNER RESPONSIBILITIES:

- A. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
 - 1. Coordination meetings.
 - 2. Testing meetings.
 - 3. Demonstration of operation of systems, subsystems, and equipment.
- B. Provide utility services required for the commissioning process.

1.07 CONTRACTOR RESPONSIBILITIES:

- A. Provide utility services required for the commissioning process.
- B. The Contractor shall assign representatives with expertise and authority to act on behalf of the Contractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
 - 1. Participate in construction-phase coordination meetings.
 - 2. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to CxA for incorporation into the Commissioning Plan. Update schedule on a weekly basis throughout the construction period.
 - 3. Document that work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
 - 4. Complete Pre-Functional Performance Checklists and Functional Performance Test Checklists.
 - 5. Provide technicians who are familiar with the construction and operation of installed systems and who shall participate in testing of installed systems, subsystems, and equipment.
 - 6. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - 7. Participate in O&M training sessions.
 - 8. Participate in system acceptance meeting.
 - 9. Provide O&M Manuals for commissioned systems to CxA for review.
 - 10. Provide final as-built plans related to commissioned systems to CxA for review.

1.08 CxA RESPONSIBILITIES:

- A. Organize and lead the commissioning team.
- B. Prepare a construction-phase Commissioning Plan. Collaborate with the Contractor to develop test and review procedures. Include design changes and scheduled commissioning activities coordinated with overall Project schedule. Identify commissioning team member responsibilities for performance of each commissioning task.
- C. Review contractor submittals applicable to commissioned systems.
- D. At the beginning of the construction phase, conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules.
- E. Prepare project-specific Pre-Functional Performance Checklists and Functional Performance Test Checklists and issue these checklists to the Contractor.
- F. Review construction for systems to be commissioned and report progress and deficiencies. Review systems and equipment installation for adequate accessibility for maintenance and component replacement or repair. Note these findings in the Issues Log.
- G. Schedule, direct, witness, and document Functional Performance Tests and systems startup. Note these findings in the Issues Log.
- H. Compile test data, review reports, checklists and certificates and include them in the Commissioning Report. Record date of acceptance and startup for each item of equipment for start of warranty periods.
- I. Review Project Record Documents for accuracy. Request revisions from Contractor to achieve accuracy. Project Record Documents requirements are specified in Division 1 Section "Project Record Documents."
- J. Verify the requirements for training operating personnel have been completed.
- K. Prepare Commissioning Report. The report will include an executive summary, history of any system deficiencies identified along with resolution, outstanding issues or seasonal testing scheduled for a later date, systems Functional Performance Test results and evaluations, and confirmation from the CxA indicating whether the commissioned systems meet the Contract Documents.
- L. Submit the final commissioning documentation, including the Commissioning Report and Project Record Documents.

1.09 COMMISSIONING DOCUMENTATION:

- A. Index of Commissioning Documents: CxA shall prepare an index to include storage location of each document.
- B. Commissioning Plan: A document prepared by CxA that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited to the following:

1. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
 2. Identification of systems and equipment to be commissioned.
 3. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
 4. Identification of items that must be completed before the next operation can proceed.
 5. Description of responsibilities of commissioning team members.
 6. Description of observations to be made.
 7. Description of expected performance for systems, subsystems, equipment and controls.
 8. Schedule for commissioning activities with specific dates coordinated with overall construction schedule.
 9. Identification of installed systems, subsystems, and equipment, including design changes that occurred during the construction phase.
 10. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
 11. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
 12. Step-by-step procedures for testing systems, subsystems, and equipment with descriptions for methods of verifying relevant data, recording the results obtained, and listing parties involved in performing and verifying tests.
 13. Functional Performance Tests: CxA shall develop functional performance tests for each system, subsystem, or equipment including interfaces and interlocks, and include a separate entry, with space for comments, for each item to be tested. Prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. Provide space for testing personnel to sign off on each checklist. FPT checklists will be issued prior to scheduled equipment start-up.
- C. Notice of Readiness: Notice of Readiness shall be signed by the Contractor, declaring that systems, subsystems, equipment, and associated controls are ready for testing. Completed Pre-Commissioning Checklists signed by the responsible parties shall accompany this notice.
- D. Functional Performance Tests: CxA shall record test data, observations, and measurements on functional performance test checklists. Photographs, forms, and other means appropriate for the application shall be included with data. CxA shall compile test and inspection reports and certificates and include them in the Commissioning Report.
- E. Corrective Action Documents: CxA shall document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.
- F. Issues Log: CxA shall prepare and maintain an issues log that describes installation and performance issues that are at variance with the OPR, BOD, and Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.
1. Creating an Issues Log Entry:
 - a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.

- b. Assign a descriptive title of the issue.
 - c. Identify date and time of the issue.
 - d. Identify test number of test being performed at the time of the observation, if applicable, for cross-reference.
 - e. Identify system, subsystem, and equipment to which the issue applies.
 - f. Identify location of system, subsystem, and equipment.
 - g. Include information that may be helpful in diagnosing or evaluating the issue.
 - h. Note recommended corrective action.
 - i. Identify commissioning team member responsible for corrective action.
 - j. Identify expected date of correction.
 - k. Identify person documenting the issue.
2. Documenting Issue Resolution:
- a. Log date correction is completed or the issue is resolved.
 - b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
 - c. Identify changes to the Contract Documents that may require action.
 - d. State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.
 - e. Identify person(s) who corrected or resolved the issue.
 - f. Identify person(s) documenting the issue resolution.
3. Issues Log Report: On a periodic basis, but not less than for each commissioning team meeting, CxA shall prepare a written narrative for review of outstanding issues and a status update of the Issues Log. As a minimum, CxA shall include the following information in the Issues Log and expand it in the narrative:
- a. Issue number and title.
 - b. Date of the identification of the issue.
 - c. Name of the commissioning team member assigned responsibility for resolution.
 - d. Expected date of correction.
- G. Commissioning Report: CxA shall document results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The Commissioning Report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the Contract Documents. The Commissioning Report shall include, but is not limited to, the following:
- 1. Lists and explanations of substitutions, compromises, variances in the Contract Documents, record of conditions, and if appropriate, recommendations for resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve as a future reference document during Owner occupancy and operation. It shall describe components and performance that exceed requirements of the Contract Documents and those that do not meet requirements of the Contract Documents. It may also include a recommendation for accepting or rejecting systems, subsystems and equipment.
 - 2. Commissioning Plan.
 - 3. Pre-Functional Performance Checklists.
 - 4. Functional Performance Test Checklists.
 - 5. Corrective modification documentation.
 - 6. Issues Log.
 - 7. Listing of off-season test(s) not performed and a schedule for their completion.

1.010 QUALITY ASSURANCE:

- A. Test Equipment Calibration: Comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.011 COORDINATION:

- A. Coordinating Meetings: CxA shall conduct coordination meetings of the commissioning team to review progress on the Commissioning Plan, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.
- B. Pre-Testing Meetings: CxA shall conduct pretest meetings of the commissioning team to review startup reports, pretest results, testing procedures, testing personnel and instrumentation requirements, and manufacturers' authorized service representative services for each system, subsystem, equipment and component to be tested.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 15995

SECTION 16000

GENERAL

1.01 CONTRACT DOCUMENTS:

- A. All work of Section 16 shall comply with the requirements of:
 - 1. General Conditions
 - 2. Supplementary General Conditions
 - 3. General Requirements
 - 4. Specifications
 - 5. Drawings
 - 6. Modifications incorporated in the documents before their execution.

1.02 WORK INCLUDED

- A. This Division of the specifications (16000) covers the complete interior and exterior electrical system for all work shown on the drawings as specified herein providing all material, labor and equipment required for the installation of the electrical systems complete and in operating condition.
- B. Include in the electrical work all the necessary supervision and the issuing of all coordinating information to any other trades who are supplying work to accommodate the electrical installations.

1.03 DRAWINGS

- A. The drawings for electrical work utilize symbols and schematic diagrams which have no dimensional significance. The work shall therefore, be installed to fulfill the diagrammatic intent expressed on the electrical drawings.
- B. Review architectural drawings for door swings, cabinets, counters, moldings and built-in equipment, conditions indicated on architectural drawings shall govern.
- C. Coordinate electrical work with the architectural details, floor plans, elevations, structural and mechanical drawings. Provide fittings, junction boxes and accessories to meet conditions.
- D. Do not scale drawings. Dimensions for layout of equipment, or spaces shall be obtained from architectural, structural or mechanical drawings unless specifically indicated on the electrical drawings.
- E. Discrepancies shown on different drawings, between drawings and specifications or between drawings and field conditions shall be promptly brought to the attention of the Architect.
- F. Provide as used on the drawings and in the specifications shall mean, furnish, install, connect, adjust and test.
- G. The drawings and specifications are complimentary and any work or material shown in one and omitted in the other, or described in the one and not shown in the other, or which may be implied by both or either, shall be furnished as though shown on both, in order to give a complete and first class installation.

1.04

SHOP DRAWINGS/ SUBMITTALS

A. General: The contractor shall provide a minimum of eight complete sets of submittal data for review. Submittal data shall be assembled in complete sets, by trade, in hard back three ring binders. Each submittal book shall include a numbered index sheet. All submittal data for one trade shall be submitted at one time unless unavailable information would delay job progress. Each manufacturer’s submittal sheet shall clearly indicate the model number, size, electrical characteristics, style, color, accessories, system, operation descriptions, etc. being submitted.

1. Equipment Power Supply and Wiring Requirements: The contractor shall submit for review a tabulated sheet of equipment power supply and wiring requirements for all mechanical equipment requiring power as specified in Division 15 of these specifications. Requirements shall be identified by horsepower or KW, operating amperage, required voltage and phase requirements, and manufacturer's suggested overcurrent circuit protection device size and minimum circuit ampacity size. Where the electrical requirements submitted for mechanical equipment differs from the branch circuitry shown on the electrical drawings, (when using the basis of design unit listed in the mechanical schedules/specifications or a similar unit of the same size from listed alternate manufacturers), the contractor shall make the necessary adjustments to the branch circuitry per the 2008 NEC at no additional cost to the owner. When changes are made to power requirements for equipment due to Owner/Architect/Engineer approved value engineering changes to equipment, this cost must be included in the value engineering overall change order cost. Costs due to adjustments in branch circuitry to equipment due to value engineering changes will not be allowed after the overall value engineering change order has been approved. In all cases, power and wiring requirements for mechanical equipment must be provided to the engineer before or at the same time as the shop drawings for the electrical distribution gear. In no case shall electrical distribution gear be ordered or branch circuitry roughed in prior to engineer review and comment on this document. Any equipment ordered or branch circuitry roughed in on the jobsite without this review and comment will be totally at the contractors risk. The Tabulation sheet submitted shall be in the following format:

EXAMPLE:

UNIT	MANUFACTURER	CONTRACT DOCUMENTS				CONFIRM	MECHANICAL SUBMITTAL		
		BKR	VOLT	PH	PANEL	MATCH	VOLTAGE	PH	MOC P
WHP-1	BARD S31H1	20/3	480	3	H2-2	<input type="checkbox"/>			
WHP-2	BARD S31H1	20/3	480	3	H2-8	<input type="checkbox"/>			
WHP-3	BARD S31H1	20/3	480	3	H2-14	<input type="checkbox"/>			
WHP-4	BARD S31H1	20/3	480	3	H2-20	<input type="checkbox"/>			

Identification of Submittal Books: Each submittal book shall indicate the Project Name and address, Architect and address, Engineer and address, Electrical Contractor and address, and any Sub-contractors and addresses.

- C. Review: The contractor shall review all submittal prior to submitting to ensure compliance with the contract documents. Comments made by the Architect do not relieve the contractor from complying with the contact documents (Drawings, Specifications, and Addenda). The purpose of the submittals is to demonstrate to the Architect that the contractor understands the design concept and that he demonstrates his understanding by indicating which equipment and materials he intends to furnish and install. When Shop Drawings are reviewed, some errors may be detected but others may be overlooked. This does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop

Drawings, the requirements of the Drawings and Specifications shall be followed and are not waived or superseded in any way by the Shop Drawing review. Any deviations from the contract documents shall be clearly stated on the submittal data. If not clearly stated the submittal shall be marked "Revised and Resubmit". Failure of the contractor to provide submittals during the submittal process shall make the contractor totally responsible for any and all changes to achieve compliance with the contract documents. Items on the submittal stamp are described as follows:

1. No Exceptions: Submittal reviewed and appears to be in compliance with the contract documents. Furnish as submitted.
 2. No Exceptions As Corrected: Submittal reviewed and appears to be in compliance with the contract documents except for items noted. Contractor shall insure noted corrections are incorporated into the equipment furnish to the project. No resubmittal required unless requested.
 3. Revise and Resubmit: Submittal reviewed does not comply with the contract documents. Contractor shall resubmit equipment to the Architect with additional information indicating compliance with the contract documents.
 4. Not Acceptable: Submittal for incorrect job or submittal damaged during shipment or delivery
- D. Submit information as required under SUBMITTALS, for each of the individual electrical sections of the specifications.
- E. Items to be submitted:
1. Equipment Power Supply and Wiring Requirements
 2. Panelboards/Switchboards and Transformers
 3. Layout of equipment in electrical room indicating NEC required clearances
 4. Fuses
 5. Conduit and Raceway
 6. Conductors and Cable
 7. Outlets and Boxes
 8. Wiring Devices
 9. Lighting
 10. Disconnect Switches
 11. Grounding Equipment and Materials
 12. Labeling Materials and Equipment
 13. Fire Alarm System
 14. Firestopping Materials
 15. Occupancy Sensors
 16. Contactors/Timeclocks
 17. Intercom System
 18. Intrusion Alarm System
 19. Emergency Generator System
- F. Data submitted shall contain all information required to indicate compliance with equipment specified. Submit field information drawings to explain fully all procedures involved in erecting, mounting and connecting all items of equipment which differ from that specified.

1.05

RECORD DRAWINGS:

- A. One complete set of electrical drawings shall be reserved for as-built drawings. Any approved deviation from the contract drawings shall be recorded on these drawings. Drawings shall be checked monthly for completeness.
- B. Completed as-built drawings shall be presented to the Architect prior to final inspection.

1.06**MAINTENANCE AND OPERATING INSTRUCTIONS:**

- A. Provide at the time of final inspection three sets of maintenance and operating instruction for:
 - 1. Switchboard, Lighting and Power Panelboards
 - 2. Fuses
 - 3. Wiring Devices
 - 4. Lighting Fixtures and Lamps
 - 5. Disconnect Switches
 - 6. Fire Alarm System
 - 7. Intrusion Alarm System
 - 8. CCTV System
 - 9. Emergency Generator
- B. Furnish a qualified and accredited factory trained technician to train personnel designated by the Owner in the proper operation and maintenance of specialized equipment.
- C. The issuing of operating instructions shall include the submission of the name, address, and telephone number of the manufacturer's representative and service company for each item of equipment so that service and spare parts can be readily obtained.

1.07**CODES AND PERMITS:**

- A. All electrical work shall meet or exceed the latest requirements of the following codes and/or other authorities exercising jurisdiction over the electrical construction work and the project.
 - 1. The National Electrical Code (NFPA 70) - 2008 Edition
 - 2. The National Electrical Safety Code (ANSI C-2)
 - 3. The Life Safety Code (NFPA 101)
 - 4. The International Building Code
 - 5. Regulations of the local utility company with respect to metering and service entrance.
 - 6. Municipal and State ordinances governing electrical work.
- B. All required permits and inspection certificates shall be obtained, and made available at the completion of the work. Permits, inspections, and certification fees shall be paid for as a part of the electrical work.

1.08**DEVIATIONS:**

- A. No deviations from the plans and specifications shall be made without the full knowledge and consent of the Architect or his authorized representative.
- B. Should the Contractor find at any time during progress of the work that, in his judgement, existing conditions make desirable a modification in requirements covering any particular item or items, he shall report such items promptly to the Architect for his decision and instruction.

1.09**COOPERATION:**

- A. This Contractor shall schedule his work and in every way possible cooperate with all other Contractors on the job to avoid delays, interferences, and unnecessary work. He shall notify them of all openings, hangers, excavations, etc., so that proper provisions shall be made for his work. This shall not relieve him of the cost of cutting, when such is required.

- B. This Contractor shall do all cutting and excavating necessary for the complete installation of his work, but he shall not cut the work of any other Contractor without first consulting the Architect. He shall repair any work damaged by him or his workmen, employing the services of the Contractor whose work is damaged.
- C. This Contractor shall by all means coordinate the location of ceiling lighting fixtures, both recessed and surface mounted, with the Ceiling Contractor so that proper hangers and supports shall be provided.
- D. Any conflict between electrical and other trades shall be reported before construction starts. No extra charges will be approved for work resulting from failure to coordinate with other trades.

1.10 INSTALLATION:

- A. Raceways, fixtures, devices, and other electrical equipment shall be installed in a neat and workmanlike manner and in accordance with recognized good practice for a first class installation.
- B. The Architect or his representative shall have the authority to reject any workmanship not complying with the contract documents.
- C. The Electrical Contractor shall personally or through an authorized licensed and competent electrician, constantly supervise the work from beginning to complete and final inspection.
- D. Electrical equipment shall be installed in accordance with manufacturer's recommendations.
- E. Locations of proposed raceway, riser, location of structural elements, location and size of chases method and type of construction of floors, walls, partitions, etc., shall be verified before construction starts.
- F. Consult owner and utility companies for underground lines before any underground work is started. Contractors shall be responsible for any damage.

1.11 EXCAVATION, TRENCHING AND BACKFILLING:

- A. General. The Contractor shall perform all excavation to install conduit structures and equipment specified in this Division of the Specifications. During excavation, materials for backfilling shall be piled back from the banks of the trench to avoid over-loading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and other excavations and water accumulating therein shall be removed by pumping. All excavations shall be made by open cut. No tunneling shall be done. All requirements of OSHA shall be complied with.
- B. Trench Excavation. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the conduit on undisturbed soil at every point along its entire length. Over depths shall be backfilled with loose, granular, moist earth, tamped. Removed unstable soil that is not capable of supporting the conduit and replace with specified material.
- C. Backfilling. The trenches shall not be backfilled until it is reviewed by the Architect or his representative. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, and gravel or soft shale, free from large clods of earth or stones, deposited in 6" layers and tamped until the conduit has a cover of not less than the adjacent existing ground but not greater than 2" above existing ground. The backfilling shall be carried on simultaneously on both sides of the trench so that conduit is

not displaced. The compaction of the filled trench shall be at least equal to that of the surrounding undisturbed material, except that trenches occurring under paved areas or in areas to be filled shall be backfilled in 6" maximum layers and each layer compacted to 95% maximum density. Settling the backfill with water will not be permitted. Any trenches not meeting compaction requirements or where settlement occurs shall have backfill removed down to the top of the conduit then backfill with approved materials as specified hereinbefore.

- D. Positively no tree roots are to be damaged, hand dig where required. Hand digging means no shovels or picks. Damaged trees or shrubbery shall be replaced in kind and must be approved by Engineer.

1.12

MATERIALS:

- A. Materials specified by manufacturer's name shall be used unless approval of other manufacturers are listed in addenda to these specifications.
- B. Drawings indicating proposed layout of space, all equipment to be installed therein and clearance between equipment shall be submitted, where substitution of materials alter space requirements on the drawings.
- C. Material Standards: All materials shall be new and shall conform to the standards where such have been established for the particular material in question. Publications and Standards of the organization listed below are applicable to materials specified herein.
 - 1. American Society for Testing and Materials (ASTM)
 - 2. Underwriter's Laboratories, Inc. (UL)
 - 3. National Electrical Manufacturer Association (NEMA)
 - 4. Insulated Cable Engineers Association (ICEA)
 - 5. Institute of Electrical and Electronic Engineers (IEEE)
 - 6. National Fire Protection Association (NFPA)
 - 7. American National Standards Institute (ANSI)
- D. Material of the same type shall be the product of one manufacturer.
- E. Materials not readily available from local sources shall be ordered immediately upon approval.
- F. The Architect shall have authority to reject any materials, or equipment, not complying with these specifications and have the Contractor replace materials so rejected immediately upon notification of rejection.
- G. Any material or equipment so rejected shall be removed from the job within 24 hours of such rejection; otherwise the Architect may have same removed at the Contractor's expense.

1.13

EQUIPMENT CONNECTIONS:

- A. All equipment requiring electrical power connections shall be connected under this Division of these specifications.
- B. Where electrical connections to equipment require specific locations, such locations shall be obtained from shop drawings.
- C. Drawings for location of conduit stub-up boxes mounted in wall or floor to serve specific equipment shall not be scaled.

- D. Electrical circuits to equipment furnished under other sections of these specifications are based on design loads. If actual equipment furnished has loads other than design loads electrical circuits and protective devices shall be revised to be compatible with equipment furnished at no additional cost to the Owner. Any revisions must have prior approval by the Architect. Before submitting shop drawings, Electrical Sub-Contractor shall along with the Mechanical Sub-Contractor review voltage and load requirements for mechanical and plumbing equipment to determine the compatibility between what is being furnished and what is shown in the contract drawings. The Electrical Sub-Contractor shall along with his submittals submit a statement that he has reviewed all shop drawings including review with the Mechanical and Plumbing Sub-Contractors.
- E. Where equipment is indicated to be served thru conduit stub-up, conduit shall be stubbed up not less than four inches above floor where transition shall be made to sealtite flexible conduit for connection to equipment.
- F. The Contractor's attention is invited to other Divisions of these specifications, where equipment requiring electrical service or electrically related work is specified to become fully aware of the scope of work required for electrical service or related work.
- G. Where electricity utilizing equipment is supplied separate from the electrical work, and is energized, controlled or otherwise made operative by electrical work, the testing to provide the proper functional performance of such wiring systems shall be conducted by the trade responsible for the equipment. The electrical work shall, however, include cooperation in such testing and the making available of any necessary testing or adjustments to the electrical equipment.
- H. Heating, air conditioning, and ventilating equipment is specified to be furnished and installed under other sections of these specifications. The controls likewise are specified to be furnished thereunder. All necessary wiring, wiring troughs and circuit breakers for power for this equipment shall be furnished and installed under this section of the specifications, in accordance with the plans and/or diagrams furnished with the equipment, or shown on these plans. Starters furnished by the Mechanical Contractor shall be installed under this Division of the specifications. Power wiring to auxiliary equipment on a piece of equipment remote from its main terminal box and interlocking of apparatus shall be accomplished under Heating Ventilating Equipment section of the specifications. Conduit and outlets for control wiring shall be furnished and installed under Division 15 of these specifications. Control conductors for mechanical equipment shall not be installed in same conduit with power conductors.

1.14

PRODUCT DELIVERY, STORAGE, HANDLING, & PROTECTION

- A. Inspect materials upon arrival at Project and verify conformance to Contract Documents. Prevent unloading of unsatisfactory material. Handle materials in accordance with manufacturer's applicable standards and suppliers recommendations, and in a manner to prevent damage to materials. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact. Containers which are broken, opened, damaged, or watermarked are unacceptable and shall be removed from the premises.
- B. All material, except items specifically designed to be installed outdoors such as pad mounted transformers or stand-by generators, shall be stored in an enclosed, dry building or trailer. Areas for general storage shall be provided by the Contractor. Provide temperature and/or humidity control where applicable. No material for interior installation, including conductors, shall be stored other than in an enclosed weather tight structure. Equipment stored other than as specified above shall be removed from the premises.

- C. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Conditions shall be those for which the equipment or materials are designed to be installed. Equipment and materials shall be protected from water, direct sunlight, cold or heat. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

1.15 CLEANING AND PAINTING

- A. Remove oil, dirt, grease and foreign materials from all raceways, fittings, boxes, panelboard trims and cabinets to provide a clean surface for painting. Touch-up scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, motor control center, switchboard or equipment enclosures with paint furnished by the equipment manufacturers specifically for that purpose.
- B. Do not paint trim covers for flush mounted panelboards, telephone cabinets, pull boxes, junction boxes and control cabinet unless required by the Architect. Remove trim covers before painting. Under no conditions shall locks, latches or exposed trim clamps be painted.
- C. Unless indicated on the drawings or specified herein to the contrary, all painting shall be done under the PAINTING Section of these Specifications.
- D. Where plywood backboards are used to mount equipment provided under Division 16, paint backboards with two coats of light grey semi-gloss paint.

1.16 GUARANTEE:

- A. All systems and component parts shall be guaranteed for one year from the date of final acceptance of the complete project. Defects found during this guaranteed period shall be promptly corrected at no additional cost to the Owner.

END OF SECTION 16000

SECTION 16010

PANELBOARDS

PART 1. GENERAL

1.01 WORK INCLUDED

- A. Distribution, lighting and receptacle power panelboards.
- B. Main Distribution Switchboard
- C. Switchboard Metering

1.02 SUBMITTALS

- A. Submit product data and complete shop drawings consisting of the following:
 - 1. Manufacturer's published literature on the panelboards including individual component information and information on the complete, assembled unit.
 - 2. Layout of electrical equipment in electrical rooms providing National Electrical Code required clearances.
 - 3. Bus short-circuit withstandability (RMS symmetrical amperes fault current rating) and withstandability of lowest rated device.
 - 4. Overall dimensions of panelboard and switchboards including space available for conduits and conductors.
 - 5. For the switchboards, submit complete drawing providing the following information: Complete rating, short-circuit with stand ability of bus and of lowest rated device, overall outline dimensions including space available for conduits, circuit schedule showing circuit numbers, device description, device frame ampere rating, feeder circuit identification, conductor ratings, and one line diagram with each circuit device numbered.

PART 2. PRODUCTS

2.01 PANELBOARDS

- A. Manufacturers: Acceptable manufacturers are Square D, General Electric, Cutler-Hammer, or Siemens.
- B. Panelboards shall be dead-front type, circuit breaker type panelboards. Panelboards shall be factory assembled equipped with thermal magnetic molded case circuit breakers with frame and trip ratings as shown or noted on plan.
- C. Circuit Breakers: Quick-make, quick-break, thermal magnetic molded case, trip indicating, and have internal common trip on all multi-pole circuit breakers. Circuit breakers shall be toggle operating, ambient compensated, and have bolted bus connections. All circuit breakers used at 120/208V shall have minimum interrupting capacity of not less than 10,000 A.I.C. symmetrical. (277/480 V - 14,000 AIC minimum). See drawings for AIC ratings.

- D. Bus Arrangement: Connections to branch circuit breakers shall be distributed phase sequence type. Three-phase, four-wire bussing shall be arranged so that any three adjacent single-pole circuit breakers are individually connected to each of the three different phases in such a manner that two or three-pole circuit breakers may be installed in any location. All bus assembly and other current-carrying parts shall be copper. Main circuit breakers shall have ratings as shown or noted on drawings. Provide grounding bus in all panelboards with lugs sized to accept all ground conductors required.
- E. Boxes: Boxes shall not have concentric knockouts pre-punched by the manufacturer. Boxes shall be general purpose, NEMA 1, minimum 20 inches wide by 5-3/4 inches deep. Boxes shall be constructed of galvanized National Electrical Code gauge steel. Side and end wire gutters shall be 4 inches minimum or as required by the National Electrical Code.
- F. Panelboard Front Covers: Front covers shall be standard type. Front covers shall be flush or surface type as shown or noted, constructed of National Electrical Code gauge steel and painted with a rust inhibitive primer and factory finished with manufacturer's standard light gray enamel. Interior trim shall have adjustable clamps and shall be complete with no open sections over circuit breaker spaces on flush mounted panelboards. Trim clamps and hinges shall be concealed. A steel frame for the panelboard circuit breaker index (directory) shall be provided inside door.

PART 3. EXECUTION

3.01 PANELBOARD INSTALLATION

- A. Furnish and install factory assembled panelboards as specified herein and as shown on the drawings.
- B. Install panelboards with top of panelboards 6 feet A.F.F. unless otherwise noted or required to avoid conflicts with other equipment. For panelboards with box dimensions too tall for this arrangement, mount the panelboard so that the operating handle of the uppermost circuit breaker or switch does not exceed 6 feet A.F.F. However, a minimum of 6 inches A.F.F. must be maintained for all boxes.
- C. Provide plywood backboard behind all surface panelboards and concrete housekeeping pads below surface panelboards to protect and enclose conduits extending up from floor.
- D. Panelboard circuit breaker numbering shall start at the top with odd numbered circuit breakers down the left side in sequence and even numbers down the right side.
- E. Wiring in panelboards shall be grouped in an orderly manner and secured with ty-wraps.
- F. No splices are allowed in panelboards. Panelboards shall not be used as junction boxes or wireways.
- G. Furnish and install a factory assembled switchboard as specified herein and as shown on the drawings.

31.03 TESTING

- A. Continuity tests and short circuit testing at 1KV shall be conducted on all panel, switchboard and feeder installations prior to closing breakers and applying power.

END OF SECTION 16010

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SECTION 16015

FUSES

1.01 SUBMITTALS

- A. Shop drawings shall be submitted and shall consist of manufacturer's published literature and technical data sufficient for the engineer to determine whether system function will be adversely affected, whether proposed fuses meet this specification, and whether they are equal in quality.

1.02 MANUFACTURERS

- A. Acceptable manufacturers are:
1. Littelfuse
 2. Cefco
 3. Gould - Shawmut

1.03 EQUIPMENT/MATERIAL

- A. All fuses rated 600 volts or less and used for main, feeder, or branch circuit protection with 200,000 ampere interrupting rating and shall be so labeled. Fuse classes and sizes indicated on the drawings have been selected to provide a fully coordinated selective protection system. To maintain this design, all fuses provided shall be furnished by the same manufacturer. Should equipment provided require a different U.L. Class or fuse size, the engineer shall be furnished with sufficient data to ascertain that system function will not be adversely affected.
- B. Current-Limiting Fuses 601-6000 Amperes
- Fuses rated over 600 amperes shall be U.L. Class "L" fuses, and shall have a minimum time delay of 10 seconds at 500% rating.
- C. Current-Limiting Fuses 600 Amperes or Less
- All fuses 600 amperes and below shall be true dual-element time delay fuses with separate spring-loaded thermal overload elements in all ampere ratings. All ampere ratings shall be designed to open at 400 degrees Fahrenheit or less when subjected to a non-load oven test. To eliminate induction heating, all fuse ferrules and end caps shall be non-ferrous and shall be bronze or another alloy not subject to stress cracking.
- D. Spare Fuses
- At the time of final acceptance, the contractor shall furnish the owner's representative, not less than three (3) spare fuses of each size and type installed. Spare fuses at main switchgear are not required.

END OF SECTION 16015

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SECTION 16020

RACEWAYS

1.01 SUBMITTALS

- A. Submit manufacturer's literature for each type of conduit or tubing and fittings used in the project.

1.02 MANUFACTURERS

- A. Acceptable manufacturers of rigid steel and electrical metallic tubing conduit are:

1. Allied Tube and Conduit Co.
2. Wheatland Tube Co.
3. Triangle
4. L.T.V.
5. American Brass
6. E.T.P.
7. Robroy

- B. Acceptable manufacturer's of polyvinyl chloride (PVC) conduit are:

1. Certainteed
2. Georgia Pipe
3. Carlon
4. Can-Tex
5. Queen City

- C. Acceptable manufacturer's of conduit fittings, bushings, and locknuts are:

1. O-Z/Gedney
2. Thomas and Belts
3. Raco

1.03 MATERIALS

- A. All metallic conduit and electric metallic tubing shall be steel, of standard pipe dimensions, smooth inside and out, and shall be galvanized. Where the word "conduit" is used hereinafter it shall mean either rigid steel conduit, electric metallic tubing, flexible steel conduit, liquid tight flexible steel conduit or schedule 40 plastic conduit. Intermediate grade conduit is not acceptable.
- B. Galvanized rigid steel conduit shall be used in all areas where it will be exposed to physical damage. Schedule 40 plastic conduit shall be used underground and in slab-on-grade. In no case shall plastic conduit be above slab; switch to rigid steel conduit when turning up above slab (including elbow). All other conduit, unless otherwise specified or called for on the plans, may be galvanized electric metallic tubing. Any exposed conduit on exterior of the building shall be galvanized rigid steel.
- C. Plastic conduit shall be made from virgin polyvinyl chloride C-300 compound. Conduit and fittings shall carry a UL label. Fitting and cement shall be produced by the same manufacturer as the conduit to assure system integrity.
- D. All conduit shall be concealed in building construction except as noted or shown otherwise. In areas with no finished ceiling and where conduit is run exposed all runs down to switches,

receptacles, etc. shall when possible be concealed in wall. It is the intent of these specifications that all conduit will be concealed whenever possible.

- E. EMT fittings shall be compression or tap-on type made of steel for sizes two inches or smaller, steel set screw type fittings may be used on sizes 2 1/2" or larger. Connectors and couplings shall be rain tight and shall have a nylon insulated throat. All fittings shall be "UL" approved. Die cast, and indenter type fittings are not acceptable. Fittings for flexible steel conduits and liquid tight flexible conduit shall be steel and have nylon insulated throat. All rigid steel conduit E.M.T. or flexible steel conduit 1" or over shall terminate using insulated grounding bushing similar and equal to O-Z/Gedney type BLG, bushings shall be steel, zinc coated with copper saddle.
- F. Rigid steel conduit and EMT shall be not less than 1/2 inch trade size, schedule 40 plastic conduit shall not be less than 3/4" trade size and not less than required by the NEC or indicated. However, where permitted by the NEC, smaller size flexible metal conduit may be used only for individual lighting fixtures. Conduit runs with more than 5 #12 conductors shall not be less than 3/4".
- G. Conduit and EMT systems indicated on the drawings for communication and signaling systems are for typical systems. Install conduit and EMT systems for the system being installed.
- H. Connect individual recessed lighting fixtures to the conduit or EMT system with "maximum 6'-0" flexible, galvanized steel conduit. Use liquid-tight flexible jacketed metal conduit for final connection to all rotating equipment and transformers. The flexible conduits shall be long enough to permit the full range of required movements without strain and to prevent the transmission of vibration. Do not utilize flexible conduit to loop between fixtures and devices. Length of flexible conduit shall be kept to a maximum of 4' or less.
- I. Galvanized rigid steel conduit couplings and connections:
 - 1. Install standard, conduit-threaded fittings.
 - 2. Ream the ends of conduits after cutting and threading them.
 - 3. For connection to sheet metal boxes, cabinets and other sheet metal enclosures, install locknuts on the inside and outside of the enclosure for each connection. See Section 16110 of these specifications.
- J. EMT couplings and connectors:
 - 1. Ream the ends of EMT after cutting them.
 - 2. Install the following threadless type fittings:
 - a. Connectors: steel compression type with insulated throat or steel tap-on type with insulated throat.
 - b. Couplings: steel compression or tap-on type.
- K. Installation of plastic conduit:
 - 1. Shall be installed in complete accordance with manufacturer's recommendations.
 - 2. Shall be a minimum of 2'-0" below finished grade when not covered by concrete.
 - 3. Shall have properly sized bond wire installed with all circuits.
 - 4. Bends and turns shall be kept to a bare minimum.
 - 5. Extreme care shall be taken to avoid crushing or cracking conduit. "DO NOT" run vehicles over exposed conduit under any conditions.
 - 6. All conduit and fittings shall be solvent welded.

7. Do not install conduit in slab. All conduit shall be installed a minimum of 6" below slab. Conduits shall not be bunched together. Maintain 1" clearance between conduits.
- L. Insulated bushings:
1. Install nylon insulated bushings on the end of all rigid conduit.
 2. The insulating material shall be designed for rugged, long service.
 3. Bushings which consist of only insulating material will not be accepted.
 4. Fittings which incorporate insulated bushings will be considered for approval in lieu of fittings with separate bushings.
- M. All couplings and connections in location where water or other liquid or vapor might contact the conduit and EMT shall also be watertight.
- N. Close empty conduit and EMT as complete runs before pulling in the cables and wires.
- O. Install exposed conduit and EMT parallel to or at right angles with the lines of the building. Locate them so they will not obstruct headroom or walkways or cause tripping.
- P. Avoid bends or offsets where practicable:
1. Do not install more bends, offsets or equivalent in any conduit or EMT run than permitted by the NEC.
 2. Make bends with standard conduit bending machines.
 3. Conduit hickies may be used for making slight offsets and for straightening conduits tubbed out of concrete.
 4. Conduit or EMT bent with a pipe tee or vise will not be accepted.
 5. Do not install crushed or deformed conduits or EMT.
- Q. Install conduit or EMT clamps:
1. At intervals as required by the NEC.
 2. Above suspended ceilings, metal supports may be installed as permitted by the NEC, except that conduit cannot be supported or secured to the T-bar grid or from the wire supporting the T-bar grid.
 3. Trapeze, split ring, band or clevis hanger may be installed as permitted by the NEC. Trapeze hangers shall be structural metal channels, angle irons or preformed metal channel shapes with the conduit and EMT runs held on specific center by U bolts, clips or clamps. Do not support conduit from ceiling suspension wire or from other conduit.
 4. Chain, wire or perforated strap supports will not be acceptable. Nor are they acceptable as a means of securing the conduit.
 5. Fasten the clamps and other supports as follows:
 - a. For new masonry or concrete structures, install threaded metal inserts prior to pouring the concrete.
 - b. For existing solid masonry or reinforced concrete structures:
 1. Install expansion anchors and bolts or approved power-set fasteners.
 2. Expansion anchors and bolts shall be not less than 1/4 inch diameter and shall extend not less than 3 inches into the concrete or masonry.
 3. Power-set fasteners shall be not less than 1/4-inch diameter and shall extend not less than 1-1/4-inch into the concrete.

- c. For hollow masonry install toggle bolts. Bolts supported only by plaster will not be accepted.
 - d. For metal structures install machine screws.
 - e. Attachments to wood plug, rawl plug, soft metal insert or wood blocking will not be permitted.
- R. For vertical runs of conduit of EMT:
- 1. Install supports for conduit, EMT, cables and wires at intervals as required by the NEC and as indicated on the drawings.
 - 2. Conduit and EMT supports shall be supported by framing for the floors.
- S. Conduits and EMT shall be kept 6" away from parallel runs of steam or hot water pipes.
- T. Clogged raceways shall be entirely free of obstructions or shall be replaced.
- U. Rigid steel conduit installed underground and in concrete shall be coated with scotchrap pipe primer and then wrapped with two layers of scotchrap 50 and 51 corrosion protection tape.
- V. All empty conduit shall have nylon pull cord installed to provide for installation of cables, conductors or wiring.
- W. Do not combine conduit homeruns. Each homerun shall be separately routed directly to panel unless specifically noted otherwise.
- X. Rigid steel conduit installed underground and in concrete shall be coated with scotchrap pipe primer and then wrapped with two layers of scotchrap 50 and 51 corrosion protection tape (Bituminous paint, two layers, is acceptable).
- Y. All empty conduit shall have 200 lb. rated nylon pull cord installed to provide for installation of cables, conductors or wiring. Provide cap and label for each end identifying termination location of other end.
- Z. Do not combine conduit homeruns. Each homerun shall be separately routed directly to panel unless specifically noted otherwise.
- AA. Cut clean and remove rough edges from all threads. Running threads are not acceptable. Rust inhibitive coating shall be applied to all exposed threads.
- AB. All fire alarm systems branch circuits shall be provided in GRS, IMC, or EMT as locations required.
- AC. At motor connections where GRS or IMC conduit cannot be attached to building within 18 inches of motor for liquid-tight flexible metal conduit transition, provide a minimum 3/4 inch vertical conduit attached to ceiling and floor from top and bottom of cast junction box. Locate cast junction box within 18 inches of motor and provide transition to liquid-tight flexible conduit with condulets.
- AD. Provide expansion fittings at all expansion joints.
- AE. Cap all conduits exposed during construction to prevent entrance of water or debris.

AF. Seal all conduits:

-46039966. Routed from interior to exterior of building.

-46039965. Routed from exterior to interior of refrigerated spaces.

Fill conduit ends with duct seal at nearest conduit termination inside building or outside refrigerated spaces. Seal conduit inside refrigerated spaces with white Permagum.

AG. In masonry walls, conduit shall not be routed horizontally. In wood or metal stud walls, conduit shall not be routed horizontally more than 1 foot. Exposed conduit shall be routed parallel or at right angles to building lines.

AH. No consolidation of homeruns is permitted.

AI. All conduits shall be routed clear of ductwork and piping.

AJ. Conduit runs shall be firmly anchored within 3 feet of any change in direction and at intervals not to exceed 8 feet. Straps and clamps designed specifically for the conduit system shall be used. (Nails are not acceptable.) Conduit may not be supported by piping, ductwork, ceiling grids, or ceiling grid hanger wire.

AK. Multiple parallel runs shall be supported by trapeze type assemblies constructed of all-thread support rods and unistrut with conduit clamps. Support rods shall not extend below trapeze more than 3/4 inch.

AL. See specification Section "Supporting Devices" in this electrical specification for anchors and support methods.

AM. Where conduits penetrate fire rated walls, ceilings, floors, or partitions, provide firestopping according to specification Section "Firestopping" in this electrical specification.

END OF SECTION 16020

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SECTION 16025

ENCLOSED CIRCUIT BREAKERS

PART 1. GENERAL

1.1 WORK INCLUDED: ENCLOSED CIRCUIT BREAKERS.

1.2 SUBMITTALS:

- A. Submit product data consisting of manufacturer's published literature and as specified in Section 16000 for enclosed circuit breakers..

PART 2. PRODUCTS

2.1 ENCLOSED CIRCUIT BREAKERS:

- A. Manufacturers: Acceptable manufacturers are Square D, General Electric, and Cutler Hammer.
- B. Enclosures: Heavy duty type, NEMA 1 general purpose enclosures indoors, NEMA 3R enclosures where noted or shown on drawings or exposed to weather.
- C. Handle Mechanism: Must be non-teasible, positive, quick-make, quick-break, must remain in positive contact with the circuit breaker handle at all times, and must be configured to allow padlocking in the "OFF" position.
- D. Circuit Breaker: Shall be molded case type and shall have minimum interrupting capacity of 14,000 amperes symmetrical at 208/120 volts and 22,000 ampers symmetrical at 480/277volts.

PART 3. EXECUTION

3.1 ENCLOSED CIRCUIT BREAKER INSTALLATION:

- A. Furnish and install factory assembled enclosed circuit breakers as specified herein and as shown on the drawings.
- B. Install enclosed circuit breaker in accordance with Article 110-26 of the National Electrical Code.
- C. Provide a plywood backboard behind all enclosed circuit breakers, identification nameplate, and concrete curb for all bottom fed conduits entering up from floor.

END OF SECTION 16025

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SECTION 16030

CONDUCTORS

1.01 SUBMITTALS

- A. Shop drawings shall be submitted and shall consist of manufacturer's published literature.

1.02 MANUFACTURERS

- A. Acceptable manufacturers are:
- | | |
|-------------|----------------|
| 1. General | 6. Cyprus Rome |
| 2. Okonite | 7. Essex |
| 3. Senator | 8. Carol |
| 4. Triangle | 9. Southwire |
| 5. Pirelli | 10. American |
- B. All wiring shall be manufactured in the United States.

1.03 MATERIALS

- A. Ratings and sizes:
1. Shall be not less than indicated on the drawings and not less than required by the NEC.
 2. Minimum size shall be No. 12 AWG copper provided the maximum voltage drops in the control circuits will not adversely affect the operation of the controls.
 3. Conductor sizes indicated on the drawings are for copper conductors.
- B. Conductors and ground wires:
1. Shall be copper.
 2. Size No. 8 AWG and larger shall be stranded.
 3. Size No. 10 AWG and smaller shall be solid.
- C. Conductor insulation:
1. Conductor insulation shall be the NEC type THHN for sizes No 10 and smaller and XHHW for sizes No. 8 and larger. Under no circumstances shall asbestos insulation be used.
- D. Wire shall be factory color coded in size No. 10 and smaller. Color shall be by integral pigmentation with a separate color for each phase, neutral and grounding conductor. Color code per phase shall be continuous throughout the project.
- E. Manufacturer's name and other pertinent information shall be marked or molded clearly on the overall jacket's outside surface or incorporated on marker tapes within the cables and wires at reasonable intervals along the cables and wires.
- F. Cables and wires indicated on the drawings for communication and signaling systems are for typical systems. Install cables and wires for the system being installed.
- G. All wiring shall be in conduit unless specifically noted otherwise.
- H. Every coil of wire shall be in the original wrapping and shall bear the Underwriters' Label of approval.

I. Where wires are left for connection to any fixture or an apparatus, spare wire or cables shall be provided at the ends for connections. Fixture connections at the outlet box shall be made with insulated wire connectors.

J. Outer jackets shall be color coded as follows:

1. Three phase or single phase circuits, 120/208 volts:

- a. Phase A - Black
- b. Phase B - Red
- c. Phase C - Blue
- d. Neutral - White
- e. Insulated ground wire - Green
- f. Isolated ground wire - Green with Yellow tracer.

Note: Where dedicated neutrals are used for receptacle circuits. Outer jacket shall be white with appropriate colored tracer (i.e. white with red tracer, white with blue tracer, white with black tracer).

2. Three phase or single phase circuits, 480/277 volts:

- a. Phase A - Brown.
- b. Phase B - Orange.
- c. Phase C - Yellow.
- d. Neutral - Gray.
- e. Insulated ground wire - Green.

3. Only for large power cables and wires which do not have color coded jackets: No. 8 and larger.

- a. Install bands of adhesive non-fading colored tape or slip-on bands of colored plastic tubing over the cables and wires at their originating and terminations points and at all outlets of junction boxes.
- b. Color shall be permanent and shall withstand cleanings.

K. Wiring for signal circuits shall conform to the recommendations of manufacturers of the signal system being installed so the system shall have optimum performance and maximum service continuity. Communication and signaling circuit wiring where run in conduit below grade or in a damp location shall be listed for use in a damp or wet location. Communication and signaling circuits run exposed above ceiling in an environmental return air plenum area shall be rated for plenum use.

L. No circuit wiring shall be smaller than number 12. Where the homerun exceeds 80'-0" in length, number 10 (minimum) wire shall be used even though all such circuits are not indicated on the plans. All wiring for emergency branch circuits shall be number 10 (minimum) unless noted otherwise.

M. When installing THHN extra care must be exercised so as not to damage nylon jacket. When nylon jacket is damaged wiring shall be removed from service.

END OF SECTION 16030

SECTION 16040

OUTLETS

1.01 SUBMITTALS

- A. Shop drawings shall be submitted and shall consist of manufacturer's published literature.

1.02 MANUFACTURERS

- A. Acceptable manufacturers are:

1. Raco
2. Steel City
3. Appleton
4. Hubbell

1.03 MATERIALS

- A. Boxes shall be galvanized pressed sheet steel for all concealed work.
- B. Where conduit runs are exposed, outlet shall be of the cast metal type.
- C. For concealed work each box shall be provided with a square cornered plaster ring.
- D. Each surface lighting fixture, receptacle and switch shall be provided with flush mounted outlet box. All outlets installed in panels and other architectural features shall be centered. The location of any outlet may be moved as much as 10'-0" by the Architect before the outlet is placed without incurring any extra cost. All dimensions refer to the finished floor line. Outlet boxes shall be pressed sheet steel and shall be galvanized for all concealed work. Where conduit runs are exposed outlets shall be of the cast metal type.
- E. Boxes shall be for the service and the type of outlet and shall not be less than 4" square and 1-1/2" deep except where otherwise specified. Boxes installed in walls shall be provided with a square cornered 1-1/2" plaster ring installed flush with surface of wall. Each outlet box above ceiling shall be supported from a structural member of the building either directly or by using a substantial and approved metal support. Conduit is not an approved means of support. Boxes installed in wall shall be supported either directly to a stud or between studs utilizing an approved bar hanger. In no case shall switch box support and clips used for mounting boxes in old work be used unless specifically called for. Top of outlet box shall be level.
- F. All ceiling or wall recessed outlet boxes or their associated plaster rings shall be flush with the finished surface. Using coverplate to secure wiring devices or shimming the device is not acceptable. Contractor shall exercise due care when cutting opening in walls or ceilings for outlet boxes so that opening size will permit the proper installation of boxes and devices. Fixture studs in ceilings and bracket outlets shall be bolted with stove bolts or shall be locking type of stud mounting.
- G. In addition to boxes indicated, install enough boxes to prevent damage to cables and wires during pulling-in operations.
- H. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.

- I. "There shall be no outlets installed back to back. A minimum of 4" shall separate each outlet."
- J. Where the volume allowed per conductor exceeds that allowed in Table 370-6(b) of the NEC for the minimum size outlet specified, a larger size outlet box shall be used and shall be sized in accordance with the table noted above.
- K. Outlet boxes shall be clean and free from dust, paint, dirt, plaster ready mix joint compound and /or any other debris.
- L. Floor boxes shall be:
 - 1. Steel City 665 Series or Walker RFB-4 concealed service floor box and hinged service top, 126 cubic inch total capacity.
 - 2. Each box shall be equipped with 2-duplex receptacles, and provision for two low tension devices. Prior to purchasing plates for computer outlets in floor box, coordinate type required with Data Network Sub-Contractor.
 - 3. Color of service top shall be as selected by the Architect.
 - 4. Coordinate installation of floor covering with General Contractor

END OF SECTION 16040

SECTION 16050

WIRING DEVICES AND DEVICE PLATE

1.01 SUBMITTALS

- A. Submit product data under provisions of Section 16000, GENERAL.
- B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

1.02 REFERENCES

- A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
- B. FS W-S-896 - Switch, Toggle.
- C. NEMA WD 1 - General-Purpose Wiring Devices.
- D. NEMA WD 5 - Specific-Purpose Wiring Devices.

1.03 MANUFACTURERS

- A. For the purpose of selecting quality and type of device, equipment manufactured by Arrow Hart has been specified. The following manufacturers meeting this specification are acceptable:
 - 1. Leviton
 - 2. Pass and Seymour
 - 3. Hubbell
 - 4. G.E.
 - 5. Bryant

1.04 PRODUCTS

- A. Switches: All wall switches shall be rated 20 ampere, 120/277 volts, have self grounding provisions, side wiring only and shall be of the silent type. Color shall be gray, except switches on emergency power shall be red.
 - 1. Single pole: Arrow Hart 1221.
 - 2. Double pole single throw: Arrow Hart 1222.
 - 3. Three way: Arrow Hart 1223.
 - 4. Four way: Arrow Hart 1994.
 - 5. Key switch single pole and three-way: Arrow-Hart 1191 and 1193 with 1187 cover plate, or Pass and Seymour equal. Key switches shall be cylinder type all keyed alike.
 - 6. Single pilot light handle: Arrow Hart 1991 PLC.
- B. Receptacle: All receptacles shall be of the grounding type, of the configuration shown on the drawings and shall be flush wall mounting type. Color shall be gray, except isolated ground receptacles shall be orange, and emergency shall be red.
 - 1. Standard duplex receptacle: 20 ampere, 125 volt, NEMA type 5-20 R, 2 pole, 3 wire, straight blade, U-grounding slot, specification grade. Arrow Hart 5342.

2. Power, receptacle with matching plug: 20 ampere, 125/250 volt, NEMA type 14-20, 3 pole 4 wire grounded, straight blade type. Arrow Hart 5759
 3. Power receptacle with matching plug: 20 ampere, 250 volt, NEMA type 6-20R 2-pole, 3 wire grounded, straight blade type. Arrow Hart 5461 GRY.
 4. Power receptacle with matching plug: 30 ampere, 250 volt, NEMA type 6-30R 2-pole, 3 wire, u-grounded slot, straight blade type. Arrow Hart 5700 N.
 5. Power receptacle with matching plug: 50 ampere, 125/250 volt, NEMA type 14-50R, 3-pole, 4 wire grounded, straight blade type. Arrow Hart 5754 N.
 6. Ground fault interrupter receptacle: 20 ampere, 125 volts, NEMA type 5-20R, 2-pole, 3-wire with grounded U slot. Arrow Hart AHGF 5342.
- C. Device plates: Plates shall be furnished for all devices and outlets indicated on the drawings (telephone, computer, TV, etc.). All plates on masonry walls shall be oversized jumbo type.
1. Flush mounted plates: Beveled type with smooth rolled outer edge, stainless steel type 302 with brushed finish.
 2. Surface box plates, beveled, galvanized steel, pressure formed for smooth edge to fit box.
 3. Weatherproof plates: Reddot CKMGV.

1.05

INSTALLATION

A. Switches:

1. Switches shall be connected to the live side of the circuit and shall control only the outlets indicated.
2. Conductors shall be looped around the terminal screw.
3. Where more than one switch is indicated in the same location switches shall be gang mounted under a common plate.
4. Where multi-wire, 277 volt switching (480 volt potential) occurs, a barrier shall be provided between switches.
5. Center line of switches in general, shall be set 3'-6" above the floor (off position down) and shall clear the door trim or corner by 4" or center the space occupied.
6. Architectural plans shall be consulted before placing switches so they will in every case be located on the strike side of the door and clear door, chair, window, and baseboard moldings.
7. Switches shall be screwed tight to the boxes and shall not depend on the cover plate to pull them tight.

B. Receptacles:

1. Conductors shall be looped around the terminal screws, "DO NOT BACK WIRE DEVICES."

2. Receptacles shall be grounded by the green wire bond and shall be pigtailed as shown on the drawings.
3. Receptacles shall be screwed tight to the plaster ring or outlet box and shall not depend on the device plate to pull them tight.
4. Center line of general use receptacles shall be in general, set 18" above the floor with receptacle mounted in the vertical position and with grounding pole at the top.
5. Coordinate receptacle height with Architectural drawings and locate so that bottom of receptacle plate shall be 1" above counter or back splash and clear all moldings.
6. Center line of receptacles located adjacent to lavatories in toilets shall be set 3'-6" above floor.
7. Receptacles serving water coolers shall be located within cooler housing or as close to bottom of housing as possible. Cord serving unit shall be as short as possible. In no case shall cord or receptacle be seen from normal viewing angle.
8. All receptacles installed in bathrooms, toilets, within 4 feet of lavatories or sinks or on building exterior shall be ground fault circuit interrupter type.

C. Plates:

1. Plates shall be level and all edges shall be in full contact with wall.
2. Plates shall be furnished for all devices and other outlets indicated on the drawings.
3. Install plates on outlet boxes and junction boxes in unfinished areas above ceilings and on surface mounted outlets.
4. Plates shall not be used to keep devices secure.
5. Plates shall be clean and free from dust, plaster or paint and spots.
6. Plate shall cover openings around outlets.

END OF SECTION 16050

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SECTION 16060

LIGHTING FIXTURES AND LAMPS

1.01 SUBMITTALS

- A. Lighting fixture submittals shall consist of manufacturer's literature including photometric data and shall note on the submittals any special requirements which have been specified.
- B. The Architect reserves the right to require sample fixtures for approval.
- C. "Manufacturer's literature for all lamps."

1.02 MANUFACTURERS

- A. Lighting fixtures shall be selected from those fixtures included in the fixture schedule as noted on the drawings or in the specifications.
- B. Lamps:
 - 1. Sylvania
 - 2. Phillips
 - 3. General Electric

1.03 EQUIPMENT

- A. Review architectural plans and specifications and provide lighting fixtures compatible with ceiling suspension system specified.
- B. Fixtures shall be selected from the fixture schedule not only by catalog number but with consideration to mounting, number and types of lamps, and reference notes as contained in the fixture schedule and as noted on the drawings and in the specifications.
- C. Fluorescent ballast shall be electronic type as manufactured by Motorola, Advance, General Electric or Magnetek. Ballast shall have five year warranty, total harmonic distortion of less than 20%. Ballast shall be instant start and parallel lamp operation.
- D. Support of lighting fixtures shall be the responsibility of the fixture installer and shall be as follows:
 - 1. Fluorescent fixture flush mounted in exposed tee, suspended acoustical tile ceilings shall be of the lay-in type and shall be supported at diagonal corners of the fixture, utilizing two (2) #14 gauge steel wires attached to the bar joist or overhead structure. Flexible conduit and wiring from outlet box to fixture shall be 1/2"C., and number 12 THHN conductors, factory supplied whips of smaller ratings are not acceptable.
 - 2. Surface mounted fluorescent fixtures shall be supported by light weight channel attached by nylon tie straps to two members of the ceiling suspension system. Two support channels are required. Surface mounted fixtures mounted on sheet rock or plaster ceilings or low density acoustical tile ceilings shall be mounted with two 1/4" x 1/4" x 4" metal spacers between fixture and ceiling. Spacers shall be located to provide air gap between fixture and ceiling. Do not place spacers directly over ballast.
 - 3. Recessed incandescent, mercury vapor, high pressure sodium, and metal halide fixtures shall be installed using standard manufacturer's mounting hardware.

4. Exit lights shall be mounted directly to the outlet box and in case of ceiling mounted units the outlet box shall be flush with the ceiling and shall be supported by a 1-1/2" channel spanning between main structural members of the suspension system. Secure the channel with nylon ty-wraps.
 5. Provide five exit lights in addition to those shown in the event the Fire Marshall requires additional units provide additional 100' conduit and conductors and labor for installation. Turn over to the Owner any exits not used.
- E. Align, mount and level the lighting fixtures uniformly.
- F. Avoid interference with and provide clearance for equipment.
- G. Lighting fixtures shall be located as shown on the lighting plan. If for any reason this is impossible or impractical, the Architect shall be notified immediately for a decision as to the best direction for the shift.
- H. Upon completion of installation, lighting fixtures and equipment shall be in first class operating order, in perfect condition as to finish, free from defects. At final inspection, fixtures shall be completely lamped, be complete with required diffusers, reflectors, side panels, louvers or the other components necessary to complete fixtures. All fixtures and equipment shall be clean and free from dust, insects, plaster or paint spots. Any reflectors, diffusers, side panels or other parts broken prior to final inspection shall be replaced by contractor.
- I. Lamps shall be provided for all fixtures:
1. Incandescent lamps shall be medium base, inside frost extended service (minimum 2500 hours).
 2. 48" fluorescent lamps shall be 32 watt T8 4100E K.
 3. Metal halide lamps shall be mogul base, of the wattage called for in the fixture schedule and shall be of the coated type.
 4. High pressure sodium lamps shall be mogul base, of the wattage called for in the fixture schedule and shall be of the diffuse type.
- J. Fixtures shall comply with the lighting standards for Georgia Public Schools, dated August 1983. Contractors shall take particular note of item 7, Brightness levels, and item 8, Fluorescent luminaries.

END OF SECTION 16060

SECTION 16070

DISCONNECT SWITCHES

1.01 SUBMITTALS

- A. Shop drawings shall be submitted and shall consist of manufacturer's published literature.

1.02 MANUFACTURERS

- A. Acceptable manufacturers are:
 - 1. Square "D" Company
 - 2. G. E.
 - 3. I.T.E.
 - 4. Cutler Hammer

1.03 EQUIPMENT

- A. Disconnect switches shall be provided for all motors and strip heaters located out of sight of motor controller, and where specifically indicated on the drawings. Disconnect switches shall disconnect all ungrounded conductors. When exposed to weather, enclosure shall be NEMA - 3R. Switches shall be installed to be fully accessible in accordance with Article 110-16 of the National Electrical Code.
- B. All disconnects shall be heavy duty type and shall be equipped with neutral bar bonded to the can for grounding purposes.
- C. For single phase motors, a single - or double-pole toggle switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125 percent of the motor rating. Enclosed safety switches shall be horsepower rated in conformance with Table III of Fed. Spec. W-D-865. Switches shall disconnect all ungrounded conductors.
- D. Each disconnect serving exterior A/C units shall be equipped with a padlock (Master 3206) all keyed alike.
- E. All disconnects shall be equipped with provisions to lock the handle in the OFF position.
- F. All disconnects serving heat pumps, A/C units and refrigeration compressors shall be fused in accordance with the name plate data on the unit.
- G. Install fuses so that ampere rating can be read without having to remove fuses.
- H. All fuses shall be as noted in Section 16015.
- I. Disconnects shall be identified as required under Section 16120.
- J. Maintain 3'-0" clearance in front of disconnect having voltage rating of 250 volts and 4'-0" clearance in front of disconnect having voltage rating of 480 volts. Do not locate disconnect over other electrical equipment (re: transformers).

END OF SECTION 16070

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SECTION 16080

DRY TYPE TRANSFORMERS

1.01 SUBMITTALS

- A. Shop drawings shall be submitted and shall include as a minimum the following information:
1. Ratings, voltage and KVA
 2. Sound rating
 3. Taps
 4. Temperature rise
 5. Overload capacity and efficiency at 25%, 50% and 100% load.
 6. Physical dimensions and new weight.

1.02 MANUFACTURERS

- A. Acceptable manufacturers are:
1. General Electric Company
 2. Square "D" Company
 3. Siemens
 4. Cutler Hammer

1.03 EQUIPMENT

- A. Dry type transformers shall be provided where shown to provide 3 phase, 4 wire, 120/208 volt grounded wye service to specific panelboards. Primary rating shall be 480 volts. KVA ratings shall be as shown on the drawings.
- B. Transformer shall be provided with six 2-1/2% full capacity taps, two above and two below unless only four 2-1/2% taps, two above and two below are standard NEMA taps for the specific KVA rating. Sound rating shall not exceed 50 db for those specified above 75 KVA. Temperature rise shall not exceed 115 degrees C. under full load in an ambient of 40 degrees C. Overload capacity shall not be less than 10% at rated voltage. Minimum B.I.L. shall be 10 KV. Vibration dampers shall be provided as a standard feature on all transformers.
- C. Where K rated transformers are shown on the plans, provide a transformer of K=13 unless noted otherwise. This transformer shall also provide a 200% rated neutral. All other characteristics shall be as specified for general dry type transformers.
- D. Primary and secondary connections to dry type transformers shall be made with flexible liquid tight conduit.
- E. Transformers shall be located a minimum of 6" from wall.
- F. Connections between the transformer and required ground shall be via non-metallic conduit and no more than 24" of non-metallic flexible conduit. Conduit for grounding conductor shall not be routed through vents in the transformer enclosure.

END OF SECTION 16080

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SECTION 16090

PHOTO CONTROL AND CONTACTOR

1.01 SUBMITTALS

- A. Submittal shall be manufacturers published literature.

1.02 MANUFACTURERS

- A. Photo Controls:
 - 1. Tork
 - 2. Paragon
 - 3. General Electric Company
 - 4. Siemens
 - 5. Intermatic
- B. Contactors:
 - 1. Square "D" Company
 - 2. Cutler-Hammer
 - 3. ASCO
 - 4. G. E.
 - 5. Intermatic

1.03 EQUIPMENT

- A. Photo control shall be rated at 1800 V.A., 90% power factor on 120 volt system. Switching mechanism shall be hermetically sealed and shall be calibrated to close circuit when illumination falls below five foot candles. Switching mechanism shall contain delay feature to prevent circuit opening in transient illumination such as headlights from passing vehicles. (Photo Control shall contain manually adjustable light level slide.) Orient photo control light sensing element north.
- B. Contactor shall be electrically held, 120 volt operating coil and in NEMA 1 enclosure. The number and rating of poles shall be as noted on the drawings.
- C. Time clock shall be digital type, 365 day programmable with general purpose indoor, outdoor case.

END OF SECTION 16090

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SECTION 16100

PULL BOXES AND JUNCTION BOXES AND FITTINGS

1.01 PULL BOXES AND JUNCTION BOXES AND FITTINGS

- A. Boxes shall be provided in the raceway systems wherever required for the pulling of wires and the making of connections.
- B. Pull boxes of not less than the minimum size required by the National Electrical Code Article 370 shall be constructed of code-gauge galvanized sheet steel. Boxes shall be furnished with screw-fastened covers. Covers on flush wall mounted boxes in well appointed areas (offices, reception, classrooms, media center, etc) shall be minimum 1/16 302 stainless steel. Boxes located on the exterior of the building shall be watertight. Covers shall be secured with tamper proof screws.
- C. Boxes shall be securely and rigidly fastened to the surface of which they are mounted or shall be supported from structural member of the building either directly or by using a substantial and approved metal rod or brace.
- D. All boxes shall be so installed that the wiring contained in them can be rendered accessible without removing part of the building.
- E. Where several circuits pass through a common pull box, the circuits shall be tagged to indicate clearly their electrical characteristics, circuit number and designation.

END OF SECTION 16100

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SECTION 16110

GROUNDING

PART 1 GENERAL:

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract documents including General and Supplementary Conditions and Division 1 Specification Sections, apply to the Section.

1.02 SUMMARY

- A. The work required under this section of the specifications consists of furnishing, installation and connections of the building secondary grounding systems. Exterior branch circuit wiring and feeder conductors extended beyond the building are included. The building electrical system shall be a 3 phase, 4 wire grounded wye delta system supplemented with equipment grounding system. Equipment grounding system shall be established with equipment grounding conductors; the use of metallic raceways for equipment grounding is not acceptable.

1.03 QUALITY ASSURANCE

- A. Industry Referenced Standards: The following specifications and standards are incorporated into and become a part of this Specification by Reference.
 - 1. Underwriters' Laboratories, Inc. (UL) Publications:
 - No.44 Rubber-Insulated Wire & Cables
 - No.83 Thermoplastic-Insulated Wires
 - No.467 Electrical Grounding & Bonding Equipment
 - No.493 Thermoplastic-Insulated Underground Feeder & Branch Circuit Cables
 - No.486 Wire Connectors and Soldering Lugs
 - 2. National Electrical Manufacturers' Standards (NEMA):
 - WC-5 Thermoplastic Insulated Wire & Cable
 - WC-7 Cross-Linked-Thermosetting Polyethylene Insulated Wire
 - 3. National Fire Protection Association Publication (NFPA):
 - No.70 National Electrical Code (NEC)
 - No.76B Safe Use of Electricity in Patient Care Areas of Hospitals
 - No.99 Health Care Facilities
- B. Acceptable Manufacturers: Products produced by the following manufacturer which conform to this specification are acceptable.
 - 1. Hydraulically applied conductor terminations:
 - a. Square D
 - b. Burndy
 - c. IlSCO
 - d. Scotch (3M)
 - e. Thomas and Betts (T&B)
 - f. Anderson

2. Mechanically applied (crimp) conductor terminations:
 - a. Scotch (3M)
 - b. Ideal
 - c. Thomas and Betts (T&B)
 - d. Burndy

PART 2 PRODUCTS:

2.01 GENERAL MATERIALS REQUIREMENTS

- A. Provide all materials under this section of the specifications. All materials shall be new.
- B. All materials shall be UL listed and bear a UL label.
- C. Refer to the specific specification section for the description and requirements of materials mentioned herein for installation.

2.02 GROUNDING CONDUCTORS

- A. Grounding electrode conductor shall be bare or green insulated copper conductor sized as indicated on the drawings.
- B. Equipment grounding conductors shall be green insulated type THHW, XHHW conductors sized as indicated on the drawings. Where size is not indicated on the drawings, conductor size shall be determined from the National Electrical Code table of sizes of equipment grounding conductors.
- C. Bonding jumpers shall be flexible copper bonding jumpers sized in accordance with the National Electrical Code table on sizes of equipment grounding electrode conductors.

2.03 TRANSFORMERS & MOTOR CONTROLLERS

- A. Provide a conductor termination grounding lug bonded to the enclosure of each transformer and motor controller.
- B. Provide a neutral bar with bonding screw in each disconnect for grounding purposes.

2.04 DEVICES

- A. Each receptacle and switch device shall be furnished with a grounding screw connected to the metallic device frame. Bond equipment grounding conductor to each outlet box. For isolated ground receptacles, bond equipment grounding conductor to box, and isolated ground conductor to device grounding screw.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Ground all non-current carrying parts of the electrical system, i.e., wireways, equipment enclosures and frames, junction and outlet boxes, machine frames and other conductive items in close proximity with electrical circuits, to provide a low impedance path for potential grounded faults.
- B. Equipment Grounding Conductor

1. Grounding conductors shall be provided in all branch circuit raceways and cables. Grounding conductors shall be the same AWG size as branch circuit conductors.
2. Grounding conductors for feeders are typically indicated on the drawings and the raceway is sized to accommodate grounding conductor shown. Where grounding conductor size is not indicated on the drawings, conductor shall be in accordance with the equipment grounding conductor table of the National Electrical Code.
3. A grounding conductor shall be installed in all flexible conduit installations. For branch circuits, grounding conductor shall be sized to match branch circuit conductors.
4. A feeder serving several panelboards shall have a continuous grounding conductor which shall be connected to each related cabinet grounding bar.
5. The equipment grounding conductor shall be attached to equipment with bolt or sheet metal screw used for no other purpose. Where grounding conductor is stranded, attachment shall be made with lug attached to grounding conductor with crimping tools.
6. Ground all motors by drilling and tapping the bottom of the motor junction box with a round head bolt used for no other purpose. Conductor attachment shall be through the use of a lug attached to conductor with a crimping tool.
7. Equipment grounding conductors shall terminate on panelboard, switchboard, or motor control center grounding bus only. Do not terminate on neutral bus. Provide a single terminals lug for each conductor. Conductor shall terminate the same section as the phase conductors originate. Do not terminate neutral conductors on the ground bus.

C. Other Grounding Requirements

1. Each telephone backboard shall be provided with a No.6 grounding conductor.
2. Lighting fixtures shall be grounded with a green insulated ground wire secured to the fixture with a UL listed bond lug, screw, or clip specifically made for such use.

3.02

TESTING

- A. Upon completion of the ground rod installation, grounding resistance reading shall be taken before connection is made to the building cold water piping system. Ground resistance readings shall not be taken within forty-eight hours of rainfall. Results of ground resistance readings shall be forwarded, in writing, immediately to the Architect and Owner.

END OF SECTION 16110

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SECTION 16120

EQUIPMENT IDENTIFICATION

1.01 SUBMITTALS

- A. Submit sample of laminated plastic identification plate with lettering.

1.02 MATERIALS

- A. Laminated plastic plates with 3/16" high white letter etched on black background.
- B. Plates shall be permanently mounted utilizing pop rivets.
- C. Painted, stenciled or indented tape identification is not acceptable.

1.03 ITEM IDENTIFICATION

- A. All electrical apparatus such as wiring troughs, panelboards, individual circuit breakers, transformers and disconnect switches shall have laminated plastic identification plates. Identification shall match labeling shown on plans.
- B. A "steel" circuit directory frame, and a directory card with a plastic covering shall be provided on the inside of each panel door. The directory shall be typed to identify the load fed by each circuit and the areas served. Spaces or room numbers shown on the drawings are not necessarily the final numbers to be assigned to these areas. The Contractors shall before completion of the project obtain from the Architect final space or room numbers so that it can be typed onto directory.
- C. Circuit breakers and disconnects shall identify the equipment served and circuit and panel from which it is served.
- D. On all panelboards the exterior identification plate shall match that on the drawings and the panel and circuit number serving the panel shall be designated within the panel.

END OF SECTION 16120

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SECTION 16140

FIRE ALARM SYSTEM

1.01 SUBMITTALS

- A. Shop drawings shall be submitted as follows:
 - 1. Manufacturer's published literature.
 - 2. One line schematic diagram covering the complete building system.

1.02 MANUFACTURERS

- A. Acceptable manufacturers:
 - 1. Edwards
- B. The systems shall be installed by the authorized local factory dealer/representative for that product. The factory dealer representative shall hold a current low voltage contractor's license. He must maintain a fully equipped and stocked service shop and shall respond to service calls within 12 normal working hours.

1.03 SCOPE

- A. This specification covers the extension of a complete electronically operated fire alarm system. The system within the building shall be electrically supervised and shall include, but not be limited to, the following components:
 - 1. Manual non-code type alarm boxes, combination vibrating horns and flashing lights, control equipment, ceiling smoke detectors, duct smoke detectors, LCD annunciator, conduit, and wiring.

1.04 GENERAL REQUIREMENTS

- A. The alarm equipment and all wiring shall be installed and interconnected by a factory certified installer and placed in working order. The name of the manufacturer and serial or identification numbers shall appear on all major components. Electrical supervision of the system shall conform to provisions of Article 240. NFPA Standard 72. Corresponding parts of all similar type equipment units shall be interchangeable, and locks for all cabinets shall be keyed alike. All devices, equipment and combination thereof shall be of the manufacturer's current production. All component parts of the system and the control unit shall be approved for the purpose intended. The stamp, label, seal or certificate of the Underwriter's Laboratories or the Factory Mutual Laboratories shall be considered as acceptable evidence of such approval.
- B. Fire Alarm Subcontractor shall submit a certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service within 12 normal working hours.

1.05 DRAWINGS AND MANUALS

- A. Three copies of complete instructions for the operation, inspection, testing and maintenance of the system, including wiring diagrams and replacement parts list shall be furnished upon final acceptance of the system. Also provide all special tools that are necessary for the maintenance of the equipment and include one set of fuses for each type and size.

1.06**INSTALLATION**

- A. A qualified fire alarm technician shall install, adjust and test the equipment. The technician shall be qualified by training and experience in the installation and operation of the fire alarm system specified. The technician shall instruct operating personnel in the operation, adjustment and maintenance of the system. A statement signed by the person or persons instructed shall be supplied to the Architect prior to final operation.
- B. Provide a written certification that the system is in complete and proper working order and in compliance with all codes.

1.07**SYSTEM OPERATION**

- A. Operation of any manual or automatic initiating device shall cause a general alarm to sound.
- B. Also circuits and audible sounding devices shall be electrically supervised. In the event of an open circuit or ground in the system, loss of operation of supervisory power, or other supervised component failure, a trouble signal shall be actuated until the system is restored to normal. A silencing switch shall be provided for silencing the trouble alarm.
- C. The system shall operate from one 120 volt circuit.
- D. Each initiating device shall be identified on the LCD annunciator.
- E. Fire Alarm System shall be interlocked with range hood extinguishing system, such that when system is activated, general alarm is sounded and signal is sent to the annunciator.

1.08**SYSTEM COMPONENTS**

- A. Fire alarm control panel: Edwards EST2
- B. Manual stations: Provide manual alarm stations, semi-flush mounted, of the pull-lever type, key resettable. Housing shall be of cast metal or impact resistance plastic with raised letters designating function and operating instructions. Housing will be red enamel with white lettering. Provide an additional 25 devices (and 100 ft. of associated wiring , conduit and labor) to be located by fire marshal. Any unused devices shall be turned over to owner.
- C. Provide a clear polycarbonate hinged shield over all pullstations. The shield device shall have an internal battery operated warning alarm such that when the shield is lifted, the integral alarm sounds. Notifier "STI Stopper 2" or other equal by approved manufacturer.
- D. LCD annunciator: Provide remote annunciator panel.. The annunciator panel shall be provided with an LCD display and complete control push buttons including, but not limited to, alarm acknowledge, alarm silence, reset, etc. Provide panel flush with lockable, hinged, see-through cover.
- E. Signal device: Provide combination low power D.C. strobe horn and speaker with high intensity flashing strobe light for both audible and visual signaling or strobe light for visual signaling only. Minimum sound level indoors at 10 feet shall be 90 db. Maximum current draw for horn and strobe light of 0.063 amps, nominal voltage of 24 D.C. Units shall be flush wall mounted 6'-8" above the finished floor at points noted on the drawings. Minimum candela level shall be 75 candela. Candela level for areas under 300 square feet may be 15, all strobes shall be synchronized. Provide an additional 25 devices (and 100 ft. of associated wiring, conduit and labor) to be located by fire marshal. Any unused devices shall be turned over to owner.

- F. Smoke detectors shall be furnished, installed and connected under Division 16. Power supply for detectors shall be 24 volt D.C. and supplied from Fire Alarm control panel. Detectors shall be photo electric type. Each detector shall have flashing LED for operational walk check. Provide an additional 25 devices (and 100 ft. of associated wiring, conduit and labor) to be located by fire marshal. Any unused devices shall be turned over to owner.
- G. Smoke detectors in duct work shall be photo electric type furnished and connected under Division 16, installation in duct work shall be accomplished under Division 15. Power supply for detectors shall be 24 volts D.C. and supplied from fire alarm control panel. Provide contacts to automatically shut down fan motors. Sampling tubes shall extend across the entire width of the duct. Provide remote station at readily accessible location in mechanical room, or if air handling unit is above ceiling, mount remote station in wall below ceiling, having LED to indicate alarm condition and key switch to test and reset alarm relay. Mount remote station 6'-0" above finished floor. Detectors for air handling equipment rated over 2000 CFM, but under 15,000 CFM shall be located in the supply duct. Detectors for air handling equipment rated over 15,000 CFM shall be located in the supply and return ducts. Detectors shall be provided whether called for on the plans or not. Location of detectors in duct work shall be as recommended by detector manufacturer, but in no case shall detector be located ahead of filters. Provide an additional 10 devices (and 100 ft. of associated wiring, conduit and labor) to be located by fire marshal. Any unused devices shall be turned over to owner.
- I. Door holders shall be furnished under door hardware section and installed under Section 16 of the specifications. Provide ceiling mounted smoke detectors on each side of door. Units shall be connected under Section 16 and powered at 24 volts D.C. from the fire alarm control panel.
- J. Tamper switches and flow switches shall be provided and installed under Division 15 of these specifications, and connected under Division 16. Power supply shall be 24 volts D.C., supplied from the fire alarm control panel. Coordinate exact quantity and locations of connections.
- K. Heat detectors, where called for, shall be provided, installed and connected under Division 16. Detectors shall be combination rate of rise and fixed temperature rated for a minimum of 135° F, and shall be rated at 200° F where required (i.e., Kitchen).
- L. Each fire alarm circuit shall be protected from lightning by installing surge protection devices either internally or externally. Circuits run between buildings shall be individually protected in addition to protection at control panel.
- M. All conductors shall be installed in conduit. Conduit installation shall be as covered under Section 16020 of these specifications.
- N. Number and size of conductors shall be as required by manufacturer of system being installed. Any cable run in conduit below grade shall be moisture proof; cable shall be equal to West Penn Aqua seal.
- O. Fire Alarm system shall interface with the Kitchen Hood Suppression System. The fire alarm system will alarm when the Kitchen hood suppression system is activated.

END OF SECTION 16140

SECTION 16160

TRANSIENT VOLTAGE SURGE SUPPRESSORS

1.01 SUBMITTALS

- A. Electrical and mechanical drawings for the TVSS shall be provided by the manufacturer which show unit dimensions, weights, mounting provisions, connection details and layout diagram of the unit.
- B. The manufacturer shall furnish an equipment manual with installation, operation, and maintenance instructions for the specified unit.
- C. Documentation of unit's UL 1449 suppression rating shall be included as required product data submittal information.
- D. The contractor shall provide detailed compliance exception statements to all provisions of this specification ten (10) days prior to the bid date.

1.02 MANUFACTURERS

- A. For the purpose of selecting quality and type of TVSS units, equipment as manufactured by Current Technology Inc. has been specified. The following manufacturers meeting these specifications are acceptable.
 - (1) Liebert
 - (2) Lea International
 - (3) Surge Suppression, Inc.
 - (4) Square D
- B. The manufacturer shall provide a Limited Five-Year Warranty, from the date of installation, against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's recommended installation, operation and maintenance instructions.

1.03 GENERAL

- A. These specifications describe the electrical and mechanical requirements for a high-energy suppression filter system utilizing transient voltage surge suppression (TVSS) for application in Category C (Main Service Entrance) and Category B (Distribution Panels) areas as defined by the IEEE C62.41 standard.
- B. The specified unit shall provide effective high energy **transient voltage clamping and surge current diversion** for all electrical modes of equipment connected downstream from the facility's main distribution panel or main over current device. The unit shall be designed for parallel connection to the facility's wiring system.
- C. All Category B (distribution panels) shall include a high frequency attenuation filter for all modes of protection the TVSS is providing.
- D. The unit shall include, but not be limited to, an engineered solid-state high-performance suppression system, utilizing Selenium Cells and/or arrays of fused non-linear voltage dependent Metal Oxide Varistors (MOV).

- E. The suppression system shall not utilize gas tubes, spark gaps, or any other components which might short or crowbar the line, thus leading to interruption of normal power to connected loads. The suppression system shall not incorporate non-field replaceable fusing, circuit boards, plug-in or quick-connect connections as part of any surge current carrying path.
- F. All internal wiring associated with the suppression filter system and subject to surge currents shall utilize low-impedance copper bus bar and/or copper conductor or equal. All internal connections associated with the suppression/filter system and which are subject to surge currents shall be made with compression type solder less lugs and shall be bolted in place.
- G. The unit shall be connected to the panel or switch gear by means of a circuit breaker as specified on the drawings or as recommended by the manufacturer. An integral fused disconnect shall not be furnished with the unit unless otherwise specified.
- H. Units shall be provided in a NEMA 1 type enclosure constructed of minimum 14 gauge steel, painted inside and out with rust inhibiting paint. Surface or flush mount enclosures are specified on the drawings.
- I. The unit shall be installed as close as practical to the wiring system in accordance with applicable national/local electrical codes and the manufacturers recommended installation instructions. Maximum 6' connections shall be made with copper conductor and shall not be any longer than is reasonably necessary, avoiding unnecessary bends. When possible, current carrying conductors between the panelboard and the suppression unit shall be twisted together.
- J. The unit shall include mechanical lugs for each phase, neutral and ground, where applicable. The lugs shall accommodate up to a 1/0 AWG copper conductor.
- K. The unit shall include externally mounted visual indicators that monitor the on-line status of each phase of the unit (L.E.D.s, neon lamps, etc.).
- L. The unit shall include Form C dry contacts (N.O. or N.C.) to facilitate connection to a building management system in order to monitor the on-line status of the unit. The contacts shall be combination normally open, normally closed and shall operate upon failure of the suppression system. Also include a display event counter.
- M. The unit shall include the manufacturer's nameplate and UL inspection labels on interior of cabinet.

1.04

STANDARDS

- A. The specified unit shall be designed, manufactured and tested in compliance with the following standards:
 - (1) American National Standards Institute and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.41-1991 and C62.45-1987).
 - (2) National Electrical Manufacturers Association (NEMA).
 - (3) National Fire Protection Association (NFPA 70 [NEC], 75, and 78).
 - (4) Underwriters Laboratories (UL 1449 and 1283).
- B. The maximum continuous operating voltage (MCOV) or threshold voltage of all suppression components utilized in the unit shall not be less than 125% of the facility's nominal operating voltage for 120 volt systems and not less than 115% of the facility's nominal operating voltage for 208, 277, and 480 volts.

- C. Based on ANSI/IEEE C62.41-1991's standard 8/20 microsecond current waveform, and in accordance with NEMA Publication No. LS 1-1992, the tested single-pulse surge current capacity, in amps, of the unit shall be no less than the following:

MODE OF PROTECTION

	L-N	L-G	N-G
Main Service Panel:	150,000	150,000	150,000
Total Capacity per Phase =	300,000		
Distribution Panels:	60,000	40,000	40,000
Total Capacity per Phase =	120,000		

- D. The unit shall be UL 1449 Listed as a Transient Voltage Surge Suppressor.
- E. The unit shall be factory tested following IEEE C62.41 and C62.45 guidelines without failing or degrading the UL 1449 Surge Suppression Rating by more than 10%.
- F. Manufacturer shall provide proof of independent third party testing in accordance with NEMA Standard LS 1-1992; the suppression unit shall provide protection modes as follows:
- (1) Five (5) modes of protection for a single phase configuration:
 - Line-to-Neutral (2)
 - Line-to-ground (2)
 - Neutral-to-ground (1)
 - (2) Seven (7) modes of protection for a three phase wye configuration:
 - Line-to-Neutral (3)
 - Line-to-Ground (3)
 - Neutral-to-Ground (1)
- G. The environmental operating parameters for the unit shall meet or exceed the following conditions:
- (1) Operating temperature range shall be -40 to +60 C (-40 to +140 F).
 - (2) Operation shall be reliable in an environment with 5% to 95% non-condensing relative humidity.
 - (3) The unit shall not generate noise levels in excess of 10dB, "A" weighted.
 - (4) No appreciable magnetic fields shall be generated. Unit shall be capable of use directly in computer rooms in any location without danger to data storage systems or devices.
- H. For purposes of quality assurance, the unit shall be "burned-in" at the factory, applying nominal voltages for which a particular unit is designed.
- I. A list of customer-replaceable spare parts where applicable shall be included in the unit's documentation set.

END OF SECTION 16160

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SECTION 16170

TELEVISION DISTRIBUTION SYSTEM

1.01 CONDUIT SYSTEM

- A. Conduit for television outlets shall extend up from the outlet and turn out above the cable tray above accessible ceiling in corridors. Provide pull string in conduit.
- B. All TV conduit, outlet boxes, and cabinets shall be for TV cable only. Joint use with sound systems, fire, telephone, etc. is not acceptable.
- C. Location of TV outlets shall be as shown on the drawings.
- D. Height of TV outlets shall be as noted on the drawings. All individual outlet boxes shall be two gang type, 4" x 4" x 2 1/4" deep, with single gang plaster rings. Plaster rings shall be 1-1/2" deep and shall be flush with finish of wall. See drawings for outlets in surface raceway.
- E. A duplex convenience A/C outlet shall be provided at the same height as each TV outlet box and within 12" horizontally.
- F. Television conduit shall be a minimum of 3/4" in size.
- G. Conduit and its installation shall be as covered under Section 16020 of these specifications.
- H. Outlets and their installation shall be as covered under Section 16040 of these specifications.
- I. All conduit shall be concealed unless otherwise noted.

END OF SECTION 16170

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SECTION 16175

FIRESTOPPING

1.01 RELATED DOCUMENTS

- A. The requirements of the general conditions, supplementary conditions, and division 1, general requirements, apply to Work in this Section.
- B. Coordinate work of this Section with the work of the following Sections to properly execute the work in the order to maintain the hourly ratings of the walls and floors where firestopping and smoke seals are applied.
 - 1. Section 13300 - Concrete Work
 - 2. Section 04200 - Masonry Work
 - 3. Section 07860 - Smoke Seals
 - 4. Section 07900 - Joint Sealers
 - 5. Section 09250 - Dry Wall
 - 6. Division 16 Section - Electrical Work

1.02 DESCRIPTION

- A. This Section describes the requirements for furnishing and installing firestopping for fire-rated construction. This includes:
 - 1. All openings in fire-rated floors and wall assemblies, both blank (empty) and those accommodating penetrating items such as cables, conduits, etc.

1.03 REFERENCES

- A. ASTM E 814: "Standard Method of Fire Tests of Through-Penetration Firestops"
- B. UL 1479, UBC 7-5: (both are same as A above)
- C. ASTM E 119: "Standard Method of Fire Tests of Building Construction and Materials"
- D. UL263, UBC 7-1: (both are same as C above)
- E. UL 2079: "Standard for Tests for the Fire Resistance of Building Joint Systems"
- F. Published Through-Penetration Systems by recognized independent testing agencies.
 - 1. UL Fire Resistance Directory.
 - 2. Warnock Hersey Certification Listings, current year.

1.04 QUALITY ASSURANCE

- A. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM 814, UL 1479 or UL 2079. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating, when required by code authority, shall be based on the measurement of the temperature rise on the penetrating item(s). The fire test pressure differential of a minimum 0.01 inches of water column is required.
- B. Fire stopping products shall be asbestos free, free of any PCBs and free of any lead.

- C. Do not use any product containing solvents, or that require hazardous waste disposal.

1.05 SUBMITTALS

- A. Submit manufacturer's product literature for each type of Firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance, limitation criteria and test data.
- B. Submit manufacturer's Warranty.
- C. Material Safety Data Sheets: Submit MSDS for each firestop product.
- D. Shop Drawings: Show typical installation details for methods of installation. Indicate which firestop materials will be used where and thickness for different hourly ratings.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in the manufacturers' original, unopened containers or packages with manufacturers' name, product identification, lot number, UL or Warnock Hersey labels, and mixing and installation instructions, as applicable.
- B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.
- C. All firestop materials shall be installed prior to expiration of shelf life.

1.07 PROJECT CONDITIONS

- A. Verify existing conditions and substrates before starting work.
- B. Do not use materials that are based on organic solvents.
- C. During installation, provide masking and drop cloths to prevent firestopping products from contaminating any adjacent surfaces.
- D. Conform to ventilation requirements by manufacturer's installation instructions or Material Safety Data Sheet.
- E. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess of or below the manufacturer's recommendations.
- F. Schedule installation of firestop products after completion of penetration item installation but prior to covering or concealing of openings.
- G. Coordinate this work with work of other trades.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one of the following manufacturers as shown below and further defined by the materials listed in Part 2.02 of this section.
 - 1. The RectorSeal Corporation. Products as listed are a standard of generic types.

2. International Protective Coatings
3. 3M Company
4. Hilti

2.02 MATERIALS

- A. Firestop Mortars:
 1. Metacaulk Fire Rated Mortar by The RectorSeal Corporation
 2. KBS Mortar by International Protective Coatings
- B. Firestop Sealants and Caulks:
 1. Metacaulk 950 by The RectorSeal Corporation
 2. Metacaulk 835 by The RectorSeal Corporation
 3. Metacaulk 805 by The RectorSeal Corporation
 4. Metacaulk 1000 by The RectorSeal Corporation
 5. CP 25WB+Caulk by 3M
 6. Flame-Safe FS900 Series by International Protective Coatings.
- C. Firestop Putty:
 1. Metacaulk Fire Rated Putty by The RectorSeal Corporation
 2. Metacaulk Fire Rated Putty pads by The RectorSeal Corporation
 3. MPS-2 Moldable Putty Stix by 3M
 4. MPP-4S Moldable Putty Pads by 3M
- D. Firestop Sleeves:
 1. Metacaulk Pipe Collars by The RectorSeal Corporation
 2. Plastic Pipe Devices by 3M
 3. Plastic Pipe Collars by International Protective Coatings
- E. Intumescent Wrap Strips:
 1. Metacaulk Wrap Strip by The RectorSeal Corporation
 2. FS-195 Wrap Strip by 3M
 3. Wrap Strip by International Protective Coatings
- F. Firestop Mastic:
 1. Metacaulk 1100 by The RectorSeal Corporation
 2. Firestop Mastic by 3M.
 3. Firestop Mastic by International Protective Coatings
- G. Accessories:
 1. Forming/Damming Materials: Mineral Fiberboard or other type recommended by manufacturer.
 2. Primer, sealant and solvent cleaner: As recommended by firestop manufacturer.
- H. Where subject to movement, firestop products used shall remain flexible to allow for such normal movement of building structure and penetrating item(s) without affecting the integrity of the firestop system.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to proper and timely completion of the work.
- B. Verify the penetrating item(s) are permanently installed and construction of fire rated

assemblies are completed prior to firestop installation.

- C. Prior to installation of firestop systems, clean surfaces of penetrating item(s) that will be in contact with firestop materials. Do not use any cleaning material that will either attack penetrating item(s) or firestop product to be installed.

3.02 CONDITIONS REQUIRING FIRESTOPPING

A. General:

1. Provide fire stopping for conditions specified whether or not firestopping is indicated, and, if indicated, whether such material is designated as insulation, safing or otherwise.
2. Insulation types specified in other Sections shall not be installed in lieu of firestopping material specified herein.

B. Penetrations:

1. Penetrations include conduit, cable, wire, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.
2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814 (UL 1479).
3. These requirements for penetrations shall apply whether or not sleeves have been provided. Firestop the annular space between sleeve and surrounding surfaces.

- C. Provide firestopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

3.03 INSTALLATION

- A. Regulatory requirements: Install firestop products in accordance with fire rated test assemblies as published by either UL or Warnock Hersey or accordance with manufacturer engineer drawings.

- B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration firestop systems.

1. Firestop all holes or voids made in fire resistive assemblies, made by penetrations, to ensure against the passage of flames, smoke, and toxic gases.
2. Protect materials from damage on surface subjected to traffic and install cover plate as required on any installed firestop system that will or may be subject to traffic.
3. Tool surfaces of firestop products to provide a smooth and clean appearance.

3.04 FIELD QUALITY CONTROL

- A. Follow safety procedures recommended in Material Safety Data Sheets.

- B. Examine penetration firestopped areas to ensure proper installation before concealing or enclosing areas.

- C. Keep areas of work accessible until inspection by Architect.

3.05 ADJUSTING AND CLEANING

- A. Remove equipment, materials and debris, leaving areas in undamaged and clean conditions.
- B. Neatly cut and trim materials.

END OF SECTION 16175

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SECTION 16180

BUILDING COMMUNICATION AND PROGRAM SYSTEM

PART 1. GENERAL

- 1.1 Work Included:
- A. The work to be provided under this section consists of furnishing and installing all equipment, cable and labor necessary for the extension of a complete and operating building communication and program system with new sound systems in the existing lunch room, new lunch room, new gymnasium and new multipurpose areas as shown on the drawings and specified herein.
- 1.2 Submittals:
- A. Shop drawings shall be submitted as follows:
1. Manufacturer's published literature.
 2. One line schematic diagram covering the complete building system.
- B. Sound Contractor shall submit a certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service calls within 12 normal working hours.
- D. All equipment shall bear the label of Underwriter's Laboratories and be listed for use under their re-examination service.
- E. All work shall be accomplished by an accredited factory trained communication technician. He shall also train personnel designated by the Owner in the proper operation and maintenance of equipment. All work in conjunction with this installation shall be in accordance with the engineering standards as established by EIA. All wiring shall be as recommended by manufacturer furnishing equipment except that each pair of cable shall be individually shielded. The manufacturer of this equipment shall provide a complete set of operating instructions, circuit diagrams and other information necessary for proper installation, operation and maintenance of the system. Three copies of the operating instructions shall be furnished to the Owner upon completion of the installation. The complete system as herein specified shall be guaranteed to be free of defects in material and workmanship for a period of one (1) year from the date of acceptance.
- 1.3 Operations:
- A. Provide separate sound systems for the Gym and Dining/Multipurpose areas as listed in these specifications and as shown on the drawings. Provide distribution of normal school programs and announcements from the Master console amplifier unit (Existing) and also provide key switch at the Gym and Dining/Auditorium area amplifiers to lock out normal school programs when these secondary system are in use. Overall building public address system by owner except ceiling speakers, speaker wiring, outlet boxes and conduit.

PART 2. PRODUCTS

- 2.1 Manufacturers – Intercom/Paging System:
- A. The acceptable manufacturers listed within the specifications shall be installed by the authorized local factory dealer/representative for that product. The factory dealer representative shall hold a current low voltage contractor's license, he must maintain a fully equipped and stocked service shop and shall be capable of responding to service calls within 12 normal working hours.
- B. Equipment (Classroom/Hallway/Office Public Address):

1. Amplifier and control unit :(Existing, Bogen).
2. Speakers: 2' x 2' exposed grid ceiling, Quam 12/25RS, 2' x 2' grille, with 24V speaker or equal by atlas, or bogen. Coordinate exact speaker type with owner.
3. Exterior / Vandal resistant / Wall Mount: Quam 6VP or equal by atlas or bogen.
4. Emergency Call, Telephone Handset: Provide handset compatible with owners equipment

2.2 Equipment Gymnasium:

A. Manufacturers:

1. TOA
2. Rauland
3. Dukane
4. Bogan
5. Williams Sound (FM Assistive Listening System Only)

B. Equipment:

A. Amplifier/mixer/control unit :

Provide solid state nine channel integrated mixer/amplifier. The unit shall provide six microphone/line inputs. The unit shall provide minimum 240 watts rms power. Auxiliary inputs shall have individual volume controls, switchable input attenuator and adjustable gain controls. Line level output shall also be provided. The unit shall have master volume control, and individual input volume controls. Provide power light and switch, output clip indicator, overload indicator and resettable circuit breaker. Unit shall be able to distribute to all speakers simultaneously. No talk back communication is required. Unit shall be rack mountable. provide toa model "a-724" or equal.

B. Am/fm reciever/cd player:

Provide rack mountable am/fm tuner/compact disc player. Unit shall be provided with lcd display, front controls, minimum of 6 memory buttons capable of storing 2 signal frequencies each. Unit shall have 50w x 4 output power. Provide telecor model "t-cdp" or equal.

C. Wall mounted cabinet: Amplifier/mixer/control units, am/fm reciver/cd player units, and assistive listening units shall be located inside a single cabinet. Cabinet shall be 16 gauge, welded with 18 in. Deep center section and adjustable mounting rails. Cabinet shall have black powder coat finish and lockable hinged door. provide toa model "a-724" or equal.

D. Microphones: provide (2) dynamic cardioid microphones. Provide microphones with hardened steel grille, moving coil dynamic neodymium magnet, 80 hz - 15 khz frequency response, -54 db power level, -70db 3.2mv/pascal open circuit voltage, 600 ohms impedance, die cast zinc alloy case, durable rubber textured gunmetal black finish. Provide atlas sound model "ctm 44" or equal.

E. Fm assistive listening system (provide 2 complete systems, one for each mixer/amplifier unit). provide complete operable fm assistive listening systems. The fm transmitter shall operate at 120 vac. Locate transmitter inside cabinet housing mixer/amplifier. Transmitter shall be able to accept a line input from the sound system. Operating frequency shall be between 72 and 76 mhz. Provide 4 personal fm receivers with belt clip pack and headset per system (including 9 volt batteries). Williams personal pa value pack system model "ppa vpe".

F. Speaker: (gym) provide soundsphere model 2212-1 compatible with amplifier.

- G. Microphone stand: DuKane 651-53.(provide 2)
- H. Microphone jacks: Switchcraft G3FS.
- I. Additional manufacturers: JBC, Mackie, Peevee.

2.3 Equipment – Multipurpose Area, Cafeteria and Existing Lunch Room:

- A. See sound system notes on Sheet E4.1.

PART 3. EXECUTION

3.1 Drawings and Manuals:

- A. Provide complete instructions for the operation, inspection, testing and maintenance of the system, including wiring diagrams and replacement parts list shall be furnished upon final acceptance of the system. Also provide all special tools that are necessary for the maintenance of the equipment and include one set of fuses for each type and size.

3.2 General Requirements:

- A. All equipment shall bear the label of Underwriter's Laboratories and be listed for use under their re-examination service.
- B. All work shall be accomplished by an accredited factory trained communication technician. He shall also train personnel designated by the Owner in the proper operation and maintenance of equipment. All work in conjunction with this installation shall be in accordance with the engineering standards as established by EIA. All wiring shall be as recommended by manufacturer furnishing equipment except that each pair of cable shall be individually shielded. The manufacturer of this equipment shall provide a complete set of operating instructions, circuit diagrams and other information necessary for proper installation, operation and maintenance of the system. Three copies of the operating instructions shall be furnished to the Owner upon completion of the installation. All communications and program control systems shall be installed as a single system using common conduits and outlets. The complete system as herein specified shall be guaranteed to be free of defects in material and workmanship for a period of one (1) year from the date of acceptance.
- C. Building Communication System Subcontractor shall submit a certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service within 12 normal working hours.

3.3 Operations:

- A. Each speaker shall be tied into the master console and switched in accordance with the switching schedule shown on the drawings. All speakers shall be capable of two way voice communication.
- B. Provide generation and distribution for up to seven distinct tones to all speakers for class change or other desired purposes. Provide master program clock within the console and set up programs as desired by the Owner.
- C. Telephone handset units with pushbutton keypad, wall mounted shall be provided at locations shown for emergency calls.

- D. Provide all call to all speakers.
- E. Provide separate sound systems for the Gym and Multi-Use areas as listed in these specifications and as shown on the drawings. Provide distribution of normal school programs and announcements from the Master console amplifier unit to separate speakers located in the same space controlled by volume control to lock out normal school programs when these secondary system are in use.
- F. Telephone handsets shall be capable of obtaining an outside telephone dial tone.

3.4 Equipment and Cable Installation:

- A. Installation of sound reinforcement system shall be performed only by experienced electronic system installer.
- B. Cable within equipment racks shall be routed in groups according to functions: control circuits, microphone circuits, line level circuits, loudspeaker circuits, and 120 VAC circuits. Cable shall be neatly arranged, but tight bundling which makes modifications difficult shall be avoided.
- C. Pressure sensitive labels shall be affixed to cables at all termination points. Label method shall be indicated on record drawings. Label number shall be supplied by houston county school system, no exceptions.
- D. Care shall be exercised in wiring so as to avoid damage to the cables and to the equipment. All wire joints and connections shall be made with resincore solder and small soldering iron or approved mechanical connectors. Soldering shall be neat and care must be taken to avoid "cold" solder joints. Splices in circuits shall be avoided. Connections to screw-type terminals shall be made with mechanically connected, un-insulated, spade-type lugs selected for the particular wire size in use and crimped.
- E. All cable pairs shall be individually shielded, and all cable run underground or under slab shall be rated for wet location.
- F. The Electrical Contractor shall ground the equipment racks via a #6 AWG insulated cable to earth ground.
- G. Each speaker circuit shall be protected from lightning by installing surge protection units at punch down block located at console. Surge protectors shall be capable of handling maximum wattage on circuit.
- H. All wiring shall be run in conduit, except above accessible ceilings. Conduit and its installation shall be as covered under "Conduit and Raceway" section of these specifications.
- I. Outlets and their installation shall be as covered under "Outlets and Boxes" section of these specifications.
- J. Cover plates and their installation shall be as covered under "Wiring Devices" section of these specifications.

END OF SECTION

SECTION 16195

TELEPHONE, COMPUTER AND SOUND CONDUIT AND OUTLET SYSTEM

1.01 CONDUIT SYSTEM

- A. Provide a complete system of conduits and outlet boxes for the installation of computer, telephone and sound system wiring. Each individual outlet shall have a 1" conduit routed concealed to above the cable tray in corridor. Provide plastic bushing. See surface raceway details on drawings for outlets in surface raceway.
- B. All conduit and outlet boxes, shall be for computer and telephone cable only. Joint use with television systems, fire, etc. it is not acceptable.
- C. Location of outlets shall be as shown on the drawings.
- D. Height of wall outlets shall be as noted on the drawings. All individual wall outlet boxes in new construction must be two gang type, 4" x 4" x 2 1/8" deep, with single gang plaster rings. Plaster rings shall be 1 1/2" deep and shall be flush with finish of wall. See drawings for outlets in surface raceway.
- E. Conduit and its installation shall be as covered under Section 16020 of these specifications.
- F. Outlets and their installation shall be as covered under Section 16040 of these specifications.
- G. There shall be a pull string provided in all conduit - nylon cord 200 pound minimum pull strength.
- H. All conduit shall be concealed unless otherwise noted.
- I. Provide 302 jumbo stainless steel blank wall plates for all outlets not cabled.

END OF SECTION 16195

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SECTION 16200

LIGHTING SENSORS

PART 1. GENERAL

1.1 WORK INCLUDED

- A. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein and shown on the plans.
- B. Contractor/Supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 16000.
- C. Contractor shall coordinate all work described in this section with all other applicable plans and specifications.

1.2 EQUIPMENT QUALIFICATION

- A. Products supplied shall be from a single manufacturer that has been continuously involved in the manufacturing of occupancy sensors for a minimum of five (5) years. Mixing of manufacturers shall not be allowed.
- B. All components shall be U.L. listed, offer a five (5) year warranty and meet all state and local applicable code requirements.
- C. Products shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.
- D. Wall type sensor switches shall not be utilized.

1.3 SYSTEM DESCRIPTION

- A. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.
- B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.
- C. Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The supplier's obligation shall include repair or replacement, and testing without charge to the owner, all or any parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. The warranty shall commence upon the owner's acceptance of the project. Warranty on labor shall be for a minimum period of one (1) year.

1.4 SUBMITTALS

- A. Manufacturer shall substantiate conformance to this specification by supplying the necessary documents, performance data and wiring diagrams. Any deviations to this specification must be clearly stated by letter and submitted.

- B. Submit a lighting plan clearly marked by manufacturer showing proper product, location and orientation of each sensor.
- C. Submit any interconnection diagrams per major subsystem showing proper wiring.
- D. Submit standard catalog literature which includes performance specifications indicating compliance to the specification.
- E. Catalog sheets must clearly state any load restrictions when used with electronic ballasts.

1.5 SYSTEM OPERATION

- A. It shall be the contractor's responsibility to make all proper adjustments to assure owner's satisfaction with the occupancy system.

PART 2. SPECIFIC REQUIREMENTS

2.1 MANUFACTURERS

- A. Acceptable Manufactures:
 - 1. Watt Stopper
 - 2. Senser Switch
 - 3. Novitas
 - 4. Hubbell Building Automation
- B. Other interested parties should submit all the information listed under section 1.04A and 1.04D a minimum of ten (10) working days prior to initial bid date.
- C. The listing of any manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the electrical contractor to ensure that any price quotations received and submittals made are for sensors which meet or exceed the specifications included herein.

2.2 PRODUCTS

- A. See drawings for part numbers
- B. Ceiling Sensors:
 - 1. Sensors shall activate the electrical load upon entry into the controlled area and deactivate it after the area is vacated.
 - 2. Room Sensors shall be able to detect the minor types of motion (i.e., picking up a telephone, turning a page in a book) of people seated anywhere in offices, classrooms and conference rooms.
 - 3. Sensors shall contain timing circuitry to provide adjustable "time to lights off" delay of 15 seconds or less (for installer check-out) to 30 minutes.
 - 4. Sensors shall contain "sensitivity" controls to adapt to room size and eliminate false triggering by HVAC.
 - 5. A manual override switch in the Sensor shall allow the load to be turned on without tools in the event of Sensor malfunction.
 - 6. Controls shall be recessed for aesthetic reasons and to avoid tampering.
 - 7. Sensor housing shall comply with UL 94V0 and shall be equipped with a protective grill to shield the detectors from damage.
 - 8. Sensor electronics shall be replaceable, in the event of failure, without disturbing

- hard-wiring or Sensor mounting.
- 9. Sensors shall surface mount to ceiling tiles through a single 3/4 inch hole with provided hardware and without accessory fittings.
- 10. Sensors shall be UL Listed.
- 11. Sensors shall be suitable for Class 2 wiring.
- 12. Sensors shall be designed for parallel wiring to allow coverage of large areas.
- 13. Sensors shall operate on 15 VDC as supplied by Novitas Switchpacks. Refer to Switchpack specifications.
- 14. Sensors shall provide sufficient switching capability to activate up to ten switchpacks.
- 15. Sensors shall be available in more than one frequency to enable individual control of adjacent spaces without gaps in coverage.
- 16. Sensors shall perform within the FDA's guidelines for ultrasonic devices.
- 17. HID controller shall be compatible with all types of High Intensity Discharge (HID) lamps, including Metal Halide, Metal Halide Pulse Start, and High Pressure Sodium.
- 18. HID controller shall operate with HID lamps utilizing Constant Wattage Autotransformer (CWA) type ballasts.
- 19. To avoid lamp damage during the HID power up period, the HID controller shall maintain a full light level during lamp warm up for 15 minutes.

C. Switchpacks:

- 1. Switchpack shall supply 15 VDC to operate up to five Sensors.
- 2. Switchpack shall be operable from either 120 or 277 VAC circuits.
- 3. Relay contacts shall have ratings of:

15 Amps:	120 VAC Tungsten
20 Amps:	120 VAC Ballast
20 Amps:	277 VAC Ballast
- 4. Switchpack shall have an isolated (dry) Form A contact closure capable of swithing up to 15 Amps incandescent (Tungsten) or up to 20 Amps fluorescent (Ballast).
- 5. Switchpack shall be capable of being mounted externally to any standard junction box or internally to standard electrical boxes with a single locknut which is provided.
- 6. Switchpack housing shall comply with UL 94V0.
- 7. Switchpack shall be UL Listed Class 2.
- 8. Switchpack shall be plenum rated.
- 9. Standard Switchpack shall be used to control electronic, magnetic and hybrid ballasts that do not create high inrush.
- 10. Heavy Duty Switchpack shall utilize zero crossing circuitry to maximize relay life.
- 11. Heavy Duty Switchpack shall be used to control high inrush electronic ballasts.

PART 3. EXECUTION

3.1 INSTALLATION

- A. It shall be the contractor's responsibility to locate and aim sensory in the correct location required for complete and proper volumetric coverage within the range of coverage's of controlled areas per the manufacturer's recommendations. Rooms shall have ninety (90) to

one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the rooms. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room.

- B. It is the contractor's responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, to verify placement of sensors and installation criteria.
- C. Proper judgment must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall also provide, at the owner's facility, the training necessary to familiarize the owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

3.2

FACTORY COMMISSIONING

- A. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor placement to ensure a trouble-free occupancy-based lighting control system.
- B. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the scheduled commissioning date. Upon completion of the system fine tuning the factory authorized technician shall provide the proper training to the owner's personnel in the adjustment and maintenance of the sensors.

END OF SECTION 16200

SECTION 16210

CCTV SECURITY SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work includes the provision for the extension of an existing Honeywell analog closed circuit television (CCTV) security equipment including all cables, other equipment and necessary connections for a complete system.
1. All empty conduits, fittings and electrical service required for each piece of equipment is included in Division 16 Electrical.
 2. The goal of the CCTV is to be based on a non-proprietary, open architecture system. The system will be capable of functioning over an IP based system without the use of proprietary equipment. The contractor shall provide software and programming of the system after the hardware has been completely installed and commissioned by the vendor.
 3. The equipment vendor is responsible for operation of the system. All commissioning of the system shall be completed prior to the acceptance of the system. The warranty period for the operational system shall commence after the acceptance of the entire building warranty or the acceptance of the CCTV system warranty, whichever is later.
 4. All work shall be performed after normal school operating hours and in cooperation with the school administration at each site. A member of the contractor's management shall be on site each night to monitor the work including cleanup and securing individual rooms and the building. The Owner's representatives will communicate with the installer as to specific events that may prohibit installation (PTA meetings, gymnasium functions, etc.).

1.2 SUBMITTALS

- A. The contractor is to submit data information sheets for all items listed below.
- B. Provide three copies of the Operations manual for this equipment, modified as necessary for this particular system, for the Owner's use. Provide a site specific Owner's guide for trouble shooting the equipment.
- C. Provide three copies of the Owners Manual, containing information of each piece of equipment, which shows operation, proper maintenance, and possible purchases that may be required for replacement parts.
- D. Provide as-built installation plans showing the exact locations of all equipment, including specific cables, lenses, and connections.
- E. Provide site-specific training for the use of the equipment to the selected Owner's representative. Provide specific training for service to the system to the selected Owner's representative.

1.3

GENERAL DESCRIPTION OF THE SYSTEM

- A. The components specified herein provide for analog cameras, sending video signals via appropriately specified cabling to a video network server/station. The video station converts the video from the cameras to compressed .jpeg files. These files are fed through the central computer network to the application server.
- B. The application server provides for access to the files, storage of the files, and allows for remote access from the owner.
- C. The contractor/vender is responsible for a complete operable system including:
 - a) The appropriate camera and lenses selection, specification of appropriate housing and mounting.
 - b) The appropriate camera location and security plan.
 - c) The correct use and specification of cabling and connectors.
 - d) The correct grouping and specification of video server/station.
 - e) The system backup power specification
 - f) The testing and commissioning of the operational system from point at the cameras to the 100baseT connection of the video server/stations.
 - g) The specification of the application server and its back up power supply.
 - h) Other special requirements, which may be required by the project.
 - i) Providing adequate lighting for the cameras field of view.
 - j) Coordination of the CCTV system with the owners Security Manager and the General Contractor.
- D. The contractor will be responsible for the programming of the application server, configuration of cable connections between the video server/station and the network, connections between the application server and the network, and final commissioning of the entire system.

1.4

GENERAL REQUIREMENTS

- A. A sole contractor shall provide and install the complete CCTV system and not be divided amongst multiple vendors. Contractor shall provide a warranty for a period of two years, to include parts and labor, commencing the day of the final acceptance of the operational system by the Owner. Individual pieces of equipment may carry a longer warranty than two years.
- B. The contractor shall refer to the electrical drawings and/or the security drawings for the exact camera location, server, UPS, video server and the conduit location from each individual camera to the central video servers.
- C. This system shall utilize coaxial cable routed between the camera locations and the room housing the video system components. **All cabling shall be plenum rated.**
 - 1. Coaxial cable shall also be utilized for most cameras, unless the distance between the cameras and video servers requires the use of fiber optic cable.
 - 2. This standard shall have a NEMA 3 approved junction box for mounting the converters, transformers, and other electrical gear where mounted in an exterior or high humidity (such as a gymnasium) setting.

- D. The contractor shall install the camera and housing units as per the manufacturer recommendations. Mount housings in secure, vandal resistant manner. All cabling shall be routed in conduit to above j-hook system.
- E. The cameras shall be grouped in units of four cameras each with a video server and UPS power unit serving one group as a whole. The contractor shall provide a stand-alone UPS for power backup of the cameras and video servers.
- F. The analog video signal shall be routed to the video station/servers via coaxial cables with BNC connections. Owner shall validate signal strength at BNC connector to provide acceptable industry standard image quality. The video station/servers will convert the images to a JPEG file and send the converted digital images via a Cat. 6 UTP cable to the nearest patch panel. The video station/servers shall be rack mounted in the nearest IDF closet available. Coordinate this location with the Owner. Each video server requires direct network connectivity to a network switch. Placement of the video server shall be with-in 10ft of network switch. The contractor shall provide the Cat 6 patch cable between the video station/servers and the patch panel.
- G. The contractor shall provide new rack mounted server equipment, and rack mounted UPS, mounted in IDF closet. The power supply distribution shall also be rack mounted. Total system shall not consume more that 10U of rack space. As an alternate installation, the video station/servers, UPS, and power supply distribution may be backboard mounted inside the IDF closet. The Owner will make the choice for the alternative installation. If backboard mounted, the contractor shall provide 3/4", AC plywood painted with intumescent paint, mounted securely to the wall construction. Mount the UPS unit on a secured shelf. Strap the UPS securely to the backboard. Mount the video station/servers on the secured shelves. Strap the video station/servers securely to the shelf.
- H. The contractor shall configure the equipment as acceptable to the Owner.
- I. Electrical power to unit to be a dedicated circuit of 20 amps.

PART 2 - EQUIPMENT

2.1 COLOR CAMERA

- A. Fixed outdoor camera, mounted on Building, Coax Cable: weather and vandal-resistant enclosure, color CCTV camera and varifocal lens with the following minimum features:
 - 1. Resolution: 480 lines.
 - 2. Minimum illumination: 0.075 lux at f/1.4.
 - 3. Manufacturer: Silent Witness, Model V28RC-MGE600. Provide Silent Witness pendant or wall mount kit as required for secure installation. Provide either QLAV1 or QLAV2 varifocal lens.
 - 4. For each school, provide (5) extra outdoor cameras with 500 ft. of cable per camera to be located by the Owner during construction.

(Acceptable manufacturers: i3DVR, Panasonic, Sony, Toshiba, Pelco, and Crest)
- B. Fixed indoor camera: impact-resistant enclosure, color CCTV camera, and lens with the following minimum features:

1. Resolution: 480 lines.
2. Minimum illumination: 0.5 lux at f/1.4.
3. Manufacturer: Silent Witness, Model C14C-MGC600 with either QLAV1 or QLAV2 varifocal lens.
4. For each school, provide (5) extra indoor cameras with 500 ft. of cable per camera to be located by the Owner during construction.

(Acceptable manufacturers: i3DVR, Panasonic, Sony, Toshiba, Pelco, and Crest)

- C. Lens: For all Silent Witness cameras provide the appropriate lens for the field of view desired. The Contractor shall provide alternate size lens at no additional charge to the Owner on Cameras, which does not provide the correct optimum field of view. With the Owner's specific approval, where the background light does not change, the fixed lens listed below can be used. These fixed lenses do not have an auto iris and will not function correctly where a change in background light occurs. The Owner shall be the final judge for the correct size and type of the lens. The preferred lens type is the QLAV1 or QLAV2 varifocal lens. Additional lens are listed below but should only be used in instances where the background lighting is constant 24 hours a day.

Lens Code	Field of View (in degrees)	
	Horizontal	Vertical
029	90	67
036	74	55
060	42	32
080	32	24
120	22	17
160	15	11

2.2

CABLES: (CABLES SHALL BE PLENUM RATED.)

The contractor should acknowledge the specific limitations of cable types. RG59U Coaxial cable should be considered as the system standard unless the cable will be exposed to exterior conditions or conditions which are electronically "noisy" or to other environmental failures. For all exterior locations where there is exposure to lighting or its related problems, (i.e. ground voltage differential) the contractor shall use fiber optic cable for the installation. In areas where there are environmental issues, including low and high temperature, or EMI problems, the contractor shall use fiber optic cables.

- A. Coaxial cables: RG59U Type, 100% sweep tested, cellular polyethylene, fluorinated ethylene-propylene, or foamed Teflon dielectric with a combination braid and foil shield for 100% shield coverage. Maximum loss shall not exceed 1.8 dB per 100' at 50 MHz. Center conductor shall be #20 AWG solid. For more than 400 feet, the contractor shall use RG6 coaxial cable or use fiber optic transmission cable. Cables shall be installed per manufacturer's guidelines.
1. Manufacturer: Alpha, Belden or West Penn.
- B. Category 6 4-Pair Plenum Cable: The cable must be rated for plenum return ceilings. The cable shall be paired, 4 pairs, 24 AWG, Solid BC - bare copper conductors, FEP Fluorinated Ethylene Propylene insulation, unshielded, flexible Flamarrest jacket with nylon ripcord. The jacket should be sequentially marked at two-foot intervals. The cable

shall have a flame rating and test: UL CMP, JL910, C (UL) CMP, DSAFT6. The cable shall be UTP (unshielded). This cable will be used in those instances where a video server/station is located away from an IDF closet or for patch cables.

C. Fiber Optic Transmission Equipment

1. All fiber optic transmission equipment shall be as manufactured by Fiber Options, Inc. or International Fiber Systems, Inc.
2. All fiber optic cable shall be 62.5 micron, multi-mode type fiber, using "st" type connectors. Fiber jacketing shall be selected dependant upon application: aerial, burial, armored, plenum. Provide the type recommended by manufacturer for specific installation and environmental condition.
3. Provide coax cable (RG59U) with bnc connectors between the camera and the fiber optic video transmitter.
4. The contractor shall provide Fiber Options 110V-T video transmitter or equal IFS product at the camera location. The contractor shall provide Fiber Options 112V-R video receiver or equal IFS product at the IDF Closet location. The 110 V-T video transmitters must be environmentalized with its 610p (plug in power supply.) Where multiple cameras are mounted in close proximity, the contractor may elect to provide a two channel transmitters and receivers (use with two multi-mode fibers). Coordinate the exact specification with the Owner.
5. Whenever the unit is mounted outdoors, a NEMA 3 box or Hoffman type box must be supplied.
6. Provide each camera housing with the required 80-100va, 24vac transformer as recommended by the camera manufacturer. Provide power connection to UPS backup.
7. All power cable is provided as part of Section 16 Electrical.
8. Provide samples of cable for approval by owner prior to installation.

D. Control cables: multiconductor, color-coded type, minimum #22 AWG, stranded tinned-copper for energy limited control circuits conforming to NFPA 70-1999, and minimum #14 AWG size, stranded tinned-copper for others. Insulation and jacket may be vinyl, PVC, cross-linked polyethylene. Voltage rating shall be 200, ac or dc, minimum except that where cable is pulled in same raceway with non-energy limited systems, insulations shall be rated 600V minimum.

2.3

CONTROLLER KEYPAD

1. The keypad shall have RS422/RS485 and RS232 communication ports to allow for operation and programming with Calibur DVMR's, and multiplexers. Provide all required cables and programming for operational system.
2. The keypad shall have zone system partitioning to allow viewing of up to 32 zones, with up to 64 cameras in each zone.
3. The keypad shall have security level features so that authorized personnel may program through confidential access codes.

4. The keypad shall have a backlit liquid crystal display and built-in annunciation that alerts user attention is needed when a call-in occurs.
5. Manufacturer Model: Kalatel Model KTD-405.

(Acceptable manufacturers: i3DVR, Panasonic, Sony, Toshiba, Pelco, and Crest)

2.4 VIDEO SERVER/STATION

- A. AXIS Communications Model 2400 video server, BNC video inputs, two serial connections, 4 MB pre/post alarm buffer, 100baseTX fast Ethernet connection.
- B. The Sony Model SNT-V304, BNC video inputs, two serial connections, 4 MB pre/post alarm buffer, 100baseTX fast Ethernet connection.
- C. The Baxall ATM-ENC6-R, ATM-ENC12-R or ATM-ENC6-D with up to 6 composite video inputs, 100baseTX fast Ethernet connection.
 1. Provide enough units for every camera. Provide a minimum of 10 percent spare capacity for future cameras to be added.
 2. Provide shelf mount secured to inside of rack structure inside IDF closets for installation of video server units and UPS. Shelf units shall be providing with hold down clamps to secure video servers firmly to shelf.
 3. See manufacturer recommendations. Provide additional programming to make system operational.
 4. Provide time stamp and text overlay, and remote configuration,
 5. Provide additional wiring and configuration for four opto-isolated alarms for event trigger actions.

(Acceptable manufacturers: i3DVR, Panasonic, Sony, Toshiba, Pelco, and Crest)

2.5 APPLICATION SERVER

- A. The system shall be capable of storing video data for a minimum of 20 days.
- B. The contractor shall furnish and install the application server. The contractor shall provide the computer server as specified with all shipping records to the owner.
- C. HP ProLiant DL380 G3 with Xeon 2.8Ghz processor, rack mountable application server.

Processor Intel Xeon Processor 2.80 GHz-512KB

Cache Memory 512-KB second level ECC cache (full speed)

Chipset	ServerWorks GC -LE Chipset	
Memory	Standard	512 MB of 2-way interleaved capable PC2100 DDR SDRAM running at 200MHz, with Advanced ECC capabilities and Online Spare capabilities
Network Controller	Two Compaq NC7781 PCI-X Gigabit NICs (embedded) 10/100/1000 WOL (Wake on LAN)	
Expansion Slots	I/O (3 Total, 3 available)	PCI Voltage:
	64-bit/100 MHz Hot Plug PCI 2	3.3 Volt or universal cards
	64-bit/133 MHz Non Hot Plug PCI 1	
Storage Controller	Smart Array 5i Plus Controller (integrated on system board)	
Storage	Diskette Drives	1.44 MB
	CD-ROM	24x IDE CD-ROM (Universal Media Bay)
	Hard Drives	6 x 72.8 GB Wide Ultra3 1"
Interfaces	Serial	1
	Pointing Device (Mouse)	1
	Graphics	1
	Keyboard	1
	External SCSI (VHDCI)	1
	Network RJ-45	3 (1 for iLO)
	USB	2
Graphics	Integrated ATI Rage XL Video Controller with 8-MB SDRAM Video Memory	

Form Factor	Rack (2U), (3.5-inch)	
ProLiant Essentials Foundation Pack Software	Insight Manager 7	Insight Manager 7 helps maximize system uptime and performance and reduces the cost of maintaining the IT infrastructure by providing proactive notification of problems before those problems result in costly downtime and reduced productivity. Insight Manager 7 is easy to set up and provides rapid access to detailed fault and performance information gathered by the Management Agents. One-click-access to the Integrated Lights-Out or Remote Insight Lights Out Edition board allows systems administrators to take full graphical control of ProLiant servers in remote locations or lights-out data centers. Finally, Insight Manager 7 in concert with the Version Control Agents and Version Control Repository Manager enables systems administrators to version manage and update system software across groups of ProLiant servers.
The contractor shall provide all of the software list here:		
The contractor shall provide all of the software list here:	SmartStart	SmartStart is a tool that simplifies server setup, providing a rapid way to deploy reliable and consistent server configurations.
The contractor shall provide all of the software list here:	Management Agents	The Management Agents form the foundation for HP's Intelligent Manageability strategy. They provide direct, browser-based access to in-depth instrumentation built into HP servers, workstations, desktops, and portables, and send alerts to Insight Manager 7 and other enterprise management applications in case of subsystem or environmental failures.
The contractor shall provide all of the software list here:	<i>ActiveUpdate</i> [™]	ActiveUpdate is a web-based application that keeps IT managers directly connected to HP for proactive notification and delivery of the latest software updates.
The contractor shall provide all of the software list here:	<i>ROMPaq</i> [™] , support software, and configuration utilities	The latest software, drivers, and firmware fully optimized and tested for your ProLiant server and options.
The contractor shall provide all of the software list here:	<i>Survey Utility</i> [™] and diagnostics utilities	The most advanced configuration analysis, reporting and troubleshooting utilities used by HP and at your fingertips.
The contractor shall provide all of the software list here:	ProLiant Essentials Value Packs	Optional software offerings that selectively extend the functionality of an Adaptive Infrastructure to address specific business problems and needs: <ul style="list-style-type: none"> • Rapid Deployment Pack – an automated solution for multi-server deployment and provisioning, enabling companies to quickly and easily adapt to changing business demands. • Workload Management Pack – provides easier management of complex environments, improving overall server utilization and enabling Windows® 2000 customers for the first time to

confidently deploy multiple applications on a single multiprocessor ProLiant Server.

- Integrated Lights-Out Advanced Pack – upgrades the Integrated Lights-Out processor to full virtual presence and control with graphical console and virtual media
- Recovery Server Option Pack – entry-level high availability software that will provide reliable protection and increased uptime against server hardware and operating system failures.

Industry Standard Compliance

ACPI 1.0b Compliant
PCI 2.2 Compliant
WOL Support
Microsoft® Logo™ certifications
USB version 1.1

Manageability

Insight Manager 7
Redundant ROM
Remote Flash ROM
Integrated Lights Out Support
Management Agent
Automatic Server Recovery (ASR)
Remote Insight Lights-Out Edition II (optional)
Integrated Management Log
Drive Parameter Tracking (with Smart Array Controllers)
Dynamic Sector Repairing (with Smart Array Controllers)
Off-Line Backup Processor capability
Pre-Failure Warranty (covers processors, hard drives and memory)

Security

Power-on password
Keyboard password
Diskette drive control
Diskette boot control
QuickLock, Network Server Mode
Serial interface control
Administrator's password
Disk configuration lock

Server Power Cords

One Lowline power cord ships standard

Power Supply

400 Watt, CE Mark Compliant
Optional Hot Plug AC Redundant Power Supply and DC Redundant Power Supply

System Fans

8 fans total. In addition to the 5 fans that ship standard, provide [Option](#)

Kit PN 293048-B21 for a total of 8 supported internally

Required Cabling	Provide all required cabling
OS Support	Microsoft Windows 2000 server
Rack Airflow Requirements	Contractor shall ensure adequate air flow around server
UPS interface	SNMP Serial Port Card for support of rack mounted UPS, provide appropriate cables for remote control of UPS unit

Service and Support Provide CarePaq three year, on-site 9x5 four hour service contract

Dimensions (HxWxD)	3.38 x 17.50 x 25.75 in/ 8.59 x 44.45 x 65.41 cm
Weight	60 lb/27.22 kg
Input Requirements (per power supply)	Range Line Voltage 90 to 132 VAC/180 to 265 VAC Nominal Line Voltage 100 to 120 VAC/220 to 240 VAC Rated Input Current 6A (110V) to 3A (220V) Rated Input Frequency 50 to 60 Hz Rated Input Power 600W
BTU Rating	1,475 BTU/HR
SCSI Connectors	One external VHDCI connector
Power Supply Output Power (per power supply)	Rated Steady-State Power 400W Maximum Peak Power 400W
Temperature Range	Operating 50° to 95°F/10° to 35°C
Relative Humidity	Operating 10% to 90%

2.6 MISCELLANEOUS EQUIPMENT

- A. CCTV Camera Power Supply, and UPS - Location at video server and UPS unit: Provide one rack mounted power supply and UPS for each video server. Turn equipment over to owner for installation in Owner's IDF Closet.
 - 1. The power supply shall provide 8 isolated 24 VAC outputs that can power devices requiring 1 amp or less. Manufacturer: Kalatel Model KTP-24-8.

(Acceptable manufacturers: i3DVR, Panasonic, Sony, Toshiba, Pelco, and Crest)
 - 2. A 25-pin Anthonol breakaway cable shall be provided to allow the head-end equipment to be relocated in easy fashion.
 - 3. UPS Power Backup- For the units providing power to interior cameras, provide one, American Power Conversion, Smart UPS 700VA RM 2U 120V, part number SU700RM2U in each IDF Closet, for EACH video server. For units providing power to the pan/tilt/zoom exterior cameras, provide one American Power Conversion, Smart UPS 1000VA RM 2U 120V, part number SU1000RM2U.
 - 4. Provide additional power cables as required to connect all equipment. Provide additional transformers and power interfaces as required.
- B. UPS Power Supply for Application server. Turn equipment over to owner for installation in Owner's IDF Closet.
 - 1. Provide one rack mounted, Compaq UPS R1500 XR 120volt power backup. (1440VA, 1340 watt)
 - 2. Provide associated power and interface cables to server. Provide other cables as required for proper installation.

2.7 PROFESSIONAL PLASMA DISPLAYS

- A. Acceptable Manufacturers: Panasonic, Sharp.
- B. Provide (1) Panasonic model TH-42PF20U, 1080P 42" Plasma display for each school. Provide (1) Chief model PST2458 plasma wall mounting bracket for each display. The display shall be installed in the school office area at a spot coordinated with the Owner's representative. The display shall be interlocked with the CCTV system and shall be capable of displaying video for a minimum of 16 cameras utilizing split screen function. Cameras to be displayed shall be adjustable via LAN/WAN, web and Pocket PC handheld devices.

PART 3 - INSTALLATION

3.1 INSTALLATION

- A. Carefully plan and locate all conduit to create a neat workmanlike appearance. Conduits shall be tight to corners and plumb.
- B. Camera mounts are located on various surfaces, and care must be taken to neatly provide holes for conduit, locate electrical service in a logical and orderly manner.

- C. Equipment located at the IDF Closet shall not be installed until the rest of the CCTV system is completely constructed.
- D. The Contractor shall coordinate final completion and coordination of the CCTV work with CCTV installer. When finished conduct a preliminary test to verify proper operation of all equipment.
- E. Provide dedicated power supply of 20 amps to all equipment. All 120VAC circuits will be provided by the electrical contractor as needed by the CCTV contractor. Provide circuits as requested by CCTV contractor to nearest 208/120 Volt panelboard with spare space available for the number of 20A/1P circuits requested.

3.2

TESTING

- A. Contractor shall demonstrate to Owner the proper operation of the entire CCTV system from the IDF Closet. The contractor shall demonstrate operation of the system.

END OF SECTION 16210

SECTION 16220

CONSTRUCTION REVIEWS INSPECTION AND TESTING

1.01 GENERAL

- A. Comply with Division 1 - General Requirements.

1.02 CONSTRUCTION REVIEWS

- A. The Architect or his representative shall observe and review the installation of all electrical systems shown on the drawings and as specified herein.
- B. Before covering or concealing any conduit below grade or slab, in wall or above ceiling, the contractor shall notify the Architect so that he can review the installation.

1.03 CONTRACTOR'S FINAL INSPECTION

- A. At the time of the Contractor's final inspection, all systems shall be checked and tested for proper installation and operation by the Contractor in the presence of the Architect or his representative.
- B. The Contractor shall furnish the personnel, tools and equipment required to inspect and test all systems.
- C. Following is a list of items that the contractor must demonstrate to the Architect or his representative as complying with the plans and specifications. Please note that this list does not necessarily represent all items to be covered in the final inspection, but should give the Contractor an idea of what is to be reviewed.
 - 1. Demonstrate that all panels have breakers as specified, ground bar, copper bus, typed directory for circuit identification and that they are free of trash.
 - 2. Demonstrate that all conduits are supported as required by the National Electrical Code.
 - 3. Demonstrate that all outlet boxes above or on the ceiling are supported as required by the National Electrical Code.
 - 4. Demonstrate that outlet boxes in wall or ceilings of combustible materials are flush with surface of wall or ceiling, and that outlet boxes in walls or ceilings of non-combustible materials are so installed that the front edge of the box or plaster ring is not set back more than 1/4".
 - 5. Demonstrate that outlet boxes in wall are secure.
 - 6. Demonstrate that all devices are properly secured to boxes, that device plates are properly aligned and are not being used to secure device.
 - 7. Utilizing a Woodhead No. 1750 testing device, demonstrate that all 125 volt receptacles are properly connected.
 - 8. Demonstrate that all fixtures have specified lamps, ballast and lens, and that they are supported as required by the National Electrical Code or as called for on the drawings or in the specifications.
 - 9. Demonstrate that all disconnects requiring fuses are fused with the proper size and type, and that all disconnects are properly identified.
 - 10. Demonstrate that Fire Alarm System is in proper working order, initiating an alarm signal from each manual and automatic device (including smoke detectors).
 - 11. Demonstrate that all other systems specified are in proper working order, and meeting all requirements outlined in specifications.

END OF SECTION 16220

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