EXCHANGE
ARMY & AIR FORCE EXCHANGE SERVICE

82nd AIRBORNE MINI-MALL EXPANSION

FORT BRAGG, NORTH CAROLINA

PROJECT SPECIFICATIONS

AAFES PROJECT NUMBER 0530-06-000005

PREPARED BY:

MORRIS & ASSOCIATES
12715 TELGE ROAD
HOUSTON, TX. 77429
TEL (281) 855-6433
FAX (281) 858-4304

REGISTERED ARCHITECT
JOHN D LINTON
21410
STATE OF TEXAS

6/8/12

SOLICITATION DOCUMENTS
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SECTION 00404

SUBSTITUTION SHEET

PART 1 GENERAL

1.1 CONTRACTING OFFICERS APPROVAL

A. The contract is based on materials and methods described in the contract document.

B. The Contracting Officer will consider proposals for substitution of materials, equipment and methods only when such proposals are accompanied by full and complete technical data and all other information required by the Contracting Officer to evaluate the proposed substitution.

C. Do not substitute materials or equipment, unless such substitution has been specifically approved for this Work by the Contracting Officer.

D. Requests for substitution must be made 10 days prior to bid proposals due date, in which case the bidder shall not be liable for costs of the Contracting Officers review, or at any time following award of Contract, in which case, however, the contractor shall be liable for costs described in Section 1.4, below.

1.2 “OR EQUAL”

A. Where the phrase “or equal” or “equal as approved in advance by the Contracting Officer”occurs in the Contract Documents, does not assume that material and equipment will be approved as equal by the Contracting Officer unless the item has been specifically approved for this work by the Contracting Officer.

B. The decision of the Contracting Officer shall be final.

1.3 AVAILABILITY OF SPECIFIED ITEMS

A. Verify prior to bidding that all specified items will be available in time for installation during orderly and timely progress of the Work.

B. In the event specified item or items will not be so available, notify the Contracting Officer prior to receipt of bids.

C. Costs of delays because of non-availability of specified items, when such delays could have been avoided by the Contractor, will be back-charged as necessary and shall not be borne by the AAFES,

1.4 AFTER THE CONTRACT IS AWARDED, NO FURTHER SUBSTITUTIONS WILL BE PERMITTED

END OF SECTION

SECTION 01011

SUMMARY OF PROJECT

PART 1 - GENERAL

1.1 STATEMENT OF WORK

A. The work covered by these specifications consists of furnishing all plant, supervision, labor, equipment, materials and incidentals necessary to perform all operations required to complete the work, all in accordance with these specifications and the applicable drawings, and subject to the terms and conditions of the contract.

1. This Project is a LEED Certified Project in accordance with the USGBC LEED 2009 Green Rating Building System for New Construction. The Contractor is advised that all contractors, subcontractors, vendors, material suppliers, and manufacturers performing work on this Project shall make every attempt to work toward and achieve this LEED Certification goal.

B. The work to be performed is located at The 82nd Airborne Shoppette, Fort Bragg, North Carolina.

C. Principal Features: The work to be performed in connection with this project includes, but is not limited to the following:

1. Demolition of existing asphalt pavement and concrete curb and gutter.
2. Demolish existing building as required for expansion and renovation.
3. Addition of a 13,000 sf Level 2 Shoppette building in place of existing Troop Store.
4. Existing Food Court to be expanded with additional food concepts and upgrade to existing concepts to a total building area of 16,500 sf.
5. Installation of masonry wall dumpster enclosure.
6. Installation of area site lighting.
7. Installation of asphalt/ concrete paving areas with concrete curb and gutter and associated concrete walks.
8. The project is to be constructed in 3 separate Phases of work laid out in the Phasing plan drawings.

D. The Contractor will be responsible during all phases of construction to track all items per the LEED requirements of certification during construction as set forth to obtain LEED certification for the project.

E. The Contractor is advised to take note of the following General Provisions of the Contract: Cleaning up; Material and Workmanship; Accident Prevention; Protection of Existing Vegetation, Structures, Utilities and Improvements; Operation and Storage Areas; Site Investigation; Permits and Responsibilities. Copies of the General Provisions may be obtained from the Contracting Officer.

1.2 SPECIAL BASE REQUIREMENTS

A. General working hours on Post are from 7:00 A.M. to 4:00 P.M.

B. No streets will be blocked without Post headquarters approval.

C. Contractor shall immediately clean up any debris tracked on to the Post streets resulting from this construction operation.

D. Construction areas including equipment storage areas shall be kept clean and neat.

E. No burning is permitted on the Post.

F. Due to the unique nature and schedule of this particular project the Contractor may likely be required to work after hours. The Contractor shall coordinate his work schedule closely with the AAFES store manager and notify the Post's Military Police prior to performing work after normal duty hours.

1.3 UTILITIES (WATER, GAS AND ELECTRICITY)

A. Existing hose bibbs will be used to obtain water for this project. The Contractor will directly be charged for consumption of utilities (water, gas and electricity) refer to Section 01510, for Temporary Utilities.

1.4 LAYING OUT WORK

A. Dimensions and elevations indicated in layout of work shall be verified by the Contractor. Discrepancies between drawings, specifications, and conditions shall be referred to the Contracting Officer in writing for adjustment before work affected is performed. Failure to make such notifications shall place responsibility upon the Contractor to carry out work in a satisfactory and workmanlike manner.

B. The Contractor shall be held responsible for the location and elevation of all the construction contemplated by the construction documents.

C. Prior to commencing work, the Contractor shall carefully compare and check all Architectural, Structural, Mechanical, and Electrical drawings, each with the other, that in any way affect the locations of elevation of the work to be executed by him, and should any discrepancy be found, he shall immediately report the same to the Contracting Officer for verifications and adjustment. Any duplication of work made necessary by failure or neglect on the Contractor's part to comply with this function shall be done at his sole expense.

D. The drawings accompanying these specifications indicate generally the design and arrangement of all apparatus, fixtures, accessories, etc. necessary to complete the work required. The exact location or arrangement of equipment is subject to minor changes necessitated by field conditions and shall be made as required without additional cost to AAFES. Measurements shall be verified by actual observations at the construction site, and the Contractor shall be responsible for all work fitting into place in a satisfactory and workmanlike manner meeting the approval of the Contracting Officer.

1.5 EXISTING OVERHEAD OR UNDERGROUND WORK

A. Carefully check the site where this project is to be erected and observe any overhead wires and equipment. Any such work shall be moved, replaced, or protected, as required, whether or not shown or specified.

B. Attention is directed to the existence of pipe and other underground improvements which are shown on the drawings. All reasonable precautions shall be taken to preserve and protect all such improvements shown on the drawings.

C. Locations of underground lines, shown on the drawings, are based on the best available sources, but are to be regarded as approximate only. Exercise extreme care in locating and identifying these lines before excavating in adjacent areas.

1.6 INTERRUPTION OF EXISTING UTILITIES SERVICES

A. The Contractor shall perform the work under this Contract with a minimum of outage time for all utilities. Interruption shall be by approved section of the utility. In some cases, the Contractor may be required to perform the work while the existing utility is in service. The existing utility services may be interrupted only when approved by the Contracting Officer. When it is necessary to interrupt the existing utilities, the Contractor shall notify the Contracting Officer and facilities engineer in writing at least seven days in advance of the time he desires the existing service to be interrupted. The interruption time shall be kept to a minimum. Depending upon the activities at the facility which require continuous service from the existing utility, an interruption may not be subject to schedule at the time desired by the Contractor. In such cases the interruption may have to be scheduled at a time of minimum requirement of demand for the utility. The amount of time requested by the Contractor for interruption of existing utility services shall be as approved by the Contracting Officer.

1.7 EXCAVATION

A. Prior to commencing any excavation work the Contractor shall obtain a valid Excavation Permit, from the Facilities Engineers Office. It shall be the Contractor's responsibility to obtain the necessary signatures and coordination for the permit.

1.8 WELDING PERMIT

A. Prior to commencing any welding, the Contractor shall obtain a welding permit from the Facilities Engineer's or Fire Department.

1.9 BARRICADES AND WARNING DEVICES

A. The Contractor shall provide barricades and lighting devices, in accordance with Manual for Uniform Traffic Control Devices by the State Department of Transportation, latest Edition, at all points of excavation and construction in vehicle traffic areas.

1.10 PROTECTION FOR OPEN FLAME DEVICES

A. When open flame and/or spark producing devices, i.e., acetylene oxygen welding equipment, electric arc welding, etc., are employed for job accomplishment, the following procedures are mandatory:

1. Inspect all surroundings and equipment to insure that combustible substances are not present in any area where contact of metal at a temperature above the flashpoint of any compound is possible.

2. Ensure that no open containers or spills of combustible substances are present.

3. Ensure that ignition is not possible by conduction, convection, radiation, or dispersion of molten metal.

4. Proper protection equipment and practices will be used, i.e., fireproof blankets, wetting of surrounding area, removal o combustible materials where practicable, earth filled backing and portable fire extinguishers of proper type on hand.

5. When the above devices are being used notify the Post Fire Department 24 hours ahead of usage.

1.11 FIRE PROTECTION

A. The Contractor shall at all times maintain good housekeeping practices to reduce the risk of fire damage. All scrap materials, rubbish, and trash shall be removed daily from in and about the building and shall not be permitted to be scattered on adjacent property.

B. Suitable storage space shall be provided 50 feet minimum outside the building area for storing flammable materials and paints; no storage will be permitted in the building. Excess flammable liquids being used inside the building shall be kept in closed metal containers and removed from the building during unused periods.

C. A contractor shall provide a fire extinguisher at each location where cutting and welding is being performed. Where electric or gas welding or cutting is done, interposed shields of incombustible material shall be used to protect against fire damage due to sparks and hot metal. When temporary heating devices are used, a watchman shall be present to cover periods when other workmen are not on the premises.

D. The Contractor shall provide fire extinguishers in accordance with the recommendations of NFPA No. 10 and 241. However, in all cases a minimum of four fire extinguishers shall be available for each building.

E. Fire Codes: The Contractor shall obey all requirements of the National Fire Codes, and Post Fire Regulations, as they relate to his work on the Post.

1.12 WORK BY OTHERS (IF APPLICABLE)

A. Work not included: Except for such auxiliary work as is shown or specified or is necessary as a part of the construction, the following work is not included in the Contract:

1. Any work shown, but marked "NOT IN CONTRACT" (N.I.C.).
2. Any work indicated to be furnished and installed by the Exchange.
3. Any work indicated to be furnished and installed by the Vendors or Concessionaires.

1.13 AAFES-FURNISHED AND INSTALLED EQUIPMENT

A. See Specification Section 01017: AAFES Furnished and Installed Equipment.

1.14 AAFES FURNISHED-CONTRACTOR INSTALLED EQUIPMENT

A. See Specification Section 01018: AAFES Furnished Contractor Installed Equipment.

1.15 LINING OF JOINTS IN FINISH MATERIALS

A. It shall be the responsibility of the Contractor to make certain in the installation of jointed floor, wall, and ceiling and pavement materials that:

1. The joints line through in a straight line and in both directions wherever possible.

2. The joints relate to all openings and breaks in the structure and be symmetrically placed wherever possible. This includes heating registers, light fixtures, equipment, etc.

3. If, because of the non-related sizes of the various materials and locations of openings, etc., it is not possible to accomplish the above, the Contractor shall

meet with the Contracting Officer to determine the most satisfactory arrangement. The Contractor shall establish center lines for all trades.

1.16 INTEGRATING WORK

A. All streets, buildings, and other improvements shall be protected from damage.

B. Contractor's operations shall be confined to the immediate vicinity of the project work and shall not in any way interfere with or obstruct the ingress or egress to and from street or adjacent property.

C. If new work is to be connected to existing work, special care shall be exercised not to disturb or damage the existing work more than necessary. All damaged work shall be replaced, repaired, and restored to its original condition at no cost to the Exchange Service.

1.17 HEADROOM UNDER PIPES

A. All horizontal runs of plumbing and heating pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance, but in no case shall this clearance be less than 7'-0" without written consent from the Contracting Officer. Where piping or conduit is left exposed within a room, the same shall run true to plumb, horizontal or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.

1.18 PATCHING GOVERNMENT-OWNED FACILITIES

A. Government-owned structures, facilities, streets, curbs, walks, etc., that are damaged or removed due to required excavations or other construction work, shall be patched, repaired or replaced, and be left in their original state of repair by the Contractor, to the satisfaction of the Contracting Officer and of authorities having jurisdiction thereof.

1.19 LOCATION OF EQUIPMENT AND PIPING

A. Drawings showing location of equipment, piping, ductwork, etc., are diagrammatic and job conditions shall not always permit their installation in the location shown. When this situation occurs, it shall be brought to the Contracting Officer's attention immediately and the relocation determined in a joint conference. The Contractor will be held responsible for the relocating of any items without first obtaining the Contracting Officer's approval. He shall remove and relocate such items at his own expense if so directed by the Contracting Officer.

1.20 OVERLOADING

A. The Contractor shall be responsible for not overloading any part or parts of structures beyond their safe calculated carrying capacities by placing of materials, equipment, tools, machinery, or any other item thereon. No loads shall be placed on floors or roofs before they have attained their permanent and safe strength.

1.21 STANDARDS

A. Any material specified by reference to the number, symbol, or title of a specific standard such as Commercial Standard, a Federal Specification, a trade association standard, or other similar standard shall comply with the requirements in the latest revision thereof, and any amendment or supplement thereto, in effect on the date of invitation for

proposals, except as limited to type, class, or grade, or modified in such reference, and except as otherwise indicated.

B. The standard referred to, except as modified in the specifications, shall have full force and effect as though printed in these specifications. These standards are not furnished to bidders for the reason that the manufacturers and trades involved are assumed to be familiar with their requirements.

1. Where Federal Specifications are referred to as a measure of quality and standard, they refer to Federal Specifications established by the Procurement Division of the United States Government and are available from the Superintendent of Documents, U.S. Government Printing Office.
2. Where Federal Specification numbers are used, they refer to the latest edition including amendments thereto.
3. Where Commercial Standards are referred to as a measure of quality, standard, and method of fabrication, they refer to Commercial Standards issued by the U.S. Department of Commerce.
4. Where ASTM Serial Numbers are used, they refer to the latest tentative specifications, standards specifications, standards methods, or standard method of testing issued by the American Society for Testing and Materials.

1.22 CERTIFICATE OF CONFORMANCE

A. Except where tests and/or inspections in connection with structural materials are specified or required by applicable laws, rules, and regulations, manufacturer's certificate covering conformance with the requirements of the above mentioned Federal Specifications and Commercial Standards may be acceptable in lieu of such items. Such certificates shall be furnished to the Contracting Officer for all items so specified.

1.23 OCCUPANCY BY THE EXCHANGE

A. AAFES shall reserve the right and privilege of partial occupancy during and prior to the absolute completion of the total work. Access shall be allowed at all times to the Exchange and its own Contractors in the endeavor.

1.24 TESTS AND REPORTS

A. See Specification Section 01410: Testing Services.

1.25 REFERENCES

A. All references to the word "Government" or “Exchange” in the specifications shall mean Army and Air Force Exchange Service (AAFES).

B. Wherever the word "provide" is used in the Contract Documents as a directive, it shall be interpreted as meaning "provide and install completely and ready for use".

C. Definitions:

1. Vendor: Person or persons selling any material item.
2. Base, Post or Facility: Location on which Exchange is being remodeled.
3. Concessionaire: Person who is directly responsible for the lease of and operation of the concessions such as Beauty Shop, Barber Shop, and Laundry/Dry Cleaners.
4. Architect-Engineer: That person or firm responsible for preparing the working drawings and specifications.

5. AAFES or Exchange: Army and Air Force Exchange Service.
6. Inspection Agency: Project Inspector contracted by AAFES.

1.26 TOXIC MATERIALS

A. Removal or disposal of toxic materials or asbestos is not included in this contract. If the Contractor encounters such materials, he shall immediately notify the Contracting Officer.

1.27 SUBMISSION OF PHOTOGRAPHS

A. Contractor shall submit to the Contracting Officer photographs taken on or about the first of every month, showing the general conditions of the work as viewed from the north, south, east, west and interior. Photographs (one disk with a minimum of 20 digital images) must accompany each Application for Payment. Each image shall have a date stamp. The disk should then contain a document file with a description of the location and direction of each photograph. The disk shall then be labeled with the project title, and AAFES Project Number. The Contractor may also submit a video of the above requirements as an option to photographs.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01017

AAFES FURNISHED AND INSTALLED EQUIPMENT

PART 1 GENERAL

1.1 AAFES FURNISHED AND INSTALLED PROPERTY (AF/AI)

A. Property: Property is indicated on the drawings.

B. Schedule: Contractor shall schedule early completion of designated areas for beneficial occupancy by AAFES usage prior to completion of entire project.

C. AAFES will furnish and install equipment as indicated on Fixture Plan in the drawings.

D. Contractor's Duties:

1. Provide access for AAFES personnel.
2. Coordinate work and cooperate with the installers of the property so that installation can be accomplished in accordance with construction schedule.
3. Provide mechanical and electrical connections to equipment and building systems where indicated on the drawings and in the specification.
4. Provide security of designated areas.
5. Provide and install all Burger King, Popeye's, Taco Bell, Anthony's Pizza, Subway, Charley's Subs, and Dunkin Donuts equipment and finishes as shown on the their respective equipment / fixture layout plan drawings.

E. AAFES Duties:

1. Inspect designated area prior to use and issue statement of acceptance of area for installation of property.
2. Make final mechanical and electrical connections between property and building systems where indicated on the drawings and/or in the specifications.
3. Provide custodial services for designated areas during use after beneficial occupancy.

1.2 DELIVERY DATE CHANGES

A. Requests by Contractor to change designated delivery dates shall be made in writing at least 30 days in advance of the designated delivery date. If the Contractor is not ready to accept delivery of AAFES furnished property the Contractor shall be responsible for storage and redelivery cost. Should AAFES be unable to effect the change, or should the Contractor fail to submit his request within the time stated above, the Contractor's obligation under this contract and as stated herein shall not be relieved and further, the Contractor will have no basis upon which he can file a claim under these conditions.

1.3 AAFES ACTIVITIES AFFECTING PROGRESS OF WORK:

A. Retail Sales Areas: Schedule date of installation of fixtures and possession of these areas 30 days prior to completion of project.

B. Serving Areas & Food Preparation Areas: Schedule date of use and possession of food preparation serving areas 30 days prior to completion of project.

C. MPA: Schedule date of installation of storage shelving and equipment 30 days prior to completion of project.

D. Construction in each area at date scheduled for its use and possession by AAFES shall be sufficiently complete, in accordance with Contract Documents, so the AAFES may occupy the area for the use for which it is intended. Comply with Contract Clauses titled inspection of Construction, and Use and Possession Prior to Completion.

1.4 ACCEPTANCE OF AREAS FOR BENEFICIAL OCCUPANCY

A. Inspection: Prior to acceptance by AAFES of an area for beneficial occupancy, the Contracting Officer will conduct an inspection of the specific area. A list of deficiencies will be provided to the Contractor.

B. Acceptance: If the Contracting Officer determines the specific area is sufficiently complete for beneficial occupancy by AAFES, the area will be accepted in writing with the exception of the deficiencies listed. The deficiencies listed shall be completed or corrected prior to final acceptance at the completion of the project.

C. Damage: Damage resulting from AAFES' use will not be considered the Contractor's responsibility.

D. Refer to clause entitled "Final Inspection and Acceptance" of the AAFES "General Provisions".

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01018

AAFES FURNISHED CONTRACTOR INSTALLED EQUIPMENT

PART 1 GENERAL

1.1 AAFES FURNISHED/CONTRACTOR INSTALLED EQUIPMENT (AF/CI):

A. AAFES furnished/Contractor installed equipment shall be handled in accordance with the "Army and Air Force Exchange Service General Provisions" clause entitled "AAFES Furnished Property".

B. AAFES Furnished Equipment: AAFES will furnish the equipment indicated for installation by the Contractor, as follows:

1. AAFES Furnished/Contractor Installed Items:

a. Point of Sales (POS) System
b. “Snack Avenue” equipment
c. All Shoppette product gondolas
d. All shelving in MPA, GNC and Food prep areas as shown on drawings. As well as, shelving storage racks in AF/AI cooler/freezer units.
e. ATM machine.
f. Ice maker machine unit
g. Bailer machine unit
h. Barber Shop equipment and stations

C. Contractor's Duties:

1. Designate required delivery date for each product. Notify the Contracting Officer in writing at least 60 days in advance of the date that AAFES furnished equipment and furnishings will be needed.
2. The equipment will be received at the job site by a representative of AAFES who will jointly, with the Contractor, verify condition and quantities. The representative will then effect receipted transfer of custody of the equipment to the Contractor.
3. Unload, handle, store (on-site), protect, uncrate, assemble, install set in final position, align, join, level, and make all utility connections to all items of equipment. Installation shall be performed in accordance with the specifications, equipment plans, and schedules shown on the Drawings and the rough-in drawings provided by AAFES.
4. Construct all openings, furnish and install required sleeves and furnish and install all reinforcing, miscellaneous supports, angles, plates, anchors, and bolts necessary to secure AAFES furnished equipment in place.
5. Repair or replace items damaged as a result of Contractor's operations.
6. Apply finish indicated, if any.
7. The installation shall be complete in all respects, including mechanical and electrical hook ups, and put into good operating condition.

D. AAFES Duties:

1. Deliver all AAFES furnished items to the job site. Schedule delivery date with supplier in accordance with Progress Chart.
2. Provide Contractor with installation drawings and instructions.

2.1 DELIVERY DATE CHANGES:

A. Requests by Contractor to change designated delivery dates shall be made in writing at least 60 days in advance of the designated delivery date. If the Contractor is not ready to accept delivery of AAFES furnished equipment the Contractor shall be responsible for storage and delivery cost. Should AAFES be unable to effect the change, or should the Contractor fail to submit his request within the time stated above, the Contractor's obligation under his contract and as stated herein shall not be relieved and further, the Contractor will have no basis upon which he can file a claim under these conditions.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01039

PROGRESS MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre Construction Meeting.

B. Progress Meeting.

1.2 RELATED SECTIONS

A. Section 01011 - Summary of Project

B. Section 01300 - Submittals

C. Section 01720 - Project Record Documents

1.3 PRECONSTRUCTION MEETING

A. The Contracting Officer will schedule and preside at preconstruction meeting.

B. Attendance Required:

1. Contracting Officers and other Headquarters AAFES representatives.
2. Local and regional AAFES representatives.
3. Installation representative (Engineering, Fire Department, Security, etc.)
4. Contractor
5. Major Sub-contractors

C. Agenda:

1. Execution of Notice to Proceed.
2. Distribution of Contract Documents.
3. Submission of list of sub-contractors.
4. Review of AAFES checklist of contract requirements.
5. Discussion of Schedule.
6. Discussion of critical sequencing.
7. Designation of responsible personnel.
8. Processing of field decisions and change orders.
9. Submission of applications for payment.
10. Submittal of shop drawings.
11. Procedures for maintaining record documents.
12. Fire and safety procedures.
13. Security procedures.
14. Accident prevention and reports.
15. Housekeeping procedures.
16. Use of premises:
    a. Office and storage locations.
    b. Personnel parking.
    c. Utility availability.

17. Major equipment deliveries.
18. Other issues pertinent to completing the contract.

D. Meeting minutes: Minutes will be taken by the Architect/Engineer and distributed to AAFES, Contractor, and Installation Engineer.

1.4 PROGRESS MEETINGS

A. The contractor shall schedule and preside at monthly progress meetings.

B. The contractor shall make arrangements for meetings, prepare agenda with copies for participants.

C. Location of Meetings: Construction office, or as directed in the notice.

D. Attendance Required:

1. Contractor's project manager.
2. Contractor's superintendent.
3. Major sub-contractors and suppliers.
4. AAFES representative (AAFES' option).

E. Agenda:

1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems and decisions.
4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Coordination of projected progress.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Other business relating to work.

F. Meeting Minutes: Architect/Engineer shall record meeting minutes, and distribute copies to the participants (including the AAFES Contracting Officer, within three (3) business days of the meeting.

PART 2 PRODUCTS

A. Section Not Used.

PART 3 EXECUTION

A. Section Not Used.

END OF SECTION

SECTION 01060

SAFETY POLICIES AND PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contractor required health and safety plan.

1. Contractor is responsible for the Job Safety and Health Plan.
2. Contractor must maintain OSHA permissible exposure limits related by the risk assessment.

B. Construction Hazard Plan.

1.2 RELATED SECTIONS

A. Environmental Protection - Section 01400.

B. Submittals - Section 01300.

C. Project Record Documents - Section 01720.

D. Material Safety Data Sheets for each chemical to be used on the project.

1.3 REFERENCES

E. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1. U.S. Army Corps of Engineers Publication: EM 385-1 Safety and Health Requirements Manual
2. OSHA 29 CFR 1910
3. OSHA 29 CFR 1926
4. National Fire Protection Code, Section 70
5. National Electric Code
6. Life Safety Code

1.4 SUBMITTALS

A. Submittals for AAFES approval - The following items shall be submitted for AAFES approval:

1. Designation of Safety Representative: The Contractor shall designate in writing a qualified OSHA trained employee responsible for the overall supervision of all accident prevention activities. Duties shall include ensuring applicable safety requirements of OSHA 29 CFR 1910 and 29 CFR 1926 are incorporated into work methods and inspecting the job site to ensure that safety measures and instructions are actually being applied. This person shall be on site at all time that work is in progress.
2. The Contractor shall be trained in OSHA procedures and shall be responsible to ensure that procedures are complied with. All other employees performing site work will meet OSHA training requirements for their job capacity.

B. Submittals for Information Only - The following items shall be Contractor certified:

1. Job Hazard Analysis: Contractor shall develop a job hazard analysis for presentation at the pre-construction conference. The Contractor's job hazard analysis shall list potential hazards that could arise during the course of the work. For each hazard, the applicable paragraph of EM 385-1-1 shall be cited.
2. Job Safety and Health Plan.

   a. The Contractor shall develop a Job Safety and Health Plan for presentation at the Pre-construction conference. The Contractor's Safety Plan shall make whatever provisions are necessary to conduct his work in accordance with current OSHA standards.
   b. The safety and health plan must address all hazards expected during construction.
   c. The following are minimum requirements for the health and safety plan:

      1. The Contractor is responsible for all compounds and degradation products addressed by the Risk Assessment Plan.
      2. Job Safety Analysis shall be complete for each occupation and Risk Assessment for operation shall be completed on the appropriate forms provided by the installation.
      3. Safety Plans: Safety Plans will be the responsibility of the Contractor for construction areas identified by the installation and/or AAFES as areas of known hazards only. These plans are required by 29 CFR 1910 and are the responsibility of the Contractor. This requirement will be coordinated through the Health and Safety Program of the military installation by the Contractor.
      4. Minimum Requirements for the Health and Safety Plan are as follows:

         (a) Must be kept on site, and must be written.
         (b) Will contain a hazard analysis (safety and health risk) for each site task and operation (to be supplied by the installation).
         (d) Will include a confined space entry procedure (per 1910.146, 147 or program equivalent).
         (e) Will include pre-entry briefings (prior to each site task activity) for all employees involved in the task, supervision, or emergency response.
         (f) Deficiencies will be corrected immediately upon discovery and after consultation with the AAFES Contracting Officer.

   d. Hazard Response Plan: The plan unplanned or non-predicted discovery of such hazards as transit pipe, contaminated soils, and other possible hazards will be addressed within an Emergency Response Plan (EMR) by all contractors. This requirement will be coordinated through the Health and Safety Program of the military installation by the contractor.
   e. Material Safety Data Sheets will be maintained at the site for all hazardous materials in use.

1.5 MONTHLY SAFETY MEETINGS

A. The Contractor will schedule safety meetings with all employees and subcontractor

personnel on a monthly basis. Minutes of safety meetings shall be prepared and signed by the Contractor. Concurrence signed by Inspection Section and the original submitted to the Contracting Officer for inclusion in the contract file.

1.6 ACCIDENT REPORTING AND RECORD KEEPING

A. The Installation Safety Office shall be notified within 24 hours of any accident that occurs on the job site or any loss of government property. The U.S. Army Abbreviated Ground Accident Report (DA Form 285-AB-R) shall be completed and sent to the Safety Office within 5 working days.

PART 2 PRODUCTS

A. Section Not Used.

PART 3 EXECUTION

3.1 LIFE OF CONTRACT REQUIREMENTS

A. The Contractor shall comply with EM-1-1 and all provisions of this section during the life of the contract.

3.2 HEAD PROTECTION

A. All work sites under this contract are designated Hard Hat Areas. The Contractor shall post the area in accordance with Paragraph 7.C.03, EM 385-1-1 and shall ensure that all personnel, vendors and visitors use hard hats while within the limits of the work site.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures, including LEED submittals.

B. Construction progress schedules.

C. Shop Drawings.

D. Samples.

E. Product Data.

F. Certificates.

1.2 RELATED SECTIONS

A. Section 01011 - Summary of Project.

B. Section 01310 - Construction Progress Schedules

C. Section 01352 - LEED Requirements

D. Section 01700 - Project Record Documents.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with AAFES Form 4450-048, “Shop Drawings and Material Submittal”.

B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

C. Identify Project, Contractor, subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.

E. Schedule submittals to expedite the Project. Transmit submittals to Contracting Officer. Coordinate submission of related items.

F. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work. Failure to identify such variations will not relieve the Contractor of the responsibility for completing the work in full accordance with the Contract Documents even though such submittals are approved by the Contracting Officer.

G. Prior to approval of the material/product submitted, the contractor shall include with the submittal a written certification that the material/product contains no asbestos. This

certificate is mandatory before approval will be issued.

H. Provide space for Contractor and Contracting Officer review stamps.

I. When revised for resubmission, identify all changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

K. LEED Submittals: Comply with requirements specified in Division 1 Section "LEED Requirements" and those specified in individual Specification Sections.

1. Number of Copies: Submit number of LEED submittal copies as directed by Contracting Officer.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Submit preliminary Progress Schedule within ten (10) days of the Notice to Proceed.

B. Submit complete (final) Progress Schedule within thirty (30) days of the Notice to Proceed.

C. Submit monthly revisions of Progress Schedule.

D. Refer to Section 01310 - Construction Progress Schedules, for submittal information.

1.5 SHOP DRAWINGS

A. Shop Drawings For Review:

1. Submitted to Contracting Officer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
2. Shop drawings shall be prepared by a qualified detailer.
3. Minimum sheet size for shop drawings shall be 8 1/2" x 11".
4. After review, and distribute copies in accordance with Submittal Procedures article above and for record documents purposes described in Section 01700 - Project Closeout.

B. Shop Drawings For Project Close-out:

1. Submitted for the AAFES's benefit during and after project completion.

C. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1. Submit the number of opaque reproductions which Contractor requires, plus three (four on structural, mechanical, and electrical submittals) copies which will be retained by Contracting Officer.

1.6 SAMPLES

A. Samples For Review:

1. Submitted to Contracting Officer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the

contract documents.

2. After review, produce duplicates and distribute in accordance with Submittal Procedures article above and for record documents purposes described in Section 01700 - Project Closeout.

B. Samples For Information:

1. Submitted for the Contracting Officer's knowledge as project administrator or for AAFES.

C. Samples For Selection:

1. Submitted to Contracting Officer for aesthetic, color, or finish selection.
2. Submit samples of finishes from the full range of manufacturers' standard colors, or in custom colors (if so stated in the product specification section), textures, and patterns for Contracting Officer selection.
3. After review, distribute in accordance with Submittal Procedures article above and for record documents purposes described in Section 01700 - Project Closeout.

D. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

E. Include identification on each sample, with full Project information.

F. Submit the number of samples specified in individual specification sections; two of which will be retained by Contracting Officer.

G. Reviewed samples which may be used in the Work are indicated in individual specification sections.

H. Coordinate sample submittals with respective shop drawings.

1.7 PRODUCT DATA

A. Submit Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, specifications, illustrations, and other descriptive data.

B. Product data that relates to shop drawings or samples must be submitted with the respective shop drawings or samples.

1.8 CERTIFICATES

A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Contracting Officer, in quantities specified for Product Data.

B. Certify that material or Product conforms to or exceeds specified requirements. Submit supporting reference data, test results, affidavits, and/or certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.9 LIMITATIONS AND CONTRACTOR’S RESPONSIBILITIES

A. Submittals will be reviewed for the limited purpose of checking for conformance with the design concept and the information shown in the drawing and specifications. These

reviews shall not include review of the accuracy for completeness of details. A review shall not indicate that the reviewer has checked the entire system of which the reviewed item is a component. The reviewer shall not be required to review partial submissions.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01310

CONSTRUCTION PROGRESS SCHEDULES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Format

B. Content

C. Revisions to schedules

D. Submittals

1.2 RELATED SECTIONS

A. General Provisions of the AAFES Contract for Construction, Article entitled: "Schedule and Progress"

B. Section 01011 - Summary of Project

C. Section 01300 - Submittals

1.4 GENERAL

A. The Contractor-prepared progress chart shall serve as a guide in managing the construction progress.

B. In preparing this system, the scheduling of construction shall be the responsibility of the Contractor.

1.4 FORMAT

A. Prepare schedules as a horizontal bar chart with separate bar for each major portion of work or operation, identifying first workday of each week.

B. The format shall be such to enable the Contracting Officer to evaluate the reasonableness of the proposed schedule and to determine if the actual construction is on schedule.

1.5 CONTENT

A. Show complete sequence of construction by activity with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Show accumulated percentage of completion of each item and total percentage of Work completed as of the first day of each month.

D. Indicate delivery dates for AAFES furnished products.

1.6 REVISIONS TO SCHEDULES

A. Indicate progress of each activity to date of submittal and projected completion date of each activity.

B. Identify activities modified since previous submittal, major changes in scope and other identifiable changes which could affect the schedule.

C. Provide narrative report with each submittal describing work accomplished during the previous period, the work scheduled for the next period, anticipated problem areas and delays and impact on the schedule. Report corrective action taken or proposed.

1.7 SUBMITTALS

A. Submit a preliminary schedule through the Contracting Officer defining the Contractor's proposed operations for the first sixty (60) of the contract within ten (10) days after date of Notice to Proceed. Indicate the Contractor's general approach for the balance of the project. Include the cost of the activities expected to be completed or partially completed before submission and approval of the complete progress schedule.

B. Upon approval of the preliminary schedule by the Contracting Officer and within thirty (30) calendar days after the Notice to Proceed, the Contractor shall submit the complete Progress Schedule.

C. Submit revised Progress Schedules with each monthly Application for Payment.

D. Submit the number of opaque reproductions which Contractor requires plus four (4) copies which will be retained by Contracting Officer.

1.8 DISTRIBUTION

A. Distribute copies of reviewed schedules to project site file, subcontractors, suppliers and other concerned parties.

B. Instruct recipients to promptly report in writing, problems anticipated by projections indicated in schedules.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01331

WEATHER TABLE

PART 1 GENERAL

1.1 INFORMATION AND DATA

A. Information and data furnished or referred to in the weather table is furnished for the Contractor's information.

1.2 CONTRACT TIME LIMITS

A. The contract time limits include weather conditions that are shown in the table listed herein.

1.3 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

A. This provision specifies the procedure for the determination of time extensions for unusually severe weather affecting exterior work in accordance with the Contract. The following listing defines the monthly anticipated adverse weather for the contract period and is based on NOAA data for the geographic location of the project.

MONTHLY ANTICIPATED ADVERSE WEATHER CALENDER DAYS
FORT BRAGG, NORTH CAROLINA

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DAYS	10	10	10	9	10	9	11	10	8	7	8	9

B. This listing of anticipated adverse weather will constitute the base line monthly weather time evaluations. Throughout the contract each month, actual adverse weather days will be recorded on a calendar basis (including weekends and holidays) and compared to the monthly anticipated adverse weather in this listing. The term "actual adverse weather days" shall include days impacted by actual adverse weather. The number of actual adverse weather days affecting exterior work shall be calculated chronologically from the first to the last day in each month. Adverse weather days must prevent work for 50 percent or more of the contractor's work day and delay work critical to the timely completion of the project. If the number of actual adverse weather days exceeds the number of days anticipated in the above listing, then the Contracting Officer will determine the time extension for the Contractor. The Contracting Officer will convert any qualifying delays to calendar days and issue a modification in accordance with the contract.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01352

LEED REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General requirements and procedures for compliance with USGBC LEED prerequisites and credits needed for Project to obtain LEED Silver certification based on LEED-NC, Version 2.2.

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on material selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are are not part of the Work of the Contract.
3. A copy of the LEED Project checklist is attached at the end of this Section for information only.

1.2 RELATED SECTIONS

A. Section 01011 - Summary of Project.

B. Section 01420 - Environmental Protection.

C. Section 01524 - Construction Waste Management.

D. Section 01810 - General Commissioning Requirements.

E. Section 01815 - HVAC Commissioning Requirements.

F. Division 2 through 16 Sections for LEED requirements specific to the Project.

1.3 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. LEED: Leadership in Energy & Environmental Design.

C. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

D. Recycled Content: The recycled content value of a material assembly shall be determined by weight.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

1.4 SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

C. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:

****

Furniture may be used toward LEED-NC Credit MR 3.1 through 7 if it is included consistently in calculations for all of them. .

****

1. Furniture.
2. Plumbing.
3. Mechanical.
4. Electrical.
5. Specialty items such as elevators and equipment.

First paragraph below requires Contractor to make early submittals indicating how certain LEED requirements will be met. This action can provide reassurance that Contractor understands the LEED requirements and can help to clear up misunderstandings before they become a bigger problem.

****

D. LEED Action Plans: Provide preliminary submittals within [**seven**] [**14**] [**30**] [**60**] <**Insert number**> days of date established for [**commencement of the Work**] [**the Notice to Proceed**] [**the Notice of Award**] indicating how the following requirements will be met:

1. Credit MR 5.1 **and Credit MR 5.2**: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
2. Credit EQ 3] [EQ 3.1]: Construction indoor-air-quality management plan.

E. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans.

1. Credit MR 2.1: Waste reduction progress reports complying with Division 1 Section "Construction Waste Management".
2. Credit MR 4.1[**and Credit MR 4.2**]: Recycled content.
3. Credit MR 5.1: Regional materials.
4. Credit MR 5.1[**and Credit MR 5.2**]: Regionally manufactured materials[**and regionally extracted and manufactured materials**].

F. LEED Documentation Submittals:

1. Credit EA 5: Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption performance over [**time**] [**a period of time of not less than one year of postconstruction occupancy**].
2. Credit MR 2.1: Comply with Division 1 Section "Construction Waste Management".
3. Credit MR 4.1[**and Credit MR 4.2**]: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
4. Credit MR 5.1[**and Credit MR 5.2**]: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
6. Credit EQ 3.1:

    a. Construction indoor-air-quality management plan.
    b. Product data for temporary filtration media.
    c. Product data for filtration media used during occupancy.
    d. Locations where temporary filters are installed.
    e. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

7. Credit EQ 3.2:

    a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
    b. Product data for filtration media used during flush-out and during occupancy.
    c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.

8. Credit EQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

9. Credit EQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

1.5 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT OF MATERIALS

A. Credit MR 4.1[**and Credit MR 4.2**]: Provide building materials with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of [**10**] [**20**] percent of cost of materials used for Project.

1. Cost of post-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
2. Cost of pre-consumer recycled content of an item shall be determined by dividing weight of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.

****

Furniture may be used toward LEED-NC Credit MR 3.1 through 7 if it is included consistently in calculations for all of them.

****

3. Do not include [**furniture,**] [**plumbing,**] mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

2.2 REGIONAL MATERIALS

****

First paragraph below applies to LEED-NC. If retaining paragraph, select materials for Project that can comply. Retain first option if retaining 20 percent; delete if retaining 10 percent.

****

A. Credit MR 5.1[**and Credit MR 5.2**]: Provide a minimum of [**10**] [**20**] percent of building materials (by cost) that are regional materials.

2.3 CERTIFIED WOOD

A. Credit **MR 7**: Provide a minimum of 50 percent (by cost) of wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:

1. Rough carpentry.
2. Miscellaneous carpentry.
3. Heavy timber construction.
4. Wood decking.
5. Metal-plate-connected wood trusses.
6. Structural glued-laminated timber.
7. Finish carpentry.
8. Architectural woodwork.
9. Wood paneling.
10. Wood veneer wall covering.
11. Wood flooring.

12. Wood lockers.
13. Wood cabinets.

****

For LEED-NC, furniture may be included, providing it is included consistently in Credits MR 3 through MR 7

****

14. Furniture.

2.4 LOW-EMITTING MATERIALS

A. Credit EQ 4.1: For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D:

1. Wood Glues: 30 g/L.
2. Metal to Metal Adhesives: 30 g/L.
3. Adhesives for Porous Materials (Except Wood): 50 g/L.
4. Subfloor Adhesives: 50 g/L.
5. Plastic Foam Adhesives: 50 g/L.
6. Carpet Adhesives: 50 g/L.
7. Carpet Pad Adhesives: 50 g/L.
8. VCT and Asphalt Tile Adhesives: 50 g/L.
9. Cove Base Adhesives: 50 g/L.
10. Gypsum Board and Panel Adhesives: 50 g/L.
11. Rubber Floor Adhesives: 60 g/L.
12. Ceramic Tile Adhesives: 65 g/L.
13. Multipurpose Construction Adhesives: 70 g/L.
14. Fiberglass Adhesives: 80 g/L.
15. Contact Adhesive: 80 g/L.
16. Structural Glazing Adhesives: 100 g/L.
17. Wood Flooring Adhesive: 100 g/L.
18. Structural Wood Member Adhesive: 140 g/L.
19. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
20. Top and Trim Adhesive: 250 g/L.
21. Plastic Cement Welding Compounds: 250 g/L.
22. ABS Welding Compounds: 325 g/L.
23. CPVC Welding Compounds: 490 g/L.
24. PVC Welding Compounds: 510 g/L.
25. Adhesive Primer for Plastic: 550 g/L.
26. Sheet Applied Rubber Lining Adhesive: 850 g/L.
27. Aerosol Adhesive, General Purpose Mist Spray: 65 percent by weight.
28. Aerosol Adhesive, General Purpose Web Spray: 55 percent by weight.
29. Special Purpose Aerosol Adhesive (All Types): 70 percent by weight.
30. Other Adhesives: 250 g/L.
31. Architectural Sealants: 250 g/L.
32. Nonmembrane Roof Sealants: 300 g/L.
33. Single-Ply Roof Membrane Sealants: 450 g/L.

34. Other Sealants: 420 g/L.
35. Sealant Primers for Nonporous Substrates: 250 g/L.
36. Sealant Primers for Porous Substrates: 775 g/L.
37. Modified Bituminous Sealant Primers: 500 g/L.
38. Other Sealant Primers: 750 g/L.

B. Credit EQ 4.2: For field applications that are inside the weatherproofing system, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D:

1. Flat Paints, Coatings, and Primers: VOC not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC not more than 150 g/L.
3. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
4. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
5. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
6. Floor Coatings: VOC not more than 100 g/L.
7. Shellacs, Clear: VOC not more than 730 g/L.
8. Shellacs, Pigmented: VOC not more than 550 g/L.
9. Stains: VOC not more than 250 g/L.

PART 3 EXECUTION

3.1 MEASUREMENT AND VERIFICATION

A. Credit EA 5: MEASUREMENT AND VERIFICATION

Project: AAFES Shopette with Burger King and Fueling Facility, Fort Bragg, NC, USA

Project Description: The Shopette with Burger King is to be a single story, 13,552 square foot new construction consisting of retail sales and restaurant areas. The building is subject to an M&V program in compliance with EA Credit 5 specified in the LEED rating system.

M&V Objective: To estimate as-built energy savings at the ECM level relative to the Baseline under actual operating conditions.

M&V Baseline: The Baseline shall be the projected energy performance of the baseline file generated during project design, which is an equivalent building designed to the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1-2004, Appendix G.

M&V Methodology: The M&V method utilized will be Option B - Energy Conservation Measure Isolation. The ECMs will be based on the sub-metering of the project. For the convenience store side, the ECMs of lighting and electrical HVAC energy usage will be analyzed. As the restaurant for this type of building could be one of several different chains, the entire restaurant energy usage will be on one electrical sub-meter and treated as a single ECM.

The M&V period shall consist of 18 months from the date of initial operation. The first 6 months shall be a trial period to allow for debugging of systems and stabilization of building operations. The formal M&V period shall be the subsequent 12 months, beginning on the first day of the next electrical billing cycle.
Analysis of the monthly energy bills shall be used to measure energy savings over the Baseline building. Surveys shall be used to determine occupancy and system schedules.

Local weather data for the M&V period shall be obtained from a Government weather agency or similar reliable and verifiable source.

3.2 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Credit EQ 3.1: CONSTRUCTION IAQ MANAGEMENT PLAN: DURING CONSTRUCTION

Overview:
The intent of this plan is to reduce indoor air quality problems caused by the construction process, helping to sustain the well-being of construction workers and building occupants. This will be accomplished primarily by HVAC Protection, Source Control and Housekeeping.

HVAC Protection:
HVAC units shall not be operated during construction. Units shall be protected from dust (plastic over openings) until startup.
HVAC equipment, including ductwork and filters, shall be properly stored to protect from dust and moisture. Ductwork openings shall be sealed with plastic prior to installation.

Source Control:
"Bake-outs" of new materials as a control for offgassing shall not be permitted.
Bottled gas in lieu of diesel shall be used for equipment such as generators where feasible. Bottled gas or electric forklifts will be used where feasible. Electric tools in lieu of gasoline shall be used where feasible. Containers of wet products (paints, sealers, etc.) and waste materials shall be covered when not in use.

Housekeeping:
Dust accumulation becoming an airborne contaminant shall be suppressed with wetting agents (damp rags, mops, etc.) in lieu of dry wiping. Vacuum equipment with high efficiency particulate filters or exterior exhausts shall be used in lieu of dry sweeping. Cleaning frequency may be increased based on visible inspection. Spills or excess application of solvent-containing products shall be removed as soon as possible to minimize odors.

B. Credit EQ 3.2: CONSTRUCTION IAQ MANAGEMENT PLAN

Option 1b: FLUSH-OUT
Occupancy is desired prior to completion of the flush-out. Occupancy will be allowed following delivery of 3,500 cu. ft. of outdoor air per sq. ft of conditioned building space. This will be accomplished by running all rooftop units with OA dampers locked to provide 50% outdoor air for a period of 3 days after substantial completion and prior to occupancy.

After occupancy, the remainder of the required 14,000 cu. ft. of outdoor air per sq. ft. of conditioned building space will be provided by running all rooftop units (except RTU-105, explained later) with OA dampers locked to provide a minimum of 0.3 cfm per sq. ft. for a period of 22 days. RTU-105 has a design minimum OA higher than 0.3 cfm per sq. ft., and so will be set to its normal operating conditions.

Special Considerations:
If substantial completion occurs during the heating season, all thermostats will be set to 60F for the 3 day, 50% OA run. If in the cooling season, all thermostats will be set to 78F for the 3 day run.

Calculations:
The above time periods were calculated in the following manner:

RTU	Area Served	CFM	50% OA	0.3 cfm/sf
RTU-101	2304	2000	1000	690
RTU-102	2038	2000	1000	610
RTU-103	2372	4000	2000	710
RTU-104	1872	1200	600	562
RTU-105	1689	3900	1950	507 (880 design)
RTU-106	1257	5000	2500	377
Totals:	11,532		9050	3833

(3500 ft^3/ft^2 * 11532 ft^2)/9050 ft^3/min = 4460 min = 3 days

((14000-3500 ft^3/ft^2)*11532 ft^2)/3833 ft^3/min = 31590 min = 22 days

LEED - New Construction v2.2

Project Name: Fort Bragg Pines Shoppette
Version: 2009 - AE evaluation

33	5	31	**Total Project Score**	Possible Points: 69

Certified 26 to 32 points **Silver** 33 to 38 points **Gold** 39 to 51 points **Platinum** 52 or more points

LEGEND: T = Targeted Point for Project / P = Possible Point / NP = Not in Project

7	0	7	**Sustainable Sites**	Possible Points 14	
T	P	NP			
x			Prereq 1	Construction Activity Pollution Prevention	x
☐			Credit 1	Site Selection*	x
☐			Credit 2	Development Density & Community Connectivity*	x
		☐	Credit 3	Brownfield Redevelopment*	x
		☐	Credit 4.1	Public Transportation Access*	x
		☐	Credit 4.2	Bicycle Storage & Commuting	x
☐			Credit 4.3	Low Emitting & Fuel Efficient Vehicles	x
☐			Credit 4.4	Parking Capacity	x
		☐	Credit 5.1	Site Development: Protect or Restore Open Habitat	x
		☐	Credit 5.2	Site Development: Maximize Open Space	x
		☐	Credit 6.1	Stormwater Design: Quantity Control	x
		☐	Credit 6.2	Stormwater Design: Quality Control	x
☐			Credit 7.1	Heat Islands Effect: Non-Roof	x
☐			Credit 7.4	Heat Islands Effect: Roof	x
☐			Credit 8	Light Pollution Reduction	x

3	2	0	**Water Efficiency**	Possible Points 5	
T	P	NP			
☐			Credit 1.1	Water Efficient Landscaping, Reduce by 50%	x
☐			Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	x
	☐		Credit 2	Innovative Wastewater Technologies	x
☐			Credit 3.1	Water Use Reduction, 20% Reduction	x
	☐		Credit 3.2	Water Use Reduction, 30% Reduction	x

6	0	11	**Energy & Atmosphere**	Possible Points 17	
T	P	NP			
x			Prereq 1	Fundamental Commissioning of the Building Energy System	x
x			Prereq 2	Minimum Energy Performance	x
x			Prereq 3	Fundamental Refrigerant Management	x
☐			Credit 1.1	Optimize Energy Performance, 10.5% New / 3.5% Existing	x
☐			Credit 1.2	Optimize Energy Performance, 14% New / 7% Existing	x
☐			Credit 1.3	Optimize Energy Performance, 17.5% New / 10.5% Existing	x
		☐	Credit 1.4	Optimize Energy Performance, 21% New / 14% Existing	x
		☐	Credit 1.5	Optimize Energy Performance, 24.5% New / 17.5% Existing	x
		☐	Credit 1.6	Optimize Energy Performance, 28% New / 21% Existing	x
		☐	Credit 1.7	Optimize Energy Performance, 31.5% New / 24.5% Existing	x
		☐	Credit 1.8	Optimize Energy Performance, 35% New / 28% Existing	x
		☐	Credit 1.9	Optimize Energy Performance, 38.5% New / 31.5% Existing	x
		☐	Credit 1.10	Optimize Energy Performance, 42% New / 35% Existing	x
		☐	Credit 2.1	Renewable Energy, 2.5%	x
		☐	Credit 2.2	Renewable Energy, 7.5%	x
		☐	Credit 2.3	Renewable Energy, 12.5%	x
☐			Credit 3	Enhanced Commissioning	x
☐			Credit 4	Enhanced Refrigerant Management	x
☐			Credit 5	Measurement & Verification	x
		☐	Credit 6	Green Power*	x

4	3	6	**Materials & Resources**	Possible Points 13	
T	P	NP			
x			Prereq 1	Storage & Collection of Recyclables	x
		☐	Credit 1.1	Building Reuse, Maintain 75% of Existing Walls, Floors, and Roof	x
		☐	Credit 1.2	Building Reuse, Maintain 100% of Existing Walls, Floors, and Roof	x
		☐	Credit 1.3	Building Reuse, Maintain 50% of Interior Non-Structural Elements	x
☐			Credit 2.1	Construction Waste Management, Divert 50% from Disposal	x
	☐		Credit 2.2	Construction Waste Management, Divert 75% from Disposal	x
		☐	Credit 3.1	Materials Reuse, Specify 5%	x
		☐	Credit 3.2	Materials Reuse, Specify 10%	x
☐			Credit 4.1	Recycled Content, Specify 10% (post-consumer + 1/2 pre-consumer)	x
	☐		Credit 4.2	Recycled Content, Specify 20% (post-consumer + 1/2 pre-consumer)	x
☐			Credit 5.1	Regional Materials, 10% Extracted, Processed, and Manufactured Locally	x
	☐		Credit 5.2	Regional Materials, 20% Extracted, Processed, and Manufactured Locally	x
		☐	Credit 6	Rapidly Renewable Materials (2.5%)	x
☐			Credit 7	Certified Wood	x

9	0	6	**Indoor Environmental Quality**	Possible Points 15	
T	P	NP			
x			Prereq 1	Minimum IAQ Performance	x
x			Prereq 2	Environmental Tobacco Smoke (ETS) Control	x
☐			Credit 1	Outdoor Air Delivery Monitoring	x
		☐	Credit 2	Increased Ventilation	x
☐			Credit 3.1	Construction IAQ Management Plan, During Construction	x
☐			Credit 3.2	Construction IAQ Management Plan, Before Occupancy	x
☐			Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	x
☐			Credit 4.2	Low-Emitting Materials, Paints & Coatings	x
☐			Credit 4.3	Low-Emitting Materials, Flooring	x
		☐	Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	x
☐			Credit 5	Indoor Chemical & Pollutant Source Control	x
		☐	Credit 6.1	Controllability of Systems, Lighting	x
		☐	Credit 6.2	Controllability of Systems, Thermal Comfort	x
☐			Credit 7.1	Thermal Comfort, Design	x
☐			Credit 7.2	Thermal Comfort, Verification	x
		☐	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	x
		☐	Credit 8.2	Daylight & Views, Views for 90% of Spaces	x

4	0	1	**Innovation & Design Process**	Possible Points 5	
T	P	NP			
☐			Credit 1.1	LEED Educational Program	x
☐			Credit 1.2	Green Housekeeping	x
		☐	Credit 1.3		x
☐			Credit 1.4	Use of Fly Ash in place of Portland Cement	x
☐			Credit 2	LEED™ Accredited Professional	x

Morris and Associates, LEED AP

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. The Contractor shall establish a quality control system to perform sufficient inspection and tests of all items of work, including that of his subcontractor(s) to insure conformation to applicable specifications and drawings with respect to the materials, workmanship, construction, finish and functional performance. Tests of materials and/or special inspections will be made, when required by these specifications, by applicable law, rules and regulations in accordance with respective Sections of the specifications. Where required, the Contractor shall employ and pay sections of the specifications. Where required, the Contractor shall employ and pay for the services of an independent agency to perform specific services and testing. Examples of such services are tests of fill materials, concrete materials, concrete mix design, asphalt concrete laboratory testing of materials proposed and calculations for asphalt concrete mixtures, etc.

B. The Contractor shall arrange and pay for all services and testing which are not specifically indicated to be provided by AAFES.

C. If a material is not required to be field tested, the Contracting Officer may require the supplier to furnish with each delivery of such material, a certificate bearing legal signature of said supplier, stating that such material complies with specification requirements.

D. If any work material requiring tests and inspections is executed, enclosed or covered before tests are made, or test reports distributed, then the Contractor shall, at his own expense, uncover such part of this work or material and keep it uncovered until such tests and inspections have been made and test reports distributed. If work or material so tested and inspected shall not be found to conform to the requirements of the Construction Documents, it shall be deemed and construed to be defective materials or faulty workmanship and the Contractor, at his own expense, shall replace work or material removed and repair all work disturbed thereby.

E. The Testing Agency shall report results of all tests in writing simultaneously to the following:

1.	Contracting Officer	3 copies
2.	Site Inspector	1 copy
3.	Contractor	1 copy
4.	Architect/Engineer	1 copy

F. Reports shall state that tests were made under responsible charge of a Testing Engineer, holding a license to operate in the state where the project is being constructed, and that material or materials were tested in accordance with provisions of these specifications, and that material and/or materials tested, passed or failed to pass such requirements.

G. If applicable to the project, Contractor will employ and pay for the services of an Independent Testing Agency to perform specified quality control testing during construction indicated in the following sections:

1. Soil Materials: Section 02205.
2. Aggregate Materials: Section 02207.
3. Site Grading: Section 02210.
4. Utility Excavation: Section 02219.
5. Backfilling: Section 02223.
6. Aggregate Base Course: Section 02231.
7. Asphaltic Concrete Paving Leveling Course: Section 02510.
8. Asphaltic Concrete Paving Wearing Course: Section 02512.
9. Portland Concrete Paving: Section 02520.
10. Curbs and Gutters: Section 02625.
11. Walks: Section 02630.
12. Storm Drainage System: Section 02721.
13. Site Sanitary: Section 02732.
14. Exterior Sanitary Sewer System: Section 02740.
15. Cast-in-Place Concrete: Section 03300.
16. Testing and Balancing of Heating, Ventilating and Air Conditioning System: Section 15990.

1.2 CONTRACTORS RESPONSIBILITY

A. Cooperate with the Contracting Officer and laboratory personnel and provide access to work and to manufacturers operations. Provide samples of materials to be tested, in required quantities. Furnish casual labor and facilities required to provide access to work to be tested; to obtain and handle samples at the site; to facilitate inspections and tests; and for laboratory's exclusive use for storage and curing of test samples. Notify laboratory sufficiently in advance of operations to allow for its assignment of personnel and scheduling of tests.

B. The use of AAFES' or Contractor's independent testing services shall in no way relieve the Contractor of his responsibility to furnish materials and construction in full compliance with the plans and specifications.

C. The Contractor shall coordinate with both AAFES and his own testing laboratories so that the work will be inspected and tested according to contract requirements. This coordinately includes notification of when tests should be taken, easy access to the work, and general cooperation in every way to insure proper control of the work.

D. Upon completion of the project the Contractor shall submit a signed certificate stating tests for this work were made in accordance with provisions of these specifications and, further, all such tests and reports made were reported as required. This certificate shall list all tests and dates when work was completed.

1.3 RELATED REQUIREMENTS

A. Submittals: Section 01300.

B. Related requirements and tests specified in Division 2 through 16.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01410

TESTING SERVICES

PART 1- GENERAL

1.1 SECTION INCLUDES

A. Selection and payment.

B. Agency responsibilities.

C. Agency reports.

D. Limits on testing authority.

E. Contractor responsibilities.

F. Schedule of tests.

1.2 RELATED SECTIONS (IF APPLICABLE)

A. Section 02205 - Soil Materials.

B. Section 02207 - Aggregate Materials.

C. Section 02210 - Site Grading.

D. Section 02219 - Utility Excavation.

E. Section 02223 - Backfilling.

F. Section 02231 - Aggregate Base Course.

G. Section 02510 - Asphaltic Concrete Paving Leveling Course.

H. Section 02512 - Asphaltic Concrete Paving Wearing Course.

J. Section 02620 - Portland Concrete Paving.

K. Section 02525 - Concrete Curbs and Gutters.

L. Section 02630 - Walks.

M. Section 02732 - Site Sanitary.

N. Section 02740 - Exterior Sanitary Sewer System.

O. Section 03300 - Cast-in-Place Concrete.

P. Section 15990 – Testing, Cleaning, and Balancing

1.3 SELECTION AND PAYMENT

A. The Contractor shall employ and pay for services of an independent testing agency or

laboratory to perform testing as specified in the individual sections listed in Article 1.2 above.

1.4 AGENCY RESPONSIBILITIES

A. Test samples of mixes submitted by Contractor.

B. Provide qualified personnel at site. Cooperate with Contracting Officer and Contractor in performance of services.

C. Perform specified sampling and testing of Products in accordance with specified standards.

D. Ascertain compliance of materials and mixes with requirements of Contract Documents.

E. Promptly notify Contracting Officer, and Contractor of observed irregularities or non-conformance of Work or Products.

F. Perform additional tests required by Contracting Officer.

G. Provide Contracting Officer with three (3) copies of each written test report, and the Contractor each with one copy of each test report. Each report shall include:

1. Date issued.
2. Project title and number.
3. Testing Laboratory name, address and telephone number.
4. Name and signature of laboratory inspector.
5. Date and time of sampling or inspection.
6. Record of temperature.
7. Date of test.
8. Identification of product and specification section.
9. Location of sample or test in the project.
10. Type of inspection or test.
11. Results of tests and compliance with Contract Documents.
12. Interpretation of test results, when requested by the Contracting Officer.

H. Upon completion of the project, the testing agency shall prepare a certificate, certified in the presence of a Notary Public, stating testing for this work was conducted in accordance with the provisions of these specifications, and further, all tests and reports were provided for this job were reported as required.

1.5 LIMITS ON TESTING AUTHORITY

A. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Agency or laboratory may not approve or accept any portion of the Work.

C. Agency or laboratory may not assume any duties of Contractor.

D. Agency or laboratory has no authority to stop the Work.

1.6 CONTRACTOR RESPONSIBILITIES

A. Deliver to agency or laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.

B. Cooperate with laboratory personnel, and provide access to the work.

C. Provide incidental labor and facilities:

1. To provide access to Work to be tested.
2. To obtain and handle samples at the site or at source of Products to be tested.
3. To facilitate tests.
4. To provide storage and curing of test samples.

D. Notify Architect/Engineer and laboratory 24 hours prior to expected time for operations requiring testing services.

E. Employ services of an independent qualified testing laboratory and pay for additional samples and tests required by Contractor beyond specified requirements:

1. For Contractor's convenience.
2. When initial tests indicate work does not comply with contract documents.
3. When, in the opinion of the Contracting Officer, additional tests or inspections are required because of the manner in which the Contractor executes his work. Examples of such tests and inspections are:

a. Tests of materials substituted for previously approved substituted or specified materials.
b. Retests made necessary by failure of materials to comply the requirements of the specifications.
c. Load tests made necessary because of portions of the structure not fully meeting specifications or drawings requirements.

1.7 SCHEDULE OF TESTS

A. Individual Specification Sections: Tests required and standards for testing.

PART 2- PRODUCTS

Not Used.

PART 3- EXECUTION

Not Used.

END OF SECTION

SECTION 01420

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this section consists of furnishing all labor, materials, and equipment and performing all work required for the prevention of environmental degradation during and as a result of construction operations under this contract. These requirements are in addition to any environmental protection requirements elsewhere in these specifications. For the purpose of this specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents, not naturally occurring at the site, which adversely affect human health or welfare; unfavorably alter ecological balances important to human life; affect other species of importance to humans; or degrade the utility of the environment for aesthetic and recreational purposes. The control of environmental pollution by the contractor requires consideration of air, water, and land, and involves noise control, solid waste management and management of radiant energy and radioactive materials, as well as other pollutants. This section also requires the protection of cultural and historic resources.

B. Contractor shall coordinate the work of this section with the work called for under the various sections of Division 2.

1.2 CONTRACTOR'S GENERAL ENVIRONMENTAL COMPLIANCEOBLIGATIONS

A. Work under this contract is to be performed on a government facility. All environmental rules applying to contractor operations elsewhere will also apply on the government facility. Contractor (and any subcontractor, agent or representative) shall comply with all applicable Federal, State, and local laws and regulations providing for environmental protection and pollution control and abatement. These include but are not limited to: the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, Comprehensive Environmental Response, Compensation and Liability Act, Toxic Substances Control Act, Federal Insecticide Fungicide and Rodenticide Act, Coastal Zone Management Act, Endangered Species Act, National Historic Preservation Act, Safe Drinking Water Act, Emergency Planning and Community Right-to-Know Act, Oil Pollution Act, Archeological Resources Protection Act, and Pollution Prevention Act. Contractor has the duty to determine for itself where such laws and regulations apply. Although the Contractor may request assistance from the Contracting Officer in delineating applicable environmental laws and regulations, Contractor has an independent responsibility to make its own determination and to do so in a timely fashion.

1.3 FINES OR PENALTIES FOR ENVIRONMENTAL NON-COMPLIANCE

A. The Contractor shall be responsible for paying any fines or penalties assessed against AAFES or the installation or the Army or the Air Force for violations of environmental laws or regulations resulting from acts or omissions of the contractor or its employees, subcontractors, or agents. This obligation is in addition to any fines or penalties that may be assessed against the contractor for the same conduct. Contractor may either reimburse these fines or penalties through the Contracting Officer or with the consent of the Contracting Officer, the Contractor may pay such fines or penalties directly to the regulatory agency or agencies concerned.

1.4 CONTRACTOR'S LIABILITY FOR ENVIRONMENTAL DAMAGES

A. Contractor agrees to hold harmless and indemnify AAFES (which includes the Army, Air Force, or other Department of Defense component, as appropriate) for any and all damages of any kind resulting from environmentally harmful activities by the contractor, contractor's employees or agents or subcontractors. "Damages" includes but is not limited to personal injury, property damage (including diminution of value), or death, environmental restoration and response costs, natural resource damages, expert witness and attorney's fees, and reimbursement of any and all expenses incurred to obtain permits as a result of Contractor's failure to identify or obtain permits for itself or AAFES.

1.5 CONTACTS WITH ENVIRONMENTAL REGULATORY OFFICIALS

A. Contractor shall immediately advise the Contracting Officer and the installation Environmental Division of the content of all contacts with federal, state, or local environmental regulators, before, during, and after the performance of this contract concerning the performance of this contract.

1.6 PERMITS FOR EQUIPMENT USED BY CONTRACTOR IN PERFORMING AAFES CONTRACTS

A. For equipment used in the performance of this contract, Contractor shall obtain in Contractor's name and at no additional expense to AAFES, all permits, and coordination's, certifications or other regulatory authorization necessary to perform and complete the work required by this contract under applicable environmental laws and regulations. "Applicable environmental laws and regulations" includes but is not limited to: the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Toxic Substances Control Act, Federal Insecticide Fungicide and Rodenticide Act, Coastal Zone Management Act, Endangered Species Act, National Historic Preservation Act, Safe Drinking Water Act, Emergency Planning and Community Right-to-Know Act, Oil Pollution Act, and Pollution Prevention Act and State, County, and Local laws and regulations on the same subjects.

1.7 PERMITS NEEDED FOR CONSTRUCTION, EXCAVATION, MODIFICATION, RENOVATION, DEMOLITION, INSTALLATION, OR OTHER ALTERATION OF BUILDINGS, STRUCTURES, EQUIPMENT, INSTALLATIONS, REAL PROPERTY OR SYSTEMS

A. Contractor shall identify all Federal, State, County, or local, permits, coordination's, certifications or other regulatory authorization requirements under all applicable environmental laws and regulations as defined in above. Contractor shall then prepare and submit in draft all applicable permit applications, coordination's, notices, or other required filings, together with all supporting data to the contracting officer for review. Permit applications or notifications or other documents that must be submitted by AAFES will be submitted by AAFES, and any documents that must be submitted by the contractor will be returned after review to the contractor for submission. No work requiring permit or other written authorization shall proceed before the Contractor has the permit or authorization or a copy thereof in its possession.

PART 2 PRODUCTS

2.1 RECYCLED MATERIALS

A. Materials used in this contract shall be, to the greatest extent practicable and consistent with financial prudence, made of recycled materials or of materials that are recyclable. Where construction debris such as concrete or asphalt or wood can be recycled, this alternative will be considered.

2.2 ASBESTOS

A. Asbestos will not be used or included in this project.

2.3 POLYCHLORINATED BIPHENYL'S (PCBs)

A. PCBs will not be used or included in this project.

2.4 LEAD-BASED PAINT

A. Lead-based paint will not be used included in this project.

2.5 OZONE-DEPLETING SUBSTANCES

A. "Class I substance," as used in this clause, means any substance designated as class I by the Environmental Protection Agency (EPA)(40 CFR Part 82), including but not limited to chlorofluorocarbons, halons, carbon tetrachloride, and methyl chloroform. Where demolition work occurs, no Class I Ozone Depleting Substances are allowed to leave the installation and become the property of the contractor.

B. "Class II substance," as used in this clause, means any substance designated as class II by EPA (40 CFR Part 82), including but not limited to, hydro chlorofluorocarbons.

C. As required by 42 USC 7671j(b), c, and (d) and 40 CFR Part 82, Subpart E, the Contractor shall label products which contain class I or class II ozone-depleting substances or are manufactured with a process that uses class I or class II ozone-depleting substances, or containers of class I or class II ozone-depleting substances, as follows:

"WARNING: Contains (or manufactured with, if applicable) _____*_____, (a) substance(s) which harm(s) public health and the environment by destroying ozone in the upper atmosphere."

*The Contractor shall insert the name of the substance(s).

D. The contractor shall comply with the applicable requirements of Sections 608 and 609 of the Clean Air Act (42 USC 7671g, National Recycling and Emission Reduction Program and 7671h, Servicing of Motor Vehicle Air Conditioners) as each or both apply to the contract.

2.6 PESTICIDES

A. Except as may be specified elsewhere in this contract, Contractor will not use or apply pesticides (such as herbicides or weed-killers, insecticides, or rodenticides) without the specific written prior approval of the Contracting Officer.

PART 3- EXECUTION (WORK PRACTICES)

3.1 GENERAL: SITE DISTURBANCE DURING CONSTRUCTION ACTIVITIES

A. Contractor shall use industry-recognized best management practices to avoid creation of fugitive dust emissions and to avoid and control storm water runoff from the construction site and any temporary roads that may be used for access to it. Water sprinkling may be used to control dust. Contractor shall perform all work under this contract in such a manner that no pollutants of any kind are released into ditches, storm drains, streams, lakes, or other surface waters on or connected to the site.

3.2 PROTECTION OF WATER RESOURCES

A. General: The General Contractor shall not pollute storm drainage, streams, lakes, or reservoirs with fuels, oils, bitumens, calcium chloride, acids, construction wastes or other harmful materials or pollutants. It is the responsibility of the General Contractor to determine and comply with all applicable federal, state, regional, municipal, and other regulations.

B. Spillage: The General Contractor shall take special measures to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides, cement, and surface drainage from entering public waters. In the event of a spill, the contractor must make all required notifications to federal, state or local authorities and will notify the Contracting Officer immediately.

C. Washing and Curing Water: Water used in aggregate processing, concrete curing, foundation, and concrete lift clean-up and other waste water shall not be allowed to enter the storm drainage system.

3.3 PROTECTION OF LAND RESOURCES

A. General: It is intended that the land resources within the project boundaries and outside the limits of permanent work performed under this contract be preserved in their present condition or be restored to a condition after completion of construction that will appear to the natural and not detract from the appearance of the project. The General Contractor shall limit his construction activities to areas defined by the Drawings or Specifications.

B. Prevention of Landscape Defacement: Except in areas marked on the plans to be cleared, the General Contractor shall not deface, remove, cut, injure or destroy trees or shrubs without specific written authority. Trees designated to be saved shall be protected from either excavation or filling within the root zone. No ropes, cables, or guys shall be fastened or attached to any existing trees for anchorage unless specifically authorized by the Contracting Officer. The General Contractor shall in any event be responsible for any damage resulting from such use.

C. Restoration of Landscape Damage: Any trees or other landscape features scarred or damaged by the General Contractor's equipment or operations shall be restored as nearly as possible to the original condition at the General Contractor's expense. The Contracting Officer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of under requirements for clearing and grubbing (Section 02102). All scars made on trees not designated on the plans to be removed by equipment construction operations, or by the removal of limbs larger than 1-inch in diameter shall be coated immediately with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced landscape personnel. Tree trimming with axes shall not be permitted. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the General Contractor and are beyond saving in the opinion of the Contracting Officer, shall be immediately removed and replaced with a nursery-grown tree of the same species.

3.4 CONTROL OF AIR EMISSIONS.

A. Contractor's actions shall conform to all federal, state, and local requirements for the control of air emissions during work under this contract. Trucks leaving the site will be brushed or washed to remove all practicable amounts of dust or other material that may become airborne. Contractor will ensure that all internal construction vehicles and equipment used will have the lowest practicable emissions characteristics and be maintained in optimum operating condition for the reduction of air emissions. Where use of electric motors instead of internal combustion engines is feasible, electric motors will be used during construction.

3.5 POLLUTION PREVENTION & WASTE DISPOSAL

A. The contractor should use prior planning to find those materials that will minimize the creation of waste in general and hazardous waste in particular. Recycling should be considered and implemented at every practicable stage of the project.

3.6 WASTE DISPOSAL

A. Pollution Prevention: The contractor should use prior planning to find those materials and work practices that will minimize the creation of waste in general and hazardous waste in particular.

B. Hazardous Waste Generation, Handling, and Disposal. Work done under this contract is to be performed on a government facility. According to rules and procedures of the United States Environmental Protection Agency, the federal facility is required to have a generator identification number under the Resource Conservation and Recovery Act (RCRA) and to be responsible for wastes (as defined under RCRA) produced, managed, stored, disposed on, or transported from the facility. Accordingly, Contractor will, to the greatest extent practicable, use materials, processes, and techniques that will avoid the creation of hazardous waste. Contractor shall prepare and follow a written waste management and disposal plan for all hazardous wastes generated on the site. Prior to generation of any hazardous wastes, contractor will coordinate planned activities regarding hazardous materials and hazardous waste with the Contracting Officer. Contractor shall submit a written waste management plan, through the contracting officer, to installation environmental office. Contractor shall follow this plan once it has been approved by the contracting officer. Under no circumstances will contractor bring onto the site hazardous waste that has been generated elsewhere. All hazardous waste will be properly disposed of by the Contractor in accordance with all federal, state, and local requirements.

C. Disposal of Non-RCRA Wastes:

1. All non-hazardous wastes generated on the site as a result of this contract must be disposed of properly, in accordance with all federal, state and local requirements. Materials will be recycled whenever practicable. Prior to creation of such wastes, the Contractor shall submit to the installation environmental management function.

D. Construction Debris:

1. The contractor is to remove clean construction debris from the site to a location of the contractor's choosing off installation. (Site soil or other site media are not covered by this paragraph.) Debris will be recycled or disposed of in accordance with all applicable federal, state, and local rules. Such debris must be free of all contamination, including but not limited to, lead paint, asbestos, and insecticides. Prior to removal of any construction debri, that debris must be certified by the installation to be free of contamination and of no value to the United States, and this certicationmust be provided to the contracting officer. To expedite work, this may be accomplished by a telecopier or other suitable electronic means, however, the original certification form must provided to the contracting officer. No form is prescribed for this certification so long as necessary information is provided and the document is signed by an authorized installation representative. However, an example is provided at the end of Part 5, and this form may be used. All construction debris removed form the installation must be covered by a certification. The contractor must arrange with the installation POC whether all debris will be coveredby one certification or several certifications will be required.

E. Consolidated Waste Disposal Plans: Contractor may, at contractor's option, submit for approval as specified above one consolidated plan for handling hazardous and non-hazardous wastes.

3.7 CONTAMINATED SOIL OR GROUNDWATER.

A. Contractor or subcontractor personnel may encounter soil or groundwater that is suspected to be contaminated, either because of odors, colors, free liquids, unexpected construction debris, or other suspicious conditions. Should this occur, the contractor will immediately stop work, notify the Contracting Officer, the installation Environmental Division and take necessary initial measures to protect workers, the site, and other personnel.

3.8 UNEXPECTED ARTIFACTS OR RELICS

A. Should contractor employees in the course of site preparation or other work on this contract find unexpected historic or archeological remains, such as bones, arrow points, pottery remnants, foundations, or other evidence of previous uses of the site, contractor will cease further site-disturbing activity and immediately notify the Contracting Officer and installation Environmental Division.

END OF SECTION

INSTALLATION CERTIFICATION FOR CLEAN CONSTRUCTION DEBRIS TO BE REMOVED FROM AAFES PROJECT SITE

As representative of _____ (insert name of installation), I am authorized to certify, and hereby do so certify, that the construction debris to be removed from the AAFES project site at _____ _____ (describe project and list address, for example Main Exchange Project, 111 Road A, X installation) has been inspected and is of no value to the United States and is free of all contamination, including but not limited to: lead paint, asbestos, PCBs, and pesticides.

CERTIFICATION:

Signed: _____ Date: _____

Printed Name, Rank or Grade, and Duty Title: _____

ORIGINAL OF THIS FORM MUST BE PROVIDED TO CONTRACTING OFFICER

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Field Offices and Sheds: Section 01590.

B. Cleaning: Section 01710.

1.2 REQUIREMENTS INCLUDE. Contractor provide and maintain specified temporary utilities for specified times during construction period.

A. Contractor:

1. All utilities required by him which:

a. Are in excess of those specified.
b. Exceed capacity of existing or permanent systems.

2. Hoses and fittings from temporary standpipes or water service connection to his work.
3. Drinking water for his own forces.
4. Ventilation for his storage spaces containing volatile or hazardous materials.
5. Temporary toilet facilities.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Only on Contracting Officer's prior written authorization, obtain and pay for:

1. Permits and inspections required by governing authorities.

B. Comply with specified codes and regulations: Latest editions in effect as of date of bidding documents.

1. National Electric Code (ANSI C1).
2. National Electrical Safety Code.
3. National Fire Protection Association Pamphlet.
4. Federal and State Requirements.

1.4 USE OF EXISTING BUILDING SYSTEMS

A. Make all arrangements with Shoppette Manager.

B. Limitations:

1. Regulate all parts of existing systems used for construction purposes.

a. Do not overload systems. When project requirements exceed system capacity, provide separate system to meet needs.

C. Modify, supplement and extend system to meet temporary utility requirements for project,

subject to approval of Contracting Officer.

D. Maintain strict supervision of use of temporary facilities.

1. Enforce conformance with:

a. AAFES regulations.
b. Specified codes and standards.

2. Use only designated facilities, systems or portions thereof.

a. Electrical Power Service:

1. Provide temporary extension of service to meet requirements of construction.
2. Do not overload circuits.
3. Replace all components damaged by Contractor's use.

b. Lighting:

1. Provide and maintain additional lighting, extend from existing system, to comply with requirements of construction.
2. AAFES maintain lamps and ballasts in existing fixtures.
3. Contractor shall replace lamps and fixtures damaged by Contractor.

c. Heating:

1. Replace all components damaged by Contractor's use.

d. Water: Protect system from freezing.
e. Temporary Toilets:

1. Furnish and install adequate portable chemical toilets for use by construction personnel. Construction personnel will not be allowed to use existing toilet facilities located within the shoppette.
2. Provide maintenance service to keep the toilet clean and sanitary.

E. Upon completion of work, or when directed by Contracting Officer, restore existing systems to original condition.

1.5 TEMPORARY CONSTRUCTION, EQUIPMENT AND PROTECTION

A. Provide, maintain, and remove upon completion of the work, all temporary rigging, scaffolding, hoisting equipment, ladders to roof, barricades around openings, and all other temporary work as required to complete all work of the Contract. Contractor shall coordinate the use and furnishing of scaffolds with his subcontractors.

B. Provide, maintain and remove upon completion of the work, or sooner if authorized by the Contracting Officer, all fences, barricades, lights, shoring, pedestrian walkways, and other protective structures or devices necessary for the safety of workmen, AAFES employees, equipment, the public, and property.

C. All temporary construction and equipment shall conform to all regulations, ordinances,

laws and other requirements of the authorities having jurisdiction, including insurance companies, with regards to safety precautions, operation and fire hazard.

D. Pumping: Provide and maintain pumping facilities, including power, for keeping the site, excavations and structures free of accumulations of water at all times, whether from underground seepage, rainfall, drainage or broken lines.

E. Unauthorized Entry: Maintain provision for closing and locking the building as soon as possible. When exterior work is in process such as concrete finish work, the Contractor shall maintain a night watchman on the premises until such time that the work cannot be harmed or damaged.

F. Damage or Theft: Protect the work and material to be used on the project, from damages or loss due to the elements, theft, vandalism, malicious mischief, or other causes. Contractor shall be held responsible for such damages, or loss, which he shall remedy at his expense.

G. Temporary Walls, Closures, Security Enclosures and Barricades: Provide and maintain all barricades or enclosures required to protect the work in progress from outside elements, dust, interior construction dust and noise, and other disturbances as a result of work under this Contract. Such protection shall be positive, shall meet the approval of the Contracting Officer, and shall be maintained for the duration of the construction period, or as required to provide for the protection as specified.

1.6 PROJECT BULLETIN BOARD

The Contractor shall furnish, install, and maintain, during the life of the project, a weather tight bulletin board approximately 3 feet high by 5 feet wide, having not less than two hinged or sliding glass doors with provisions for locking. The bulletin board shall be mounted where, and as approved by the Contracting Officer, in a prominent place, accessible to employees of the Contractor and Subcontractors, and to applicants for employment. The bulletin board shall remain the property of the Contractor, and shall be removed by him upon completion of the contract work. The following information, which will be furnished by AAFES to the Contractor (except safety posters), shall be posted on the bulletin board, and shall be maintained by the Contractor in an easily readable condition at all times for the duration of the Contract:

A. The Equal Employment Opportunity Poster and Notice of Nondiscrimination of Employment (Standard Form 38).

B. Wage Rate Information Poster (Form SOL 155), with the contract schedule of minimum rates as required by the Davis-Bacon Act.

C. Safety posters.

1.7 TEMPORARY SECURITY WALL

A. Contractor shall construct and install temporary security walls at existing walls where new openings are cut through existing exterior walls. Openings shall be constructed with 2" x 4"s and 3/4" plywood with temporary lockable door in each opening. Surface into existing exchange shall be painted and new doors shall have 2 padlocks on the existing exchange side.

PART 2 PRODUCTS

2.1 MATERIALS. Shall be adequate for purposes intended, shall not create unsafe or unsanitary

conditions, nor violate requirements of specified codes. Comply with Federal and State Regulations.

A. Electrical Power System:

1. Comply with Division 16.
2. Provide and maintain all specified facilities, including conductors, raceways, breakers, fuses and switches.

B. Lighting:

1. Comply with:

a. Division 16.

2. Receptacles, fixtures:

a. Standard products, meeting UL requirements.
b. Provide heavy-duty guards on fixtures.
c. Provide appropriate types of fixtures and receptacles for environment in which used, in accordance with NEC and NEMA standards.
d. All receptacle circuits GFCI protected.

PART 3 EXECUTION

3.1 ALL TEMPORARY UTILITIES

A. Comply with Division 16 and Federal and State regulations.

B. Install work in neat and orderly manner.

C. Make structurally, mechanically and electrically sound throughout.

D. Maintain to give safe, continuous service, and to provide safe working conditions.

E. Modify and extend systems as work progresses.

3.2 INSTALLATION

A. Electrical:

1. Do not run branch circuits on floor or on ground.

B. Lighting:

1. Control lighting at secondary power centers unless otherwise specified.

3.3 REMOVAL

A. Upon Contracting Officer's prior written authorization, completely remove temporary materials and equipment.

B. Repair all damage caused by installation. Restore to original conditions.

END OF SECTION

SECTION 01510

TEMPORARY UTILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, water and sanitary facilities.

1.2 RELATED SECTIONS

A. Section 01590 - Field Offices and Sheds.

B. Section 01700 - Project Closeout.

1.3 TEMPORARY ELECTRIC

A. The contractor shall furnish and install a complete, temporary electric service for construction needs throughout the construction period.

1. The temporary electric service shall originate from within the existing building. The electrical contractor shall be responsible for furnishing and installing all fused cutouts, conductors, disconnects, and miscellaneous hardware.
2. The temporary electric service shall be a 120/208 volt, 3 phase, 4 wire, 200 amp service for construction operations.
3. Provide power centers, located such that all points of the construction area can be reached with extension cords no more than 100 feet long. Provide 20 amp, 120 and 208 volt grounded outlets, for use by all trades, each protected by a circuit breaker.
4. The Contractor will be responsible for providing and paying for temporary electrical service during construction.
5. Use of electric resistance heating devices is not permitted.
6. Unusually heavy electric loads, such as electric welding equipment, and other equipment with special power requirements shall not be connected to the existing system.

B. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of five (5) foot candles.

1. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
2. Provide guarded lighting sockets and lamps. Use 100 watt lamps, minimum. Maintain 110 volts in lighting system.
3. Maintain lighting and provide routine repairs.
4. Permanent building lighting may be utilized during final stages of construction.

C. Field Offices and Sheds: Provide electric service to the field office(s) and shed(s) to meet the requirements listed in Section 01590 - Field Offices and Sheds.

D. Standards: the temporary electric service shall comply with the National Electric Code. Extension cords used by any and all trades, shall be UL approved.

1.4 TEMPORARY HEATING

((SECTION NOT USED)

1.6 TEMPORARY COOLING

(SECTION NOT USED)

1.7 TEMPORARY VENTILATION

(SECTION NOT USED)

1.8 TELEPHONE SERVICE

A. The Contractor will be responsible for providing and paying for temporary telephone service during construction.

B. Refer to Section 01590 - Field Offices and Sheds.

1.9 TEMPORARY WATER SERVICE

A. Connect to existing water source for construction operations at time of project mobilization.

B. The Contractor will be responsible for providing and paying for temporary water service during construction. The Contractor shall maintain strict conservation measures to prevent waste of water during construction.

C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

1.10 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide at time of project mobilization.

B. Furnish, install, and maintain adequate portable chemical toilets for use by construction personnel.

C. Provide regular maintenance service to maintain clean and sanitary conditions.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01520

CONTRACTOR PREPARED PROGRESS CHART SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

A. Related Requirements Specified Elsewhere:

1. Summary of Project: Section 01011.
2. Progress Meetings: Section 01039.
3. Construction Phasing: Section 01042.
4. Submittals: Section 01300.

B. Provide projected construction schedules for entire work, update monthly.

1.2 SCOPE

A. The Contractor shall prepare a Progress Chart System to serve as a guide in managing the construction progress. Reference General Provisions clause entitles, "Schedule and Progress".

1.3 GENERAL

A. The progress chart shall be prepared by the contractor and shall consist of a bar chart as described in this section. In preparing this system, the scheduling of construction shall be the responsibility of the contractor and shall be developed in accordance with the phasing plan shown on the construction drawings. The requirement for the system is included to assure adequate planning and execution of the work and to assist the Contracting Officer in appraising the reasonableness of the proposed schedule and evaluating progress of the work.

1.4 PROGRESS CHART SYSTEM

A. The system consists of keeping a record of the time allotted for each activity and the actual progress of the activity.

B. Activities shall be listed vertically and shall include the units of work required for the project.

C. All activities of AAFES which affect progress and Contract required dates for completion shall be shown. Include activities for AAFES FURNISHED/AAFES INSTALLED ITEMS.

D. The selection and number of activities shall be subject to the Contracting Officer's approval.

1.5 A SCALE OF TIME

A. A scale of time, from date of the beginning of the contract work to the date of completion of the contract work, shall be indicated horizontally on the chart. The units of time indicated shall be days.

1.6 ACTIVITY TIMES

A. Activity shall be indicated in the form of scaled time bars. The bars shall indicate the following:

1. The schedule of time allotted for the activity.
2. The actual progress of the activity including the actual time of the activity start, the time spent to date or to the finish of the activity.

1.7 SUBMISSION AND APPROVAL

A. Submission and approval of the system shall be as follows:

1. A preliminary bar chart defining the contractor's planned operations during the first sixty (60) calendar days after notice to proceed shall be submitted within ten (10) days. The Contractor's general approach for the balance of the project shall be indicated. Cost of the activities expected to be completed or partially completed before submission and approval of the complete bar chart should be included.

1.8 THE COMPLETE BAR CHART

A. The complete bar chart shall be submitted within thirty (30) calendar days after receipt of notice to proceed.

1.9 CONTRACTOR

A. The Contractor shall submit at intervals of thirty (30) calendar days a copy of the complete bar chart with the current activity progress clearly indicated. Cost of each activity completed and each partially completed shall be included.

B. The contractor shall also submit a narrative report with the updated bar chart, including a description of problem areas (current and anticipated) delaying factors and their impact, and an explanation of corrective actions taken or proposed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01524

CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for the following, as applicable:

1. Salvaging nonhazardous construction waste.
2. Recycling nonhazardous construction waste.
3. Disposing of nonhazardous construction waste.

1.2 RELATED SECTIONS

A. Section 01352 - LEED Requirements.

B. Section 01420 - Environmental Protection.

C. Division 2 through 16 Sections for construction waste management requirements specific to the Project.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 50 percent by weight of total waste generated by the Work.

1.5 SUBMITTALS

A. Waste Management Plan: Submit three (3) copies of plan within seven (7) days of date established for commencement of the Work.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three (3) copies of report. Include the following information, as applicable:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit three (3) copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. LEED Submittal: LEED letter template for Credit MR 2.1 and 2.2, as applicable, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

I. Qualification Data: For Waste Management Coordinator.

1.6 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings". Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Contracting Officer. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 1 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three (3) days of submittal return.

2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, and other incentives received for recycling waste materials shall accrue to Contracting Officer.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Base property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

1. Comply with requirements in Division 2, Landscape Sections for use of chipped organic waste as organic mulch.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
   a. Comply with requirements in Division 2, Landscape Sections for use of clean sawdust as organic mulch.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
   a. Comply with requirements in Division 2, Landscape Sections for use of clean ground gypsum board as inorganic soil amendment.

3.4 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning or burying debris on site is not permitted.

C. Disposal: Transport waste materials and legally dispose of them off Base property.

END OF SECTION

SECTION 01590

FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary field offices and sheds.

B. Maintenance and cleaning.

C. Removal.

1.2 RELATED SECTIONS

A. Section 01011 - Summary of Project.

B. Section 01510 - Temporary Utilities.

PART 2 PRODUCTS

2.1 MATERIALS, EQUIPMENT, FURNISHINGS

A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.2 CONSTRUCTION

A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.

B. Construction: Structurally sound, secure, weather tight enclosures for office and storage spaces. Maintain during progress of Work; remove at completion of Work.

C. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.

D. Exterior Materials: Weather resistant, finished in one color acceptable to Contracting Officer.

E. Interior Materials in Offices: Sheet type materials for walls and ceilings, pre-finished or painted; resilient floors and bases.

F. Lighting for Offices: 50 ft-C (538 lx) at desktop height, exterior lighting at entrance doors.

G. Fire Extinguishers: One 10 lb standard dry chemical (ABC) type fire extinguisher at each office and each storage area.

H. Interior Materials in Storage Sheds: As required to provide specified conditions for storage of products.

2.3 ENVIRONMENTAL CONTROL

A. Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain 68 degrees F heating and 76 degrees F cooling.

B. Storage Spaces: Heating and ventilation as needed to maintain Products in accordance with Contract Documents; adequate lighting for maintenance and inspection of Products.

2.4 CONTRACTOR OFFICE AND FACILITIES

A. Size: For Contractor's needs and to provide space for project meetings. Minimum size: 150 square feet.

B. Telephone: The Contractor shall install, maintain and pay for telephone service for the Contractor's field office including an answering device and outside bell.

C. Fax: Install, maintain and pay for facsimile service for the Contractor's Field Office.

D. Furnishings in Meeting Area: Conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.

E. Other Furnishings: Contractor's option.

F. Equipment: Six (6) adjustable band protective helmets for visitors, one 10 inch outdoor weather thermometer and a weather protected bulletin board for posting information required by the contract.

2.5 STORAGE AREAS AND SHEDS

A. Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products.

PART 3 EXECUTION

3.1 PREPARATION

A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.2 INSTALLATION

A. Install office spaces ready for occupancy 15 days after date of Notice to Proceed.

B. Employee Residential Occupancy: Not permitted on Installation property.

3.3 MAINTENANCE AND CLEANING

A. Weekly cleaning services for offices; periodic cleaning and maintenance for office and storage areas.

B. Maintain approach walks free of mud, water, and snow.

3.4 REMOVAL

A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION

SECTION 01650

STARTING OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Starting Systems.

B. Demonstration and instructions.

C. Testing, adjusting and balancing.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control.

B. Section 01700 - Contract Closeout.

1.3 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Contracting Officer seven (7) days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable manufacturer's representative and/or Contractors' personnel in accordance with manufacturers' instructions.

G. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Section 01300 that equipment or system has been properly installed and is functioning correctly.

1.4 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to AAFES and Facility personnel two weeks prior to date of final inspection.

B. Demonstrate project equipment by a qualified representative who is knowledgeable about the project.

C. For equipment of systems requiring seasonal operation, perform demonstration for other season within six months.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with AFFES/Facility personnel in detail to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time at designated location.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

1.5 TESTING, ADJUSTING AND BALANCING

A. Contractor will appoint, employ, and pay for services of an independent firm to perform testing, adjusting, and balancing.

B. The independent firm will perform services specified in Section 15990.

C. Reports will be submitted by the independent firm to the Contracting Officer indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01700

PROJECT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Substantial Completion.

B. Final Inspections.

C. Closeout Submittals.

1.2 RELATED SECTIONS:

A. General Provisions of the Contract: Final Acceptance and Payment.

B. Section 01300 - Submittals

C. Section 01710 - Cleaning

D. Section 01720 - Project Record Documents

1.3 SUBSTANTIAL COMPLETION:

A. Contractor:

1. Submit written certification to Contracting Officer that project, or designated portion of Project, is substantially complete.
2. Submit list of major items to be completed or corrected.

B. Contracting Officer will make an inspection after receipt of certification.

C. Should Contracting Officer consider that work is substantially complete:

1. Contractor shall prepare, and submit to Contracting Officer, a list of items to be completed or corrected, as determined by the inspection.
2. Contracting Officer will prepare and issue a Certificate of Substantial Completion, containing:

a. Date of Substantial Completion.
b. Contractor's list of items to be completed or corrected, verified, and amended by Contracting Officer.
c. The time within which Contractor shall complete or correct work of listed items.
d. Time and date AAFES will assume possession of work or designated portion thereof.
e. Responsibilities of AAFES and Contractor for:

i Utilities.
ii. Operation of mechanical, electrical, and other systems.
iii. Maintenance and cleaning.
iv. Security.

f. Signatures of:

i. Contracting Officer.
ii. Contractor.

3. AAFES occupancy of project or designated portion of project:

a. Contractor shall:

i. Perform final cleaning in accordance with Section 01710.

b. AAFES will occupy project, under provisions stated in Certificate of Substantial Completion.

4. Contractor: Complete work listed for completion or correction, within designated time.

D. Should Contracting Officer consider that work is not substantially complete:

1. He shall immediately notify Contractor, in writing, stating reasons.
2. Contractor: Complete work, and send second written notice to contracting officer, certifying that project, or designated portion of project, is substantially complete.
3. Contracting Officer will reinspect work.

1.4 FINAL INSPECTION

A. Contractor shall submit written certification that:

1. Contract documents have been reviewed.
2. Project has been inspected for compliance with contract documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in presence of Facility Representatives and are operational.
5. Project is completed and ready for final inspection.

B. Contracting Officer will make final inspection after receipt of certification.

C. Should the Contracting Officer consider that work is finally complete in accordance with requirements of contract documents, he shall request contractor to make project closeout submittals.

D. Should the Contracting Officer consider that work is not finally complete:

1. He shall notify contractor, in writing, stating reasons.
2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to the Contracting Officer certifying that work is complete.
3. The Contracting Officer will reinspect work.

1.5 PROJECT RECORD DOCUMENTS:

A. Project Record Documents: Specified requirements of Section 01720.

1.6 OPERATION AND MAINTENANCE MANUALS:

A. Submit data bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable plastic covers.

B. Prepare binder cover with printed title "Operation and Maintenance Manuals", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, typed on 20 pound white paper, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of Contractor, Subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

    a. Significant design criteria.
    b. List of equipment.
    c. Parts list for each component.
    d. Operating instructions.
    e. Value chart.
    f. Maintenance instructions for equipment and systems.
    f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:

    a. Shop drawings and product data.
    b. Air and water balance reports.
    c. Certificates.
    d. Photocopies of warranties.
    e. Training Sessions attendance roster.

E. Submit six (6) copies of the operation and maintenance manuals to the Contracting Officer.

1.7 OPERATION AND MAINTENANCE INSTRUCTION:

A. The Contractor shall provide, at his expense, manufacturer's representatives to completely check out all mechanical and electrical systems and items covered by the drawings and specifications. This requirement shall be scheduled just prior to, and during the initial start up. After all systems are functioning properly, the representatives shall instruct Facility Maintenance Personnel in the proper operation and maintenance of each item. In addition to instructions given at the project, the Facility Maintenance Personnel shall be given a classroom instruction course on operation and maintenance of the systems. Training sessions shall be limited to four (4) continuous hours where practical. Schedule additional four (4) hour sessions as required.

1.8 DD FORM 1354:

A. Preparation of DD Form 1354 "Transfer and Acceptance of Military Real Property": At the

conclusion of the project the Contractor will compile and furnish to the Contracting Officer certain costs and quantity data of materials and systems furnished and installed. A list of items for which the costs and quantity data are required will be furnished to the Contractor. Such information will be returned to the Contracting Officer within 10 days from the receipt of the list.

1.9 WARRANTY AND EXTENDED WARRANTIES:

A. Upon completion of project, prior to final payment, guarantees required by technical divisions of Specifications shall be properly executed in quadruplicate by subcontractors and submitted to Contracting Officer. Delivery of guarantees shall not relieve contractor from any obligation assumed under contract.

B. Submit guarantee covering entire project for one year. In addition, where separate guarantees, for certain portions of work, are for longer periods, General Contractor's guarantee shall be extended to cover such longer periods.

C. Guarantees shall become valid and operative upon issuance of Certificate of Inspection and Acceptance by AAFES. Guarantees shall not apply to work where damage is a result of abuse, neglect by AAFES, or his successor(s) in interest.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01710

CLEANING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Progress Cleaning.

B. Final Cleaning.

1.2 RELATED SECTIONS

A. General Provisions of the Contract.

B. Section 01011 - Summary of Project

C. Section 01045 - Cutting and Patching

D. Section 01590 - Field Offices and Sheds

E. Individual Specification Sections - Cleaning Requirements.

1.3 SAFETY REQUIREMENTS

A. Standards: Maintain project in accordance with the following safety and insurance standards:

1. The Corps of Engineers Manual, EM 385-1-1, latest edition, entitled: "General Safety Requirements", as referred to in General Provisions, Paragraph: Accident Prevention.

B. OSHA Standards:

1. The Contractor shall be required to comply with OSHA requirements in 29 CFR 1926 and 29 CFR 1910. The OSHA Standards are subject to change, and such changes may affect the Contractor in his performance under the contract. It is the Contractor's responsibility to know such changes, effective dates of changes, and comply with all requirements.

C. Hazards Control:

1. Store volatile wastes in covered metal containers and remove from premises daily.
2. Prevent accumulation of wastes which create hazardous conditions.
3. Provide adequate ventilation during the use of volatile or noxious substances. Volatile or noxious substances shall be stored and used with personal protection equipment in accordance with the MSDS recommendations. The Contractor shall provide appropriate personal protection equipment and ensure that employees use it.

D. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on the facility.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways.

PART 2 PRODUCTS

2.1 MATERIALS

A. Use only cleaning materials recommended by the manufacturer of the surface to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.1 PROGRESS CLEANING

A. Execute cleaning to ensure that the building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.

B. Maintain site in a clean and orderly condition.

C. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

D. Remove waste materials, debris, and rubbish from site and legally dispose of at public or private dumping areas off of Government property.

E. Vacuum clean interior building areas when ready to receive finish painting, and continue cleaning to eliminate dust.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights. Open free-fall chutes are not permitted.

G. Schedule cleaning operations so that dust and other contaminants resulting from the cleaning process will not fall on wet, newly painted surfaces.

3.2 FINAL CLEANING

A. Employ professional cleaners for final cleaning.

B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces and of concealed spaces.

C. Remove grease, dust, dirt, stains, temporary labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine; finish vacuum carpeted and soft surfaces.

D. Repair, patch, and touch-up marred surfaces to specified finish, to match adjacent surfaces.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Broom clean paved surfaces; rake clean other surfaces of grounds.

G. Clean all glass.

H. Replace air conditioning filters if units were operated during construction.

I. Clean ducts, blowers, and coils, if air HVAC units were operated without filters during construction.

J. Maintain cleaning until project, or portion thereof, is occupied by AAFES.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 DESCRIPTION

A. Submittals: Section 01300.

1.2 MAINTENANCE OF DOCUMENTS

A. Maintain at job site, one copy of:

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Reviewed Shop Drawings.
5. Change Orders.
6. Other Modifications to Contract.
7. Field Test Records.

B. Store documents in field office apart from documents used for construction.

C. Provide files and racks for storage of documents.

D. File documents in accordance with Project Filing Format of Uniform Construction Index.

E. Maintain documents in clean, dry, legible condition.

F. Do not use record documents for construction purposes.

G. Make documents available at all times for inspection by Contracting Officer.

1.3 MARKING DEVICES

A. Provide red colored pencils for all marking.

1.4 RECORDING

A. Label each document "PROJECT RECORD" in 2 inch high printed letters.

B. Keep record documents current.

C. Do not permanently conceal any work until required information has been recorded.

D. Contract Drawings: Legibly mark to record actual construction.

1. Depths of various elements of foundation in relation to first floor level.
2. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
3. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
4. Field changes of dimension and detail.
5. Changes made by change order or field order.

6. Details not on original contract drawings.

E. Specifications and Addenda: Legibly mark up each section to record:

1. Changes made by Change Order or Field Order.
2. Other matters not originally specified.

1.5 SUBMITTAL

A. At completion of project, deliver record documents to Contracting Officer.

B. Accompany submittal with transmittal letter, in duplicate, containing:

1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each record document.
5. Certification that each document as submitted is complete and accurate.
6. Signature of Contractor, or his authorized representative.

END OF SECTION

SECTION 01810

GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 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.

B. OPR and BoD documentation prepared by Owner and Architect contains requirements that apply to this Section.

1.2 SECTION INCLUDES

A. General requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.

1.3 RELATED SECTIONS

A. Division 15 Section "HVAC Commissioning Requirements" for specific requirements for commissioning HVAC systems.

1.4 DEFINITIONS

A. BoD: Basis of Design.

B. CxA: Commissioning Authority.

C. OPR: Owner's Project Requirements.

D. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.

E. TAB: Testing, Adjusting, and Balancing.

1.5 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): 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 General, Mechanical, and Electrical Contractors, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.6 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and General Contractor for use in developing the commissioning plan; systems manual; operation and maintenance training plan; and testing plans and checklists.

B. 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. Training in operation and maintenance of systems, subsystems, and equipment.
3. Testing meetings.
4. Demonstration of operation of systems, subsystems, and equipment.

C. Provide utility services required for the commissioning process.

D. Provide the BoD documents, prepared by Architect and approved by Owner, to the CxA and General Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.7 CONTRACTOR'S RESPONSIBILITIES

A. Provide utility services required for the commissioning process.

B. General 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 design- and construction-phase coordination meetings.
2. Participate in maintenance orientation and inspection.
3. Participate in operation and maintenance training sessions.
4. Participate in final review at acceptance meeting.
5. Certify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
6. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
7. Review and approve final commissioning documentation.

C. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:

1. Participate in design- and construction-phase coordination meetings.
2. Participate in maintenance orientation and inspection.
3. Participate in procedures meeting for testing.
4. Participate in final review at acceptance meeting.
5. 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.
6. Provide information to the CxA for developing construction-phase commissioning plan.
7. Participate in training sessions for Owner's operation and maintenance personnel.
8. Provide updated Project Record Documents to the CxA on a daily basis.

9. Gather and submit operation and maintenance data for systems, subsystems, and equipment to the CxA, as specified in Division 1 Section "Operation and Maintenance Data."
10. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures and participate in testing of installed systems, subsystems, and equipment.

1.8 CxA'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Prepare a construction-phase commissioning plan. Collaborate with General Contractor and with subcontractors to develop test and inspection procedures. Include design changes and scheduled commissioning activities coordinated with overall Project schedule. Identify commissioning team member responsibilities, by name, firm, and trade specialty, for performance of each commissioning task.

C. Review and comment on submittals from General Contractor for compliance with the OPR, BoD, Contract Documents, and construction-phase commissioning plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.

D. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss progress of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The CxA shall prepare and distribute minutes to commissioning team members and attendees within five (5) workdays of the commissioning meeting.

E. 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 for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; and Project completion.

F. Observe and inspect construction and report progress and deficiencies. In addition to compliance with the OPR, BoD, and Contract Documents, inspect systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.

G. Prepare Project-specific test and inspection procedures and checklists.

H. Schedule, direct, witness, and document tests, inspections, and systems startup.

I. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.

J. Certify date of acceptance and startup for each item of equipment for start of warranty periods.

K. 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."

L. Review and comment on operation and maintenance documentation and systems manual outline for compliance with the OPR, BoD, and Contract Documents. Operation

and maintenance documentation requirements are specified in Division 1 Section "Operation and Maintenance Data."

M. Prepare operation and maintenance training program and provide qualified instructors to conduct operation and maintenance training. Operation and maintenance training is specified in Division 1 Section "Demonstration and Training."

N. Videotape and edit training sessions.

O. Videotape construction progress including hidden shafts.

P. Prepare commissioning reports.

Q. Assemble the final commissioning documentation, including the commissioning report and Project Record Documents.

1.9 COMMISSIONING DOCUMENTATION

A. Index of Commissioning Documents: CxA shall prepare an index to include storage location of each document.

B. OPR: A written document, prepared by Owner, that details the functional requirements of Project and expectations of how it will be used and operated. This document includes Project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information.

C. BoD Document: A document, prepared by Architect, that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

D. 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. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
2. 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.
3. Identification of systems and equipment to be commissioned.
4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
5. Identification of items that must be completed before the next operation can proceed.
6. Description of responsibilities of commissioning team members.
7. Description of observations to be made.
8. Description of requirements for operation and maintenance training, including required training materials.
9. Description of expected performance for systems, subsystems, equipment, and controls.

10. Schedule for commissioning activities with specific dates coordinated with overall construction schedule.
11. Identification of installed systems, subsystems, and equipment, including design changes that occurred during the construction phase.
12. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
13. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
14. 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.

E. Test Checklists: CxA shall develop test checklists 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. Specific checklist content requirements are specified in Division 1 Section "HVAC Commissioning Requirements." Each checklist, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:

1. Name and identification code of tested item.
2. Test number.
3. Time and date of test.
4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
5. Dated signatures of the person performing test and of the witness, if applicable.
6. Individuals present for test.
7. Deficiencies.
8. Issue number, if any, generated as the result of test.

F. Certificate of Readiness: Certificate of Readiness shall be signed by [**each**]Contractor, Subcontractor(s), Installer(s), and CxA certifying that systems, subsystems, equipment, and associated controls are ready for testing. Completed test checklists signed by the responsible parties shall accompany this certificate.

G. Test and Inspection Reports: CxA shall record test data, observations, and measurements on test checklists. Photographs, forms, and other means appropriate for the application shall be included with data. CxA shall compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.

H. 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.

I. Issues Log: CxA shall prepare and maintain an issues log that describes design, 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 OPR, BoD, or Contract Documents that may require action.
d. State that correction was completed and system, subsystem, and equipment is 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.

J. 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 OPR, BoD, and Contract Documents. The commissioning report shall include, but is not limited to, the following:

1. Lists and explanations of substitutions; compromises; variances in the OPR, BoD, and 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 OPR, BoD, and Contract Documents and those that do not meet requirements of the OPR, BoD, and Contract Documents. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.
2. OPR and BoD documentation.
3. Commissioning plan.
4. Testing plans and reports.
5. Corrective modification documentation.

6. Issues log.
7. Completed test checklists.
8. Listing of off-season test(s) not performed and a schedule for their completion.

K. Systems Manual: CxA shall gather required information and compile systems manual. Systems manual shall include, but is not limited to, the following:

1. OPR and BoD, including system narratives, schematics, and changes made throughout the Project.
2. Project Record Documents as specified in Division 1 Section "Project Record Documents."
3. Final commissioning plan.
4. Commissioning report.
5. Operation and maintenance data as specified in Division 1 Section "Operation and Maintenance Data."

1.10 SUBMITTALS

A. Commissioning Plan Prefinal Submittal: CxA shall submit two (2) hard copies of prefinal commissioning plan. Deliver one copy to General Contractor, one to Owner, and one to Architect. Present submittal in sufficient detail to evaluate data collection and arrangement process. One copy, with review comments, will be returned to the CxA for preparation of the final construction-phase commissioning plan.

B. Commissioning Plan Final Submittal: CxA shall submit two (2) hard copies and two sets of electronically formatted information of final commissioning plan. Deliver one hard copy and one set of discs to Owner, and one copy to Architect. The final submittal must address previous review comments. The final submittal shall include a copy of the prefinal submittal review comments along with a response to each item.

C. Test Checklists and Report Forms: CxA shall submit sample checklists and forms to General Contractor quality-control manager and subcontractors for review and comment. Submit two (2) copies of each checklist and report form.

D. Certificates of Readiness: CxA shall submit Certificates of Readiness.

E. Test and Inspection Reports: CxA shall submit test and inspection reports.

F. Corrective Action Documents: CxA shall submit corrective action documents.

G. Prefinal Commissioning Report Submittal: CxA shall submit two (2) hard copies of the prefinal commissioning report. Include a copy of the preliminary submittal review comments along with CxA's response to each item. CxA shall deliver one copy to Owner and one copy to Architect. One copy, with review comments, will be returned to the CxA for preparation of final submittal.

H. Final Commissioning Report Submittal: CxA shall submit two (2) hard copies and two (2) sets of electronically formatted information of the final commissioning report. CxA shall deliver one hard copy and one set of discs to Owner, and one copy to Architect. The final submittal must address previous review comments and shall include a copy of the prefinal submittal review comments along with a response to each item.

1.11 QUALITY ASSURANCE

A. Instructor Qualifications: Factory-authorized service representatives, experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.

B. 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.

1.12 COORDINATION

A. Coordinating Meetings: CxA shall conduct monthly 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. Pretesting Meetings: CxA shall conduct pretest meetings of the commissioning team to review startup reports, pretest inspection results, testing procedures, testing personnel and instrumentation requirements, and manufacturers' authorized service representative services for each system, subsystem, equipment, and component to be tested.

C. Testing Coordination: CxA shall coordinate sequence of testing activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

D. Manufacturers' Field Services: CxA shall coordinate services of manufacturers' field services.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

A. Training Preparation Conference: Before operation and maintenance training, CxA shall convene a training preparation conference to include Owner's operation and maintenance personnel, each Contractor, and subcontractors. In addition to requirements specified in Division 1 Section "Demonstration and Training," perform the following:

1. Review the OPR and BoD.
2. Review installed systems, subsystems, and equipment.
3. Review instructor qualifications.
4. Review instructional methods and procedures.
5. Review training module outlines and contents.
6. Review course materials (including operation and maintenance manuals).
7. Inspect and discuss locations and other facilities required for instruction.

8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

B. Training Modules: Develop an instruction program that includes individual training modules for each system, subsystem, and equipment as specified in Division 1 Section "Demonstration and Training."

END OF SECTION

SECTION 01815

HVAC COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 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.

B. OPR, BoD, and BoD-HVAC documentation prepared by Owner and Architect contains requirements that apply to this Section.

1.2 SECTION INCLUDES

A. This Section includes requirements for commissioning the HVAC system and its subsystems and equipment. This Section supplements the general requirements specified in Division 1 Section "General Commissioning Requirements."

1.3 RELATED SECTION

A. Division 1 Section "General Commissioning Requirements" for general requirements for commissioning processes that apply to this Section.

1.4 DEFINITIONS

A. Architect: Includes Architect identified in the Contract for Construction between Owner and Contractor, plus consultant/design professionals responsible for design of HVAC, electrical, communications, controls for HVAC systems, and other related systems.

B. BoD: Basis of Design.

C. BoD-HVAC: HVAC systems basis of design.

D. CxA: Commissioning Authority.

E. OPR: Owner's Project Requirements.

F. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.

G. TAB: Testing, Adjusting, and Balancing.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. The following responsibilities are in addition to those specified in Division 1 Section "General Commissioning Requirements."

B. TAB Contractor:

1. Attend procedures meeting for TAB Work.
2. Certify that TAB Work is complete.

C. Mechanical Contractor:

1. Attend TAB verification testing.
2. Provide measuring instruments and logging devices to record test data, and data acquisition equipment to record data for the complete range of testing for the required test period.

D. HVAC Instrumentation and Control Contractor: With the CxA, review control designs for compliance with the OPR and BoD, controllability with respect to actual equipment to be installed, and recommend adjustments to control designs and sequence of operation descriptions.

E. TAB Contractor:

1. Contract Documents Review: With the CxA, review the Contract Documents before developing TAB procedures.

a. Verify the following:

1) Accessibility of equipment and components required for TAB Work.
2) Adequate number and placement of duct balancing dampers to allow proper balancing while minimizing sound levels in occupied spaces.
3) Adequate number and placement of balancing valves to allow proper balancing and recording of water flow.
4) Adequate number and placement of test ports and test instrumentation to allow reading and compilation of system and equipment performance data needed to conduct both TAB and commissioning testing.
5) Air and water flow rates have been specified and compared to central equipment output capacities.

b. Identify discontinuities and omissions in the Contract Documents.
c. This review of the Contract Documents by the TAB Subcontractor satisfies requirements for a design review report as specified in Division 15 Section "Testing, Adjusting, and Balancing."

2. Additional Responsibilities: Participate in tests specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation."

F. Electrical Contractor:

1. With the Mechanical Contractor, coordinate installations and connections between and among electrical and HVAC systems, subsystems, and equipment.
2. Attend TAB verification testing.

1.6 COMMISSIONING DOCUMENTATION

A. The following are in addition to documentation specified in Division 1 Section "General Commissioning Requirements."

B. BoD HVAC: Owner will provide BoD-HVAC documents, prepared by Architect and approved by Owner, to the CxA and Mechanical and Electrical Contractors for use in

developing the commissioning plan, systems manual, and operation and maintenance training plan.

C. Test Checklists: CxA shall develop test checklists for HVAC systems, subsystems, and equipment, including interfaces and interlocks with other systems. CxA shall prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. In addition to the requirements specified in Division 1 Section "General Commissioning Requirements," checklists shall include, but not be limited to, the following:

1. Calibration of sensors and sensor function.
2. Testing conditions under which test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of test.
3. Control sequences for HVAC systems.
4. Strength of control signal for each set point at specified conditions.
5. Responses to control signals at specified conditions.
6. Sequence of response(s) to control signals at specified conditions.
7. Electrical demand or power input at specified conditions.
8. Power quality and related measurements.
9. Expected performance of systems, subsystems, and equipment at each step of test.
10. Narrative description of observed performance of systems, subsystems, and equipment. Notation to indicate whether the observed performance at each step meets the expected results.
11. Interaction of auxiliary equipment.
12. Issues log.

1.7 SUBMITTALS

A. The following submittals are in addition to those specified in Division 1 Section "General Commissioning Requirements."

B. Testing Procedures: CxA shall submit detailed testing plan, procedures, and checklists for each series of tests. Submittals shall include samples of data reporting sheets that will be part of the reports.

C. Certificate of Readiness: CxA shall compile certificates of readiness from Mechanical and Electrical Contractors certifying that systems, subsystems, equipment, and associated controls are ready for testing.

D. Certificate of Completion of Installation, Prestart, and Startup: CxA shall certify that installation, prestart, and startup activities have been completed. Certification shall include completed checklists provided by TAB Contractor as specified in Division 15 Section "Testing, Adjusting, and Balancing."

E. Certified Pipe Cleaning and Flushing Report: CxA shall certify that pipe cleaning, flushing, hydrostatic testing, and chemical treating have been completed.

F. Test and Inspection Reports: CxA shall compile and submit test and inspection reports and certificates, and shall include them in systems manual and commissioning report.

G. Corrective Action Documents: CxA shall submit corrective action documents.

H. Certified TAB Reports: CxA shall submit verified, certified TAB reports.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 TESTING PREPARATION

A. Prerequisites for Testing:

1. Certify that HVAC systems, subsystems, and equipment have been completed, calibrated, and started; are operating according to the OPR, BoD, and Contract Documents; and that Certificates of Readiness are signed and submitted.
2. Certify that HVAC instrumentation and control systems have been completed and calibrated; are operating according to the OPR, BoD, and Contract Documents; and that pretest set points have been recorded.
3. Certify that TAB procedures have been completed, and that TAB reports have been submitted, discrepancies corrected, and corrective work approved.
4. Test systems and intersystem performance after approval of test checklists for systems, subsystems, and equipment.
5. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
6. Verify each operating cycle after it has been running for a specified period and is operating in a steady-state condition.
7. Inspect and verify the position of each device and interlock identified on checklists. Sign off each item as acceptable, or failed. Repeat this test for each operating cycle that applies to system being tested.
8. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
9. Annotate checklist or data sheet when a deficiency is observed.
10. Verify equipment interface with monitoring and control system and TAB criteria; include the following:

    a. Supply and return flow rates for VAV and constant volume systems in each operational mode.
    b. Operation of terminal units in both heating and cooling cycles.
    c. Minimum outdoor-air intake in each operational mode and at minimum and maximum airflows.
    d. Building pressurization.
    e. Total exhaust airflow and total outdoor-air intake.
    f. Operation of indoor-air-quality monitoring systems.

11. Verify proper responses of monitoring and control system controllers and sensors to include the following:

    a. For each controller or sensor, record the indicated monitoring and control system reading and the test instrument reading. If initial test indicates that the test reading is outside of the control range of the installed device, check calibration of the installed device and adjust as required. Retest malfunctioning devices and record results on checklist or data sheet.
    b. Report deficiencies and prepare an issues log entry.

12. Verify that HVAC equipment field quality-control testing has been completed and approved. CxA shall direct, witness, and document field quality-control tests, inspections, and startup specified in individual Division 15 Sections.

B. Testing Instrumentation: Install measuring instruments and logging devices to record test data for the required test period. Instrumentation shall monitor and record full range of operating conditions and shall allow for calculation of total capacity of system for each mode of operation. For individual room cooling tests, provide temporary heaters to impose a cooling load indicated in BoD. Operational modes include the following:

1. Occupied and unoccupied.
2. Warm up and cool down.
3. Economizer cycle.
4. Emergency power supply.
5. Life-safety and safety systems.
6. Smoke control.
7. Fire safety.
8. Stair pressurization system.
9. Temporary upset of system operation.
10. Partial occupancy conditions.
11. Special cycles.

3.2 TAB VERIFICATION

A. TAB Contractor shall coordinate with CxA for work required in Division 15 Section "Testing, Adjusting, and Balancing." TAB Contractor shall copy CxA with required reports, sample forms, checklists, and certificates.

B. General Contractor, HVAC contractor, and CxA shall witness TAB Work.

C. TAB Preparation:

1. TAB Contractor shall provide CxA with data required for "Pre-Field TAB Engineering Reports" specified in Division 15 Section "Testing, Adjusting, and Balancing."

   a. CxA shall use this data to certify that prestart and startup activities have been completed for systems, subsystems, and equipment installation.

D. Ductwork Air Leakage Testing:

1. Architect will identify, for HVAC Contractor and CxA, portions of duct systems to have ductwork air leakage testing. Ductwork air leakage testing shall be performed according to Division 15 Section "Metal Ducts," and shall be witnessed by the CxA.
2. On approval of preliminary ductwork air leakage testing report, the CxA shall coordinate verification testing of ductwork air leakage testing. Verification testing shall include random retests of portions of duct section tests, reported in preliminary ductwork air leakage testing report. The HVAC Contractot shall perform tests using the same instrumentation (by model and serial number) as for original testing; the CxA shall witness verification testing.

E. Verification of Final TAB Report:

1. CxA shall select, at random, 10 percent of report for field verification.
2. CxA shall notify TAB Contractor 10 days in advance of the date of field verification; however, notice shall not include data points to be verified. The TAB Contractor shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item is defined as follows:

    a. For all readings other than sound, a deviation of more than 10 percent.

        1) For sound pressure readings, a deviation of 3 dB. (Note: Variations in background noise must be considered.)

4. Failure of more than 10 percent of selected items shall result in rejection of final TAB report.

F. If deficiencies are identified during verification testing, CxA shall notify the HVAC Contractor and Architect, and shall take action to remedy the deficiency. Architect shall review final tabulated checklists and data sheets to determine if verification is complete and that system is operating according to the Contract Documents.

G. CxA shall certify that TAB Work has been successfully completed.

3.3 TESTING

A. Test systems and intersystem performance after test checklists for systems, subsystems, and equipment have been approved.

B. Perform tests using design conditions whenever possible.

1. Simulate conditions by imposing an artificial load when it is not practical to test under design conditions and when written approval for simulated conditions is received from CxA. Before simulating conditions, calibrate testing instruments. Set and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
2. Alter set points when simulating conditions is not practical and when written approval is received from CxA.
3. Alter sensor values with a signal generator when design or simulating conditions and altering set points are not practical. Do not use sensor to act as signal generator to simulate conditions or override values.

C. Scope of HVAC Contractor Testing:

1. Testing scope shall include entire HVAC installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. It shall include measuring capacities and effectiveness of operational and control functions.
2. Test all operating modes, interlocks, control responses, responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. Detailed Testing Procedures: CxA, with HVAC Contractor, TAB Contractor and HVAC Instrumentation and Control Contractor, shall prepare detailed testing plans, procedures, and checklists for HVAC systems, subsystems, and equipment.

E. Boiler Testing and Acceptance Procedures: Testing requirements are specified in Division 15 boiler Sections. CxA shall review and comment on submittals, test data, inspector record, and boiler certification and shall compile information for inclusion in systems manual.

F. HVAC Instrumentation and Control System Testing:

1. Field testing plans and testing requirements are specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation." The CxA, HVAC Contractor, and the HVAC Instrumentation and Control Contractor shall collaborate to prepare testing plans.
2. CxA shall convene a meeting of appropriate entities to review test report of HVAC instrumentation and control systems.

G. Pipe cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in Division 15 piping Sections. HVAC Contractor shall prepare pipe system cleaning, flushing, and hydrostatic testing. CxA shall review and comment on plan and final reports. CxA shall certify that pipe cleaning, flushing, hydrostatic tests, and chemical treatment have been completed. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed Drawings for each pipe sector showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
2. Description of equipment for flushing operations.
3. Minimum flushing water velocity.
4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

H. Energy Supply System Testing: HVAC Contractor shall prepare a testing plan to verify performance of gas systems and equipment. Plan shall include the following:

1. Sequence of testing and testing procedures for each equipment item and pipe section to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in system testing plan.
2. Tracking checklist for managing and ensuring that all pipe sections have been tested.

I. Heat-Generation System Testing: HVAC Contractor shall prepare a testing plan to verify performance of boilers, feedwater equipment, furnaces, and auxiliary equipment. Plan shall include the following:

1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each

item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.

2. Tracking checklist for managing and ensuring that all pipe sections have been tested.

J. Refrigeration System Testing: HVAC Contractor shall prepare a testing plan to verify performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. Plan shall include the following:

1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
2. Tracking checklist for managing and ensuring that all pipe sections have been tested.

K. HVAC Distribution System Testing: HVAC Contractor shall prepare a testing plan to verify performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems. Include HVAC terminal equipment and unitary equipment. Plan shall include the following:

1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
2. Tracking checklist for managing and ensuring that all pipe sections have been tested.

L. Vibration and Sound Tests: HVAC Contractor shall prepare testing plans to verify performance of vibration isolation and seismic controls. CxA shall witness and certify tests and inspections.

M. <**Insert HVAC systems.**>

N. Deferred Testing:

1. If tests cannot be completed because of a deficiency outside the scope of the HVAC system, the deficiency shall be documented and reported to Owner. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.
2. If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed and documented and additional tests scheduled.

O. Testing Reports:

1. Reports shall include measured data, data sheets, and a comprehensive summary describing the operation of systems at the time of testing.
2. Include data sheets for each controller to verify proper operation of the control system, the system it serves, the service it provides, and its location. For each

controller, provide space for recording its readout, the reading at the controller's sensor(s), plus comments. Provide space for testing personnel to sign off on each data sheet.

3. Prepare a preliminary test report. Deficiencies will be evaluated by Architect to determine corrective action. Deficiencies shall be corrected and test repeated.
4. If it is determined that the system is constructed according to the Contract Documents, Owner will decide whether modifications required to bring the performance of the system to the OPR and BoD documents shall be implemented or if tests will be accepted as submitted. If corrective Work is performed, Owner will decide if tests shall be repeated and a revised report submitted.

END OF SECTION

SECTION 02110

SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES (IF APPLICABLE)

A. Removal of surface debris.

B. Removal of paving, curbs, and sidewalks.

C. Removal of trees, shrubs, and other plant life.

D. Topsoil excavation.

1.2 RELATED SECTIONS (IF APPLICABLE)

A. Section 02210 - Site Grading.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that existing plant life designated to remain is tagged or identified.

B. Identify a salvage area for placing removed materials.

3.2 PROTECTION

A. Locate, identify, and protect utilities that remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping.

C. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.3 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs indicated. Remove stumps, root system to a depth of 36 inches and surface rock.

C. Clear undergrowth and deadwood, without disturbing subsoil.

3.4 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Partially remove paving, curbs, and sidewalks; as indicated. Neatly saw cut edges at right

angle to surface.

3.5 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion.

END OF SECTION

SECTION 02205

SOIL MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Subsoil materials.

B. Topsoil materials.

1.2 RELATED SECTIONS

A. Section 01410 - Testing Services.

B. Section 02010 - Subsurface Investigation.

C. Section 02207 - Aggregate Materials.

D. Section 02210 - Site Grading.

E. Section 02223 - Backfilling.

F. Section 02231 - Aggregate Base Course.

G. Section 02930 - Lawns.

1.3 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

D. ASTM D2487 - Classification of Soils for Engineering Purposes.

E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

F. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

1.5 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.

B. Materials Source: Submit name of imported materials source.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with State Department of Transportation Standard Specifications for Highway Construction.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

A. Subsoil Type S1:

1. Excavated and re-used material, or imported borrow.
2. Graded.
3. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
4. Conforming to ASTM D2487 Group Symbol CL.

2.2 TOPSOIL MATERIALS

A. Topsoil Type S2:

1. Excavated and reused material. Select.
2. Graded.
3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
4. Conforming to ASTM D2487 Group Symbol OH.

B. Topsoil Type S3:

1. Imported borrow.
2. Friable loam.
3. Reasonably free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.
4. Acidity range (pH) of 5.5 to 7.5.
5. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.
6. Conforming to ASTM D2487 Group Symbol PT.

2.3 SOURCE QUALITY CONTROL

A. Section 01410 - Testing Services.

B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D1557.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 SOIL REMOVAL

A. Excavate subsoil and topsoil from areas designated.

B. Remove lumped soil, boulders, and rock.

C. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations indicated on the drawings.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Prevent intermixing of soil types or contamination.

E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

A. Remove stockpile as directed by AAFES PM. Leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 02207

AGGREGATE MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate materials.

1.2 RELATED SECTIONS

A. Section 01410 - Testing Services.

B. Section 02205 - Soil Materials.

C. Section 02210 – Site Grading.

D. Section 02223 - Backfilling.

E. Section 02231 - Aggregate Base Course.

F. Section 02667 - Site Water Lines.

G. Section 02732 - Site Sanitary Sewerage Systems.

1.3 REFERENCES

A. AASHTO - M147 - Materials for Aggregate and Soil-Aggregate.

B. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

C. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

D. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

E. ASTM D2487 - Classification of Soils for Engineering Purposes.

F. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

G. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

H. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

1.5 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals.

B. Materials Source: Submit name of imported materials suppliers.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate Type A1 (Gravel): Angular crushed stone free of shale, clay, friable material and debris; graded in accordance with ASTM D2487 Group Symbol GW; within the following limits:

Sieve Size	Percent Passing
2 inches	100
1 inch	95
3/4 inch	95 to 100
5/8 inch	75 to 100
3/8 inch	55 to 85
No. 4	35 to 60
No. 16	15 to 35
No. 40	10 to 25
No. 200	5 to 10

B. Aggregate Type A2 (Pea Gravel): Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM D2487 Group Symbol GM; to the following limits:

1. Minimum Size: 1/4 inch
2. Maximum Size: 5/8 inch

2.2 FINE AGGREGATE MATERIALS

A. Fine Aggregate Type A3 (Sand): Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM D2487 Group Symbol SP; within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

2.3 BLENDED AGGREGATE MATERIALS

A. Blended Aggregate Type A4 (Crushed Aggregate Base for Paving): Blended crushed aggregate conforming to State Department of Transportation Standard Specifications for Highway Construction.

2.4 SOURCE QUALITY CONTROL

A Section 01410 - Testing Services.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136.

C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136.

D. If tests indicate materials do not meet specified requirements, change material or material source and retest.

E. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 STOCKPILING

A. Stockpile materials on site at locations designated by the Contracting Officer.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

A. Remove stockpile as directed by AAFES PM. Leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 02210

SITE GRADING

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope of Work:

1. The work performed under this section consists of general site work, including soil removal, rock excavation, general excavation and backfill, and finish grading.

2. The Contractor shall familiarize himself with the information contained in the subsurface investigation report if available, included in Section 02010.

B. Related Work Specified Elsewhere:

1. Section 01410 - Testing Services
2. Section 02110 - Site Clearing
3. Section 02205 - Soil Materials

1.2 QUALITY ASSURANCES

A. American Society for Testing and Materials:

C 136	Sieve Analysis of Fine and Coarse Aggregates.
D 422	Particle - Size Analysis of Soils.
D 1140	Amount of Material in Soils Finer than No. 200 (75 um) Sieve in Mineral Aggregates by Washing.
D 2937	Density of Soil in Place by the Drive-Cylinder Method.
C 117	Material Finer than No. 200 (75 um) Sieve in Mineral Aggregates by Washing.
C 127	Specific Gravity and Absorption of Coarse Aggregate.
C 128	Specific Gravity and Absorption of Fine Aggregate.
D 1557	Moisture Density Relations of Soils Using 10 lb. (4.5 kg) Rammer and 18 in. (457 mm) Drop.
E 11-R	Wire-cloth sieves for Testing Purposes.
E 548	Generic Criteria for Use in Evaluating of Testing and Inspecting Agencies.

B. State Highway Department Standard Specifications for Highway Construction.

1.3 TESTING SERVICES

A. Soil Compaction Testing:

1. Contractor shall employ and pay for the services of a qualified geotechnical engineering consultant for advice on all earthwork techniques involved in the work. Inform Contracting Officer of conditions requiring a variation to the Contract Documents; consult with Contracting Officer regarding disposition of earthwork variations.

2. AAFES will employ an independent testing agency to perform tests on structural fill for compaction. Tests shall be provided by a laboratory approved and paid for by AAFES. The Contractor shall provide a 50-pound sample of each material, from each source, to the testing agency five days prior to start of earthwork. Do not place any fill material until laboratory tests confirm material suitable as structural fill.

3. Laboratory Test on structural fill for compaction: ASTM D1557.

4. Contractor shall notify the testing agency and geotechnical engineering consultant sufficiently in advance of operations to allow for their assignment of personnel and scheduling of tests.

5. Testing Agency and geotechnical engineer shall prepare written reports of services performed.

6. Tests (To be performed by the AAFES employed testing agency):

   a. Perform tests in areas where compacted structural fill densities are specified.
   b. Perform tests on sub-grade areas prior to backfilling, and at each layer of compacted structural fill for every 3,000 square feet, or less, of filled area, for areas other than back fill at foundation walls.
   c. Perform tests at undisturbed bearing area and at each layer of compacted structural fill in bearing area at each individual footing.
   d. Perform tests at each layer of compacted backfill at foundation walls; perform tests at locations not to exceed 50 feet o.c.
   e. Perform tests remote from each other and in areas representative of the entire subgrade.

7. The testing laboratory shall promptly notify Contracting Officer and Contractor of irregularities or deficiencies of work which are observed during performance of services. If in the opinion of the Contracting Officer additional tests are required beyond those specified and their results indicate compaction less than the percentage density specified, the contractor shall bear the expense of such additional tests ordered.

B. Allowable Tolerances: Perform all earthwork to a finished tolerance within plus or minus one tenth of a foot.

C. Samples: Provide test results and samples of materials that have been tested for fill.

PART 2 PRODUCTS

2.1 FILL MATERIAL

A. Local excavated materials are satisfactory for fill and backfill with the following conditions:

1. Materials containing excessive moisture that do not readily compact, stripping

materials, or organic materials are not acceptable.

2. No materials weighing less than 125 pounds per cubic foot at optimum moisture content and 95 percent compaction shall be acceptable.

2.2 SELECTION OF BORROW MATERIALS

A. Borrow materials shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Borrow material shall be obtained from designated sources outside government controlled land by the Contractor unless otherwise directed by AAFES.

2.3 GRANULAR AND SELECT GRANULAR FILL

Granular fill material shall be used for grade increases within the building outline, and under all paved areas, all backfill operations including foundations, utility trenches in load bearing areas, and in undercutting operations within the structure. The granular fill should be composed of sound durable material meeting the following material and gradational requirements.

Soils utilized as granular fill shall not contain deleterious materials (topsoil, organics, construction debris, etc.). The material must have a Plasticity Index, PI, of 5 or less for the material passing the No. 40 sieve. The material should have less than 20 percent loss based on the Magnesium Sulfate Soundness Test (ASTM C-88, 1983 edition) after 4 cycles. The granular fill shall meet the following guideline gradations.

Percent Passing by Weight					
3"	2"	3/4"	1/4"	#40	#200
100	90-100	75-90	30-65	5-40	0-10

Not more than 30 percent, by weight, of the particles retained on the 3/4 inch sieve shall consist of flat or elongated particles having a length more than 3 times the width.

Select granular fill material shall be used as a base course in pavement areas, below floor slabs and below exterior finishes concrete such as sidewalks. Select granular fill shall meet all of the material and gradational requirement as set forth for granular fill except that no more than three percent, by weight, be finer than 0.02 mm or roughly 8 percent, by weight, finer than the number 200 sieve. Select granular fill is non-frost susceptible material.

PART 3 EXECUTION

3.1 EXCAVATION (NOT SPECIFIED IN OTHER RELATED SECTIONS)

A. Excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades indicated.

B. During the construction, excavation and filling shall be performed in a manner and sequence that will provide proper drainage at all times.

3.2 REMOVAL OF EXISTING MATERIAL

A. The Contractor shall remove all top soil (moist clay), to its full depth (a minimum of 1'-6" to 2'-0" shall be removed), under, and 5 feet beyond: all buildings, all paved area, and all areas scheduled to receive fill. The minimum depth of existing soil removed from within the new building area shall be 18" to 2'-0" (all lean clay see boring log for locations).

3.3 SUB-GRADE PREPARATION

A. The Contractor, upon removal of existing soil as described in paragraph 3.2, shall proof roll the sub-grade under the observation of a geotechnical engineer. Upon approval of the sub-grade by the geotechnical engineer, the Contractor may commence backfilling procedures. If the geotechnical engineer does not approve the sub-grade, the contractor shall immediately notify the Contracting Officer of the unsatisfactory condition for further direction. In the event that additional excavation and backfilling, or other procedures are required a unit cost shall be negotiated.

3.4 BACKFILL AND COMPACTION

A. Once it is established by the Testing Agency that the sub-grade is suitable for backfill, the Contractor shall proceed. The suitable and accepted structural backfill material shall be placed in horizontal lifts not exceeding 8 inches in depth, and compacted to 95 percent of its maximum dry density under all structures and paved areas (90 percent under lawn areas), and at a moisture content within 2 percent of the optimum moisture content, both attained through the Modified Proctor compaction method (ASTM D1557).

3.5 FINSHED EXCAVATION AND FILLS

A. All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinary obtainable from blade-grader operations, except as otherwise specified. Surface shall be finished not more than 0.10 foot above or below the established grade.

3.6 SPOILS

A. Any earth left over from the various sections shall be stockpiled on site as directed by the Base/Post.

3.7 PROTECTIONS

A. Newly graded areas shall be protected from traffic, erosion, and any settlement or washing away that may occur from any cause, prior to acceptance. Damaged areas shall be repaired and grades re-established to the required elevations and slopes at no additional cost to AAFES until such time that newly planted vegetation has stabilized the slopes.

END OF SECTION

SECTION 02219

UTILITY EXCAVATION

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Site Water Lines: Section 02667.
B. Site Sanitary Sewerage Systems: Section 02732
C. Gasoline Dispensing & Underground Storage Tank Systems: Section 13050
D. Raceways: Section 16110.

1.2 QUALITY ASSURANCES

A. American Association of State Highway Officials Standard:

T 147-54 The Field Determination of Density of Soil-in-Place.

B. American Society for Testing and Materials (ASTM):

C 136 Sieve Analysis of Fine and Coarse Aggregates.

D 422 Particle - Size Analysis of Soils.

D 1140 Amount of Material in Soils Finer than the No. 200 (75 um) sieve.

D 2937 Density of Soil in Place by the Drive-Cylinder Method.

C 117 Material Finer than No. 200 (75 um) Sieve in Mineral Aggregates by Washing.

C 127 Specific Gravity and Absorption of Coarse Aggregate.

C 128 Specific Gravity and Absorption of Fine Aggregate.

D 1557 Moisture Density Relations of Soils Using 10 lb. (4.5 kg) Rammer and 18 in. (457 mm) drop.

E 11-R Wire-cloth sieves for testing purposes.

E 548 Generic Criteria for Use in Evaluation of Testing and Inspecting Agencies.

C. Test for Displacement of Sewers: Sewer mains shall be checked to determine whether any displacement of the pipe has occurred after the trench has been backfilled to 2 feet above the pipe and tamped as specified. The test shall be as follows: A light shall be flashed between manholes, or, if the manholes have not as yet been constructed, between the locations of the manholes, by means of flashlight or by reflecting sunlight with a mirror. If the illuminated interior of the pipeline shows poor alignment, displaced pipe, or any other defects, the defects as designated by the Contracting Officer shall be satisfactorily remedied.

1.3 TESTING SERVICES

A. Soil Compaction Testing:

1. Contractor shall employ and pay for the services of a qualified geotechnical engineering consultant for advice on all earthwork techniques involved with the work. Inform Contracting Officer of conditions requiring a variation to the contract documents; consult with the Contracting Officer regarding disposition of earthwork variations.

2. AAFES will employ an independent testing agency to perform tests on structural fill for compaction. Tests shall be provided by a laboratory approved and paid for by AAFES. Provide a 50 pound sample of each material, from each source, to the testing agency five days prior to start of earthwork. Do not place any fill material until laboratory tests confirm material suitable as structural fill.

3. Laboratory tests on structural fill for compaction: ASTM D1557.

4. Contractor shall notify the testing agency and geotechnical engineering consultant sufficiently in advance of operations to allow for their assignment of personnel and scheduling of tests.

5. Testing Agency and geotechnical engineer shall prepare written reports of services performed.

6. Tests (to be performed by AAFES employed testing agency):

   a. Make tests in areas where compacted structural fill densities are specified. (Density and moisture tests).

   b. Make tests at each layer of compacted backfill in utility trenches; make tests at locations not to exceed 100 feet o.c.

   c. Make tests remote from each other and in areas representative of the entire subgrade.

7. The testing laboratory shall promptly notify the Contracting Officer and the Contractor of irregularities or deficiencies of work which are observed during performance of services. If in the opinion of the Contracting Officer additional tests are required beyond those specified and their results indicate compaction less than the percentage density specified, the Contractor shall bear the expense of such additional tests ordered.

B. Allowable Tolerances:

1. Perform all earthwork to a finished tolerance within plus or minus one tenth of a foot.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Satisfactory materials: Local excavated granular materials are satisfactory for fill ad backfill with the following exceptions:

1. Materials containing excessive moisture that do not readily compact, stripping, or organic materials are not acceptable.

2. No materials weighing less than 125 pounds per cubic foot at optimum moisture content and 95 percent compaction shall be acceptable.

PART 3 EXECUTION

3.1 EXCAVATION

A. General: All excavation of every description and of whatever substances encountered shall be performed to the depths indicated or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods. Sheeting and shoring shall be done as may be necessary for the protection of the work and for the safety of personnel.

Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled, if in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly tamped in such tunnel sections.

B. Trench excavation: Trenches shall be of the necessary width for proper laying of pipe, cables, or ducts. The banks of pipe trenches shall be as nearly vertical as practicable. Care shall be taken not to over-excavate. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of pipe sections where it is necessary to excavate for bedding bell holes and for the proper sealing of pipe joints, and as hereinafter specified. Bell holes and depressions for joints shall be dug after the trench bottom has been graded, and in order that the pipe rest on the prepared bottom for as nearly its full length as practicable. Bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joint. Stones shall be removed as necessary to avoid point bearing. Where rock excavation, as defined hereinbefore, is required in trenches for pipe, the rock shall be excavated to a minimum overdepth of 6 inches below the trench depths indicated or specified. Except as hereinafter specified for wet or otherwise unstable material, overdepths shall be backfilled as with materials specified for backfilling the lower portion of trenches. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe is encountered in the bottom of the trench, such material shall be over excavated to a depth to allow for construction of a stable pipe bedding. The trench shall be backfilled to the proper grade with suitable approved materials. Special requirements relating to specified utilities are as follows:

1. Storm Sewers: The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed 8 inches on either side of the pipe. The width of the trench above that level shall be as wide as necessary for sheeting and bracing and the proper performance of the work. The bottom of the trench shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil for as nearly the full length of the barrel as proper jointing operations will permit. This part of the excavation shall be done manually only a few feet in advance of the pipe laying by men skilled in this type of work.

2. Water Lines: Pipe shall be bedded on a 4-inch minimum of aggregate base and trench shall be filled with granular or sand backfill.

3. Sanitary Sewer: Pipe shall be bedded on a 4-inch minimum of sand base, and trench shall be backfilled with granular or sand backfill to 12" above the pipe.

C. Excavation for Appurtenances: Excavation for manholes and similar structures shall be sufficient to leave at least 12 inches in the clear between the outer surfaces and the embankment of timber that may be used to hold and to protect the banks. Any overdepth excavation below such appurtenances that has not been directed will be considered unauthorized and shall be refilled with sand, gravel, or concrete, as directed, at no additional cost to AAFES.

3.2 BACKFILLING

A. The trenches shall not be backfilled until the utilities systems as installed conform to the requirements specified in the several sections covering the installation of the various utilities. Where, in the opinion of the Contracting Officer, damage is likely to result from withdrawing sheeting, the sheeting shall be left in place and the contract price will be adjusted accordingly. Except as otherwise specified for special conditions of overdepths, trenches shall be backfilled to the ground surface with selected material as specified in paragraph 2.1 Fill Materials, and shall be placed and compacted in accordance with Paragraphs C. and D. below. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted as specified, or the condition shall be otherwise corrected as approved.

B. The surface shall be restored to its original condition as near as practicable and as hereinafter specified: Existing pavement and base course disturbed by trenching operations shall be replaced in an acceptable manner with materials equal to the adjacent pavement and base course. New pavement and base course shall extend beyond each side of the trench a minimum distance of one foot. Existing compacted subgrade and earth below compacted subgrade shall be replaced with material complying with paragraph 2.1, Fill Materials, and shall be placed and compacted in accordance with paragraphs C and D below.

C. Lower Portion of Trench: Backfill material shall be deposited in 6 inch maximum thickness layers and compacted with suitable tampers to the density of the adjacent soil or graded as hereinafter specified until there is a cover of not less than 2 feet over sewers and 1 foot over other utility lines. The backfill materials in this portion of the trench shall consist of a selected material as specified in paragraph 2.1, Fill Materials, free from stones larger than 3 inches in any dimension, except that where the pipe is coated or wrapped for protection against corrosion the backfill material shall be free from stones larger than 1 inch in any dimension.

If any portion of the cover in the lower portion of the trench is in the depth of special compaction and materials requirements under pavement, the special requirements shall control. Special care shall be taken not to damage the coating or wrapping of the pipes.

D. Remainder of Trench: Except for special materials for pavements, the remainder of the trench shall be backfilled with material as specified in paragraph 2.1, Fill Materials, that is free of stones larger than 6 inches or one-half the layered thickness, whichever is smaller, in any dimension. Backfill material shall be deposited in layers not exceeding the thickness specified below, and each layer shall be compacted to the minimum density specified as applicable to the particular area. Degree of compaction shall be as follows:

1. Under Pavements: Six-inch layers, 95 percent maximum density, ASTM D1557, up to the elevations at which the requirements for pavement sub-grade materials and compaction control.

2. Under Turfed or Seeded Lawn Areas and Sidewalks: Twelve-inch layers, 90 percent maximum density, ASTM D1557.

3. Under Other Areas: Two-foot layers, density equal to the adjacent soil.

END OF SECTION

SECTION 02223

BACKFILLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building perimeter backfilling to subgrade elevations.

B. Site filling and backfilling.

C. Fill under slabs-on-grade.

D. Fill under paving.

E. Fill for over-excavation.

F. Consolidation and compaction as scheduled.

1.2 RELATED SECTIONS

A. Section 01410 - Testing Services.

B. Section 02205 - Soil Materials.

C. Section 02207 - Aggregate Materials.

D. Section 02219 - Utility Excavation.

E. Section 02667 - Site Water Lines.

F. Section 02721 - Storm Drainage System.

G. Section 02732 - Site Sanitary Sewerage Systems

H. Section 03300 - Cast-in-Place Concrete.

1.3 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

D. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Fill Type S1: As specified in Section 02205.

B. Structural Fill Type S2: As specified in Section 02205.

C. Concrete: Lean concrete conforming to Section 03300 with a compressive strength of 1500 psi.

2.2 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, woven; Mirafi 500X or Propex 2002 manufactured by Amoco.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify subdrainage, damp proofing, or waterproofing installation has been inspected.

B. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

C. Verify structural ability of unsupported walls to support imposed loads by the fill.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Type S1 fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over organic, porous, wet, frozen or spongy subgrade.

C. Place geotextile fabric, if required, over fill prior to placing next lift of fill.

D. Granular Fill Type A3: If required, Place and compact materials in equal continuous layers not exceeding 8 inches compacted depth.

E. Soil Fill Type S1: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

F. Employ a placement method that does not disturb or damage other work.

G. Maintain optimum moisture content of backfill materials to attain required compaction density.

H. Backfill against supported foundation walls and piers. Do not backfill against unsupported foundation walls and piers.

I. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

J. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.

K. Make gradual grade changes. Blend slope into level areas.

L. Remove surplus backfill materials from site.

M. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Section 01400 - Quality Assurance: Field inspection and testing.

B. Compaction testing will be performed in accordance with ASTM D2922, and ASTM D1556.

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Frequency of Tests: perform one test per lift at the following rate:

1. Perform one test per lift per every 8,000 square feet or less under all concrete slabs on grade, and under all paved areas.
2. Perform one test per lift per every 100 lineal feet or less under all wall footings.
3. Perform one test per lift under each column footing.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work from vehicular traffic and other equipment or operations which disturb the placed and compacted fill.

B. Reshape and re-compact fills subjected to vehicular traffic or other damage.

3.7 SCHEDULE

A. Interior Slab-On-Grade:

1. Fill Type S1, compacted to 95 percent maximum density, ASTM D1557.
2. Cover with Fill Type A3 (capillary barrier), 6 inches thick, compacted to 95 percent maximum density, ASTM D1557.

B. Exterior side of foundation walls and retaining walls:

1. Fill Type S1, to subgrade elevation, each lift, compacted to 90 (95, if under exterior slabs on grade, or paving) percent maximum density, ASTM D1557.

C. Fill Under Grass Areas:

1. Fill Type S2 or S3, to 6 inches below finish grade, compacted to 90 percent maximum density, ASTM D1557.

D. Fill Under Landscaped Areas:

1. Fill Type S2 or S3, to 12 inches below finish grade, compacted to 90 percent maximum density, ASTM D1557.

E. Fill Under Asphalt Paving:

1. Compact subsoil to 95 percent of its maximum dry density.
2. Fill Type S1, to bottom of aggregate base, compacted to 95 percent maximum density, ASTM D1557.

F. Fill Under Concrete Paving:

1. Compact subsoil to 95 percent of its maximum dry density.
2. Fill Type S1, to bottom of concrete paving, compacted to 95 percent maximum density, ASTM D 1557.

G. Fill to Correct Over-excavation: Contractor's option of the two following methods:

1. Lean concrete to minimum compressive strength of 1,500 psi.
2. Fill Type A1, flush to required elevation, compacted to 95 percent maximum density, ASTM D1557.

END OF SECTION

SECTION 02231

AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate base course.

1.2 RELATED SECTIONS

A. Section 01410 - Testing Services.

B. Section 02207 - Aggregate Materials.

C. Section 02210 - Site Grading.

D. Section 02223 - Backfilling.

E. Section 02510 - Asphaltic Concrete Paving Binder Course.

F. Section 02512 - Asphaltic Concrete Paving Wearing Course.

1.4 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

B. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

C. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

D. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

PART 2 PRODUCTS

2.1 MATERIALS

A. Blended Aggregate Fill Type A4: As specified in Section 02207.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A. Spread aggregate over prepared substrate to a total compacted thickness indicated on the drawings.

B. Place aggregate in maximum 8 inch layers and roller compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Flatness: Maximum variation of 3/8 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation From Design Elevation: Within 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Section 01410 - Testing Services.

B. Compaction testing will be performed in accordance with ASTM D2922.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. Frequency of Tests: One test per lift, per 8,000 square feet of area.

3.6 SCHEDULES

A. Under Asphalt Pavement:

1. Compact placed aggregate materials to achieve compaction of 95 percent maximum density, ASTM D1557.

END OF SECTION

SECTION 02510

ASPHALTIC CONCRETE PAVING LEVELING COURSE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Asphaltic concrete paving, leveling course.

1.2 RELATED SECTIONS

A. Section 02210 – Site Grading.

B. Section 02223 - Backfilling.

C. Section 02231 - Aggregate Base Course.

D. Section 02512 - Asphaltic Concrete Paving Wearing Course.

E. Section 02625 – Curbs And Gutters.

1.3 REFERENCES

A. ASTM D946 - Penetration-Graded Asphalt Cement for Use in Pavement Construction.

B. TAI - (The Asphalt Institute) - MS-2 Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.

C. TAI - MS-3 Asphalt Plant Manual.

D. TAI - MS-8 Asphalt Paving Manual.

E. TAI - MS-19 Basic Asphalt Emulsion Manual.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with State Department of Transportation Standard Specifications for Highway Construction.

B. Mixing Plant: Conform to State Department of Transportation Standard Specifications Highway Construction.

C. Obtain materials from same source throughout.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen suppliers bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Cement: In accordance with State of Department of Transportation Standard Specifications for Highway Construction.

B. Aggregate for Leveling Course Mix: In accordance with State Department of Transportation Standard Specification for Highway Construction.

2.2 SOURCE QUALITY CONTROL AND TESTS

A. Section 01400 - Testing Services.

B. Submit proposed mix design of each class of mix for review prior to beginning of work.

C. Test samples in accordance with TAI MS-2.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that compacted crushed aggregate base is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.2 SUBBASE

A. Section 02231 - Aggregate Base Course forms the base construction for work of this section.

3.3 PREPARATION - PRIMER

A. Apply primer on crushed aggregate base.

B. Use clean sand to blot excess primer.

3.4 PLACING ASPHALT PAVEMENT

A. Install Work in accordance with State Department of Transportation Standard Specifications for Highway Construction.

B. Place asphalt within 24 hours of applying primer.

C. Place to 1/2 inch compacted thickness indicated in the drawings.

D. Install drainage grilles and frames, manhole frames in correct position and elevation.

E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.5 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from True Elevation: Within 1/2 inch.

3.6 FIELD QUALITY CONTROL

A. Section 01410 - Testing Services.

B. Take samples and perform tests in accordance with TAI.

C. Test results shall meet the minimum density required by the State Department of Transportation Standard Specifications for Highway Construction.

3.7 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 3 days or until surface temperature is less than 140 degrees F (60 degrees C).

3.8 SCHEDULES

A. Pavements shall be installed at the thickness indicated on the drawings for the various areas of asphalt paving.

END OF SECTION

SECTION 02512

ASPHALTIC CONCRETE PAVING WEARING COURSE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Asphaltic concrete paving, wearing course.

B. Bituminous Tack Coat.

1.2 RELATED SECTIONS (IF APPLICABLE)

A. Section 02210 - Site Grading.

B. Section 02223 - Backfilling.

C. Section 02510 - Asphaltic Concrete Paving Leveling Course.

D. Section 02559 - Bituminous Prime Coat.

1.3 REFERENCES

A. ASTM D946 - Penetration-Graded Asphalt Cement for Use in Pavement Construction.

B. TAI - (The Asphalt Institute) - MS-2 Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.

C. TAI - MS-3 Asphalt Plant Manual.

D. TAI - MS-8 Asphalt Paving Manual.

E. TAI - MS-19 Basic Asphalt Emulsion Manual.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with State Department of Transportation Standard Specifications for Highway Construction.

B. Mixing Plant: Conform to State Department of Transportation Standard Specifications for Highway Construction.

C. Obtain materials from same source throughout.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen suppliers bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Cement: In accordance with State Department of Transportation Standard Specifications for Highway Construction.

B. Aggregate for Wearing Course Mix: In accordance with State Department of Transportation Standard Specification for Highway Construction.

C. Bituminous Tack Coat: In accordance with State Department of Transportation Standard Specification for Highway Construction.

D. Pavement-Marking Paint: Alkyd-resin type; ready mixed; complying with FS TT-P-115, Type I, or AASHTO M 248, Type N.

E. Pavement-Marking Paint: Latex, water-base emulsion; ready mixed; complying with FS TT-P-1952.

F. Wheel Stops: Precast, air-entrained concrete; 2,500 psi minimum compressive strength; approximately 6 inches high, 9 inches wide, and 84 inches long. Provide chamfered corners and drainage slots on underside, and provide holes for dowel-anchoring to substrate. Dowels: Galvanized steel, diameter of 3/4 inch, minimum length 12 inches.

G. Signs and Sign Supports: Sign base materials shall be sheet aluminum complying with ASTM B209. Face material shall be Type I, Class 1 or 3, with reflectivity 1 conform to ASTM D 4956. Sign Messages shall conform to the State Manual on Uniformed traffic Control Devices. Sign supports shall be flanged channel sections weighting not less than 2.5 lb/ft with a minimum tensile strength of 5,000 psi and minimum yield strength of 36,000 psi. Supports shall be zinc coated in accordance with AASHTO M 111.

2.2 ASPHALT PAVING MIX

A. Use dry material to avoid foaming. Mix uniformly.

B. Wearing Course: Mixture in accordance with State Department of Transportation Standard Specification for Highway Construction.

2.3 SOURCE QUALITY CONTROL AND TESTS

A. Section 01410 - Testing Services.

B. Submit proposed mix design of each class of mix for review prior to beginning of work.

C. Test samples in accordance with TAI MS-2.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that asphalt paving leveling course is clean, dry, free of ice, debris, and defects that will adversely affect the finished wearing course. Verify that asphalt paving leveling course or aggregate base course is compacted to the specified density, and will support the loads imposed by placement of the wearing course.

B. Verify gradients and elevations of leveling course are correct.

3.2 SUBBASE

A. The base construction for work of this section consist of either:

1. Aggregate base course.
2. Existing asphaltic concrete paving.
3. Existing concrete paving.

3.3 PREPARATION AND PLACEMENT - TACK COAT

A. The existing asphaltic or concrete surface shall be patched, rendered free of irregularities to the extent necessary to provide a smooth surface.

B. Immediately prior to applying tack coat, the contractor shall thoroughly clean and remove all debris from the surface. The surface shall be thoroughly dry.

C. The bituminous tack coat shall be uniformly distributed at the minimum rate of 0.03 gal/sy or at the rate indicated on the drawings.

D. All areas and spots missed by the distributor shall be treated with a hand sprayer to insure thorough coverage.

E. The treated area shall be protected from damage and soil until the wearing course is applied.

3.4 PLACING ASPHALT PAVEMENT

A. Install work in accordance with State Department of Transportation Standard Specifications for Highway Construction.

B. Place asphalt within 24 hours of applying tack coat.

C. Place to 1/2 inch compacted thickness indicated in the drawings.

D. Install drainage grilles and frames, manhole frames in correct position and elevation.

E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.5 TOLERANCES

A. Flatness: Maximum variation of 3/8 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from True Elevation: Within 1/2 inch.

3.6 PAVEMENT MARKINGS

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with the Engineer/Architect.

B. Allow wearing course to cure for 7 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.7 SIGNS AND SIGN SUPPORTS

A. Signs shall be place in at the locations shown on the drawings in accordance with the State Manual on Uniformed traffic Control Devices. Minimum mounting height 5 feet.

B. Signs on Channel supports shall be fastened with galvanized bolts, washers and nuts with a minimum diameter of 5/16” in accordance with State Department of Transportation Standard Specifications for Highway Construction. Supports shall be embedded into firm soil at a minimum depth of 2 feet.

C. Signs fastened to wooden posts shall be secured with galvanized lag bolts and washer. Signs fastened to buildings shall be secured with galvanized lag bolts and washers with an expansion sleeve. Minimum length of lag bolts 3”, minimum diameter of 5/16”.

3.8 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes cast into wheel stops. Firmly bond each dowel to wheel stop and to pavement. Extend upper portion of dowel 4 inches into wheel stop and lower portion a minimum of 8 inches into pavement

3.9 FIELD QUALITY CONTROL

A. Section 01410 - Testing Services.

B. Take samples and perform tests in accordance with TAI.

C. Test results shall meet the minimum density required by the State Department of Transportation Standard Specifications for Highway Construction.

3.10 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 3 days or until surface temperature is less than 140 degrees F.

3.11 SCHEDULES

A. Pavements shall be installed at the thicknesses indicated on the drawings for the various areas of asphalt paving.

END OF SECTION

SECTION 02559

BITUMINOUS PRIME COAT

PART 1 GENERAL

1.1 SCOPE OF THE WORK

A. This work shall consist of preparing and treating an existing surface with asphalt material, cover material, if required, in accordance with these specifications and in reasonably close conformity with the lines shown on the plans or established by the Engineer.

1.2 RELATED WORK

A. Section 02510 - Asphaltic Concrete Paving Leveling Course

B. Section 02512 - Asphaltic Concrete Paving Wearing Course

1.3 APPLICABLE PUBLICATIONS

A. The Publications listed below, form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Society for Testing and Materials (ASTM) Publications:

a.	D 140	Sampling Bituminous Materials
b.	D 2027	Cutback Asphalt (Median-Curing Type)
c.	D 2995	Determining Application Rate of Bituminous Distributors

1.4 QUALITY ASSURANCE

A. Install prime coat to State Department of Transportation Standard Specifications for Highway Construction.

PART 2 PRODUCTS

2.1 BITUMINOUS MATERIAL

A. Bituminous material shall be cutback asphalt meeting the requirements of AASHTO, grades MC-30 or MC-70.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACE

A. The surface to be primed shall be shaped to the required grade and section, rendered free from all ruts, corrugations, segregated material or other irregularities and shall be uniformly compacted.

3.2 PRIME COATING

A. The rates of application of materials shall be as 0.25 gal/sy or as indicated on the drawings.

B. Prime coat shall not be applied when the air temperature is below 60 degrees F and

falling but may be applied when the air temperature is above 50 degrees F and rising.

C. Equipment for heating and applying the asphalt material and for applying cover material shall conform to State Department of Transportation Standard Specifications for Highway Construction.

D. Delays in priming may necessitate reprocessing or reshaping to provide a smooth compacted surface.

E. Asphalt material shall be applied to the width of the section to be primed by means of a pressure distributor in a uniform continuous spread. Care shall be taken that the application of asphalt material at the junctions of spreads is not in excess of the specified amount. Excess asphalt material shall be squeegeed from the surface. Skipped areas or deficiencies shall be corrected.

F. During the application of asphalt material, care shall be taken to prevent spattering adjacent pavements, structures and trees. The distributor shall not be cleaned or discharged into ditches, borrow pits, onto shoulders or along the right-of-way and, when not in use, shall be parked so that the spray bar or mechanism will not drip asphalt materials on the surface of the traveled way.

END OF SECTION

SECTION 02620

PORTLAND CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior cement concrete pavement for the following:

1. Roadways.
2. Driveways.
3. Parking lots.

B. LEED Requirements:

1. Paving materials complying with LEED requirements to reduce heat islands (thermal gradient differences between developed and undeveloped areas) and to achieve Sustainable Site (SS) Credit 7.1 in accordance with USGBC LEED for New Construction, Version 2.2.
2. Use of products having recycled content.

1.2 SECTION INCLUDES

A. Section 02210 - Site Grading

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Samples: 10 lb sample of aggregate.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

1. Cementitious materials and aggregates.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or adhesive.
8. Joint fillers.

E. LEED Submittals:

1. Product Data for Credit SS 7.1: For products to reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.
2. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work 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.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves of a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. General: Use reinforcing steel with recycled content, unless indicated otherwise on Civil Drawings or not approved by Civil Engineer or Contracting Officer.

B. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

C. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.

D. Epoxy-Coated Welded Wire Fabric: ASTM A 884, Class A, plain steel.

E. Reinforcement Bars: ASTM A 615, Grade 60, deformed.

F. Epoxy-Coated Reinforcement Bars: ASTM A 775; with ASTM A 615, Grade 60, deformed bars.

G. Steel Bar Mats: ASTM A 184; with ASTM A 615, Grade 60, deformed bars; assembled with clips.

H. Plain Steel Wire: ASTM A 82, as drawn.

I. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A coated, plain steel.

J. Joint Dowel Bars: Plain steel bars, ASTM A 615 Grade 60. Cut bars true to length with ends square and free of burrs.

K. Epoxy-Coated Joint Dowel Bars: ASTM A 775; with ASTM A 615, Grade 60, plain steel bars.

L. Tie Bars: ASTM A 615, Grade 60, deformed.

M. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer coated wire bar supports.

N. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

2.3 CONCRETE MATERIALS

A. General: Use the same brand and type of cementations material from the same manufacturer throughout the Project. Paving shall have a Solar Reflectance Index (SRI) in accordance with USGBC LEED for New Construction, Version 2.2.

B. Portland Cement: ASTM C 150, Type I or II.

C. Fly Ash: The use of fly ash conforming to ASTM C 618, Class C, unless indicated otherwise on Civil Drawings or not approved by Civil Engineer or Contracting Officer.

D. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:

1. Class: 4S.
2. Class: 4M.
3. Class: 1N.
4. Maximum Aggregate Size: 1-1/2 inches nominal.
5. Maximum Aggregate Size: 1 inch nominal.
6. Maximum Aggregate Size: 3/4 inch nominal.
7. Do not use fine or coarse aggregates containing substances that cause spalling.

E. Water: ASTM C 94.

2.4 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

E. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

G. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated celluloses fiber.

B. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.

C. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated celluloses fiber, or ASTM D 1752, cork or self-expanding cork.

D. Pavement-Marking Paint: Alkyd-resin type; ready mixed; complying with FS TT-P-115, Type I, or AASHTO M 248, Type N.

E. Pavement-Marking Paint: Latex, water-base emulsion; ready mixed; complying with FS TT-P-1952. Color: as indicated.

F. Wheel Stops: Precast, air-entrained concrete; 2500-psi minimum compressive strength; approximately 6 inches high, 9 inches, and 84 inches. Provide chamfered corners and drainage slots on underside.

G. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

H. Joint Sealints:

1. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS As indicated.
2. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
3. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3405 or D 3406.
4. Jet-Fuel-Resistant Sealant for Concrete and Tar Concrete: Single-component formulation complying with ASTM D 3569 or D 3581.
5. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.

2.7 CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

C. Proportion mixes to provide concrete with the following properties:

1. Compressive Strength (28 Days): 3,500 psi.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 3 inches.

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:

1. Air Content: 5.5 percent for 1-1/2-inch maximum aggregate.
2. Air Content: 6.0 percent for 1-inch maximum aggregate.
3. Air Content: 6.0 percent for 3/4-inch maximum aggregate.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

2.9 SIGNS AND SIGN SUPPORTS

A. Sign base materials shall be sheet aluminum complying with ASTM B209. Face material shall be Type I, Class 1 or 3, with reflectivity 1 conform to ASTM D 4956. Sign Messages shall conform to the State Manual on Uniformed traffic Control Devices. Sign supports shall be flanged channel sections weighting not less than 2.5 lb/ft with a minimum tensile strength of 5,000 psi and minimum yield strength of 36,000 psi. Supports shall be zinc coated in accordance with AASHTO M 111.

PART 3 EXECUTION

3.1 PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

1. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. 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.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.4 JOINTS

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
3. Provide tie bars at sides of pavement strips where indicated.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces. Radius: 1/4 inch.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: 1/4 inch.

G. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

H. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of backer materials.
2. Do not stretch, twist, puncture, or tear backer materials.
3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

I. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

J. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.

K. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.

L. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or derbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

I. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

J. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

K. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

L. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

M. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water 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 reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12 inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.9 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.10 SIGNS AND SIGN SUPPORTS

A. Signs shall be place in at the locations shown on the drawings in accordance with the State Manual on Uniformed traffic Control Devices. Minimum mounting height 5 feet.

B. Signs on Channel supports shall be fastened with galvanized bolts, washers and nuts with a minimum diameter of 5/16” in accordance with State Department of Transportation Standard Specifications for Highway Construction. Supports shall be embedded into firm soil at a minimum depth of 2 feet.

C. Signs fastened to wooden posts shall be secured with galvanized lag bolts and washer. Signs fastened to buildings shall be secured with galvanized lag bolts and washers with an expansion sleeve. Minimum length of lag bolts 3”, minimum diameter of 5/16”.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: General Contractor will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Section.

B. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.
5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

C. Test results shall be reported in writing to Architect/Engineer, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain

Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as the sole basis for approval or rejection.

E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, 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.

3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 02625

CURBS AND GUTTERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Curb and gutters for the Project indicated on Drawings or specified herein.

B. LEED Requirements:

1. Curb and gutter paving materials complying with LEED requirements to reduce heat islands (thermal gradient differences between developed and undeveloped areas) and to achieve Sustainable Site (SS) Credit 7.1 in accordance with USGBC LEED for New Construction, Version 2.2.
2. Use of products having recycled content.

1.2 RELATED SECTIONS

A. Section 01410 - Testing Services

B. Section 03300 - Cast-In-Place Concrete

1.2 QUALITY ASSURANCE

A. American Society for Testing and Materials (ASTM)

ASTM A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 94	Ready-Mixed Concrete
ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM D 1190	Concrete Joint Sealer, Hot-Poured Elastic Type\F
ASTM D 1751	Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

1.3 SUBMITTALS

A. Test Reports of Proposed Design Mix:

1. Reports of Portland cement concrete compression, yield and air content tests listed in ASTM C 94.

B. Certificates:

1. Manufacturer's certification that products meet specification requirements.

C. LEED Submittals:

1. Product Data for Credit SS 7.1: For products to reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.
2. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled

1.4 ENVIRONMENTAL REQUIREMENTS

A. Portland Cement Concrete:

1. Allowable concrete temperatures:

a. Cold Weather: Maximum and minimum, ASTM C 94.
b. Hot Weather: Maximum concrete temperature 90 degrees F.

2. Do not place concrete during rain, sleet, or snow.

1.5 PROTECTION

A. Protect portland cement concrete from traffic for minimum of seven days.

1.6 INSPECTION AND TESTING

A. The Contractor shall employ, and pay for, concrete testing services.

B. Perform concrete inspection and tests as listed in "Methods of Sampling and Testing", ASTM C94, ACI 301, Chapter 16; and as specified, all in accordance with Section 01410. The more stringent requirements shall be followed.

C. Make three (3) concrete test cylinders for every 100 or less cubic yards of concrete placed per day.

D. Make one slump test and air content for each set of test cylinders taken.

PART 2 PRODUCTS

2.1 MATERIALS

A. Ready Mixed Concrete: ASTM C 94, 4000 psi, Class II, with 4% to 6% entrained air.

1. Fly Ash: The use of fly ash conforming to ASTM C 618, Class C, unless indicated otherwise on Civil Drawings or not approved by Civil Engineer or Contracting Officer.

B. Curing Material: Liquid membrane, ASTM C 309, Type 2 white pigmented.

C. Reinforcing Steel: ASTM A 615-85, Grade 60.

1. The use of reinforcing steel with recycled content, unless indicated otherwise on Civil Drawings or not approved by Civil Engineer or Contracting Officer.

D. Expansion Joint Fillers: ASTM D 1751.

E. Concrete Joint Sealer: ASTM D 1190.

PART 3 EXECUTION

3.1 INSTALLATION

A. Cast-In-Place Concrete:

1. Set forms to line and grade.
2. Install forms over full length of curb.
3. Position integral curb joints at same location as sidewalk joints or maximum of 10 feet.
4. Form contraction joints using steel templates or division plates.
5. Remove templates or plates as soon as concrete has hardened sufficiently to retain its shape.
6. Install expansion joint material behind curb at abutment to sidewalks, curb returns, and adjacent structures.
7. Place concrete in position without separation of concrete materials.
8. Consolidate concrete with mechanical vibrators.
9. Round face of curbs at top with finishing tool of correct radius.
10. Finish exposed surfaces with wood float followed by light brushing with broom, brush or burlap.
11. Apply curing material and cure for seven days.

B. At locations where curbs do not a join existing curb, transition from full curb height a curb height of 1-1/2” over a distance of 4’.

3.2 PATCHING

A. Patch to match material, color and texture of surrounding area.

B. Replace defective work if patching is not acceptable to Contracting Officer.

END OF SECTION

SECTION 02630

WALKS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Walks for the Project indicated on Drawings or specified herein.

B. LEED Requirements:

1. Walk paving materials complying with LEED requirements to reduce heat islands (thermal gradient differences between developed and undeveloped areas) and to achieve Sustainable Site (SS) Credit 7.1 in accordance with USGBC LEED for New Construction, Version 2.2.
2. Use of products having recycled content.

1.2 RELATED SECTIONS

A. Section 01410 - Testing Services

B. Section 03300 - Cast-In-Placed Concrete

1.2 QUALITY ASSURANCE

A. American Society for Testing and Materials (ASTM):

ASTM A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 94	Ready-Mixed Concrete
ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM D 1190	Concrete Joint Sealer, Hot-Poured Elastic Type\F
ASTM D 1751	Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

1.3 SUBMITTALS

A. Test Reports of Proposed Design Mix

1. Reports of portland cement concrete compression, yield and air content tests listed in ASTM c 94.

B. Certificates:

1. Manufacturer's certification that products meet specification requirements.

C. LEED Submittals:

1. Product Data for Credit SS 7.1: For products to reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

2. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled

1.4 ENVIRONMENTAL REQUIREMENTS

A. Portland Cement Concrete:

1. Allowable concrete temperatures:

a. Cold Weather: Maximum and minimum, ASTM C 94.
b. Hot Weather: Maximum concrete temperature 90 degrees F.

2. Do not place concrete during rain, sleet, or snow.

1.5 PROTECTION

A. Protect Portland cement concrete from traffic for minimum of seven days.

1.6 INSPECTION AND TESTING

A. General Contractor will employ, and pay for, concrete testing services.

B. Perform concrete inspection and tests as listed in "Methods of Sampling and Testing", ASTM C94, ACI 301, Chapter 16; and as specified, all in accordance with section 01410. The more stringent requirements shall be followed.

C. Make three concrete test cylinders for every 100 or less cubic yards of concrete placed per day.

D. Make one slump test and air content test for each set of test cylinders taken.

PART 2 PRODUCTS

2.1 MATERIALS

A. Ready Mixed Concrete: ASTM C 94, 4,000 lb, Class II, with 4% to 6% entrained air.

1. Fly Ash: The use of fly ash conforming to ASTM C 618, Class C, unless indicated otherwise on Civil Drawings or not approved by Civil Engineer or Contracting Officer.

B. Curing Material: Liquid Membrane, ASTM C 309, Type 2 white pigmented.

C. Reinforcing Steel: ASTM A 615-85, Grade 60.

1. The use of reinforcing steel with recycled content, unless indicated otherwise on Civil Drawings or not approved by Civil Engineer or Contracting Officer.

D. Expansion Joint Fillers: ASTM D 1751.

E. Concrete Joint Sealer: ASTM D 1190 (Color: gray).

F. Tactile Warning Surface Materials:

1. Dry-Shake Colored Hardener: "Surflex" as manufactured by Euclid Chemical Company, or approved equal. Provide color chart for selection of color.

PART 3 EXECUTION

3.1 FORMS

A. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete, and of a height equal to the full depth of the finished sidewalk. Wood forms shall be surfaced plank, 2 inch nominal thickness. Steel forms shall be of approved section with a flat top surface. Forms shall be set with the upper edge true to line and grade, and shall be held rigidly in place by stakes placed at intervals not to exceed 4 feet.

B. Forms shall be coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed except that with probable freezing temperatures, oiling is mandatory. Side forms shall not be removed less than 12 hours after finishing is completed.

3.2 CONCRETE PLACEMENT AND FINISHING

A. General: Concrete shall be placed in the forms in one layer of such thickness that when compacted and finished the sidewalk will be of the thickness indicated. After the concrete has been placed in the forms, a strike-off guided by the side forms shall be used to bring the surface to the proper section to be compacted. The concrete shall be tamped and consolidated with a suitable wood or metal tamping bar, and the surface shall be finished to grade with a wood float. The finished surface of the walk shall not vary more than 3/16 inch from the testing edge of a 10 foot straightedge. Irregularities exceeding the above shall be satisfactorily corrected. The surface shall be divided into rectangular areas by means of contraction joints. See drawings for details.

B. Contraction Joints: The contraction joints shall be formed on the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one fourth of the sidewalk slab thickness, using a jointer to cut the groove. All sidewalk contraction joints shall be tooled. Location of joints to be as indicated on the drawings.

C. Expansion Joints: Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated. Transverse expansion joints shall be filled with 1/4 inch thick joint filler strips or with resin-impregnated fiberboard. Joint filler shall be placed with top edge 1/4 inch below the surface and shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch, and concrete over the joint filler shall be removed. Expansion joints shall be formed about structures and features that project through or into the sidewalk pavement, using joint filler of the type, thickness and width indicated. The filler shall be installed in such a manner as to form a complete, uniform separation between the structure and sidewalk pavement. At the end of the curing period, expansion joints shall be carefully cleaned and filled with joint sealer.

The concrete at the joint shall be surface dry, and the atmosphere and pavement temperatures shall be above 50 degrees F. at the time of application of joint sealer materials. The joints shall be filled flush with the concrete surface in such a manner as to minimize spilling on the walk surface. Spilled sealed materials shall be removed immediately and the surface of the walk cleaned. Dummy groove joint shall not be

sealed.

D. Surface Uniformity: The completed surface shall be uniform in color and free of surface blemishes and tool marks.

E. Provide broom finish.

3.3 TACTILE DETECTABLE WARNING SURFACE

A. Provide tactile surface, meeting latest ADA Standards, on concrete pedestrian ramps where indicated on the drawings.

B. Apply two even applications of color/hardener to the concrete surface, using dry-shake method. Float after each application.

C. Before stamping tool is used, apply a release agent in accordance with the manufacturer's specifications.

D. Apply the stamping tool while the concrete is in a plastic state. Tamp stamping tool into the surface in accordance with the manufacturer's specifications.

3.4 CURING AND PROTECTION

A. Curing: Immediately after the finishing operations, the exposed concrete surface shall be cured.

B. Backfilling: After curing, debris shall be removed, and the area adjoining the sidewalk shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with the lines and grades indicated.

C. Protection: The completed sidewalk shall be protected from damage until accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Sidewalk that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed by the Contracting Officer.

END OF SECTION

SECTION 02667

SITE WATER LINES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and fittings for site water line including domestic water line and fire water line.

B. Valves, fire hydrants and domestic water hydrants.

1.2 RELATED SECTIONS (IF APPLICABLE)

A. Section 02207 - Aggregate Materials.

B. Section 02219 - Utility Excavation.

C. Section 02223 - Backfilling.

D. Section 03300 - Cast-in-Place Concrete: Concrete for thrust restraints.

1.3 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

D. ASTM B88 - Seamless Copper Water Tube.

E. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

F. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

G. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

H. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).

I. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

J. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

K. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

L. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

M. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.

N. ASTM D3035 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside

Diameter.

O. AWS A5.8 - Brazing Filler Metal.

P. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

Q. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other liquids.

R. AWWA C111- Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.

S. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

T. AWWA C500 - Gate Valves, 3 through 48 in NPS, for Water and Sewage Systems.

U. AWWA C502 - Dry Barrel Fire Hydrants.

V. AWWA C504 - Rubber Seated Butterfly Valves.

W. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in through 24 in NPS.

X. AWWA C509 - Resilient Seated Gate Valves 3 in through 12 in NPS, for Water and Sewage Systems.

Y. AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.

Z. AWWA C606 - Grooved and Shouldered Type Joints.

AA. AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water.

BB. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, 1/2 inch through 3 inch, for Water

CC. UL 246 - Hydrants for Fire - Protection Service.

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

1.5 SUBMITTALS FOR CLOSEOUT

A. Section 01700 - Contract Closeout.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01700 - Contract Closeout: Procedures for submittals.

B. Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted

utilities.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with Installation utility department.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.1 WATER PIPE

A. Ductile Iron Pipe: AWWA C151:

1. Fittings: Ductile or Gray iron, standard thickness.
2. Joints: AWWA C111, rubber gasket with rods.

B. Copper Tubing: ASTM B88, Type K, annealed:

1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
2. Joints: Compression connection or AWS A5.8, BCuP silver braze.

C. PVC Pipe: ASTM D1785, Schedule 40, SDR-26 for 160 psig pressure rating, SDR-21 for 200 psig rating:

1. Fittings: ASTM D2466, PVC.
2. Joints: ASTM D2855, solvent weld.
3. Trace Wire: Magnetic detectable conductor brightly colored plastic covering, imprinted with "Water Service" in large letters.

D. PVC Pipe: AWWA C900 Class 150:

1. Fittings: AWWA C111, cast iron.
2. Joints: ASTM D3139 compression gasket ring.
3. Trace Wire: Magnetic detectable conductor brightly colored plastic covering, imprinted with "Water Service" in large letters.

2.2 GATE VALVES - UP TO 3 INCHES

A. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression or IPS ends, with control rod, extension box and valve key.

2.3 GATE VALVES - 3 INCHES AND OVER

A. AWWA C500, Iron body, bronze trim, non-rising stem with square nut, single wedge, flanged or mechanical joint ends, control rod, extension box and valve key.

B. AWWA C509, Iron body, bronze trim, non-rising stem with square nut, single wedge, resilient seat, flanged or mechanical joint ends, control rod, extension box and valve key.

2.4 BALL VALVES - UP TO 2 INCHES

A. Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA compression inlet end, compression or IPS outlet with electrical ground connector, with control rod, extension box and valve key.

2.5 SWING CHECK VALVES - FROM 2 INCHES TO 12 INCHES

A. AWWA C508, iron body, bronze trim, 45 degree swing disc, renewable disc and seat, flanged ends.

2.6 BUTTERFLY VALVES - FROM 12 INCHES TO 24 INCHES

A. AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, infinite position lever handle.

2.7 FREEZE LESS VALVE

A. Freezless valve shall be completely sealed, suitable for bury, with below frost line resevoir.

2.8 HYDRANT (IF APPLICABLE)

A. Hydrant: AWWA C502, UL 246, dry barrel type, inside dimension of 7 inches minimum, with minimum 5 inches diameter valve seat opening; minimum net water area of barrel not less than 190 percent of valve opening; 6 inch bell or mechanical joint inlet connection with accessories, gland bolts, and gaskets.

B. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.

C. Hose and Streamer Connection: Match sizes and threads with utility company, two hose nozzles, one pumper nozzle.

D. Finish: Primer and two coats of enamel in color required by utility company.

2.9 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in Section 02207.

B. Cover: Fill Type as specified in Section 02205.

2.10 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 03300.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building service connection and Base/Post utility water main size, location, and invert are as indicated.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 02219 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Form and place concrete for pipe thrust restraints at any change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide sq ft thrust restraint bearing on subsoil as indicated.

C. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent.

D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact to 95 percent.

E. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Maintain separation of water main from sewer piping in accordance with plumbing code.

B. Install pipe to indicated elevation to within tolerance of 5/8 inches.

C. Install ductile iron piping and fittings to AWWA C600.

D. Route pipe in straight line.

E. Install pipe to allow for expansion and contraction without stressing pipe or joints.

F. Install access fittings to permit disinfect ion of water system.

G. Slope water pipe and position drains at low points.

H. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

I. Establish elevations of buried piping to proper cover in accordance with plumbing codes.

J. Install trace wire continuous over top of pipe. Buried 6 inches below finish grade, above pipeline.

K. Backfill trench in accordance with Section 02219.

3.5 INSTALLATION - VALVES AND HYDRANTS (IF APPLICABLE)

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

D. Set hydrants to grade, with nozzles at least 20 inches above ground.

E. Locate control valve 4 inches away from hydrant.

F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with pumping codes.

3.7 SERVICE CONNECTIONS

A. Provide water service to Base/Post requirements with reduced pressure backflow preventer and sand strainer.

B. Provide sleeve in foundation wall for service main. Support with reinforced concrete bridge. Calk enlarged sleeve watertight.

C. Anchor service main to interior surface of foundation wall.

D. Provide 18 gage galvanized sheet metal sleeve surrounding service main to 6 inches above floor and 6 feet minimum below grade. Size for 2 inches minimum of glass fiber insulation stuffing.

3.8 FIELD QUALITY CONTROL

A. Section 01410 - Quality Assurance: Field inspection and testing.

B. Compaction testing will be performed in accordance with ASTM D1557 and ASTM D2922.

C. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

D. Frequency of Tests: One test per lift.

END OF SECTION

Section 02685

GAS METERS

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B109.2	(1992) Diaphragm Type Gas Displacement Meters (Over 500 Cubic Feet per Hour Capacity)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B31.8	(1995) Gas Transmission and Distribution Piping Systems

1.1 Service Line Regulators

A shutoff valve, meter set assembly, and service regulator shall be installed on the service line outside the building, 450 mm (18 inches) above the ground on the riser. An insulating joint shall be installed on the inlet side of the meter set assembly and service regulator and shall be constructed to prevent flow of electrical current. A 10 mm
(3/8 inch) tapped fitting equipped with a plug shall be provided on both sides of the service regulator for installation of pressure gauges for adjusting the regulator. All service regulator vents and relief vents shall terminate in the outside air in rain and insect resistant fittings. The open end of the vent shall be located where gas can escape freely into the atmosphere, away from any openings into the building and above areas subject to flooding.

2.0 Gas Meters

Meters shall conform to ANSI B109.2. Meters shall be pipe or pedestal mounted and shall include a strainer immediately upstream. Meters shall be provided with over-pressure protection as specified in ASME B31.8 tamper-proof protection. Meters shall be suitable for accurately measuring and handling gas at pressures, temperatures, and flow rates indicated. Meters shall have an encoded-type register **(preferred)** with a 3-wire output cable, when possible, otherwise a pulse switch initiator (Retrofit Kit) capable of operating up to speeds of 500 pulses per minute with no false pulses may be used. The initiator shall require no field adjustments and shall provide the maximum number of pulses up to 500 per minute that is obtainable from the manufacturer. It shall provide not less than one pulse per 100 cubic feet of gas.

3.0 Installation

Meters shall be installed in accordance with ASME B31.8. Permanent gas meters shall be installed with provisions for isolation and removal for calibration and maintenance, and shall be suitable for operation in conjunction with an energy monitoring and control system. A communication cable (3-conductor, 22 AWG) shall be routed from meter to the MIU through appropriate sized conduit. Approximate 1-2 feet of cable shall be provided at both ends for final connection (termination) by DPW Energy Team.

3.1 Connections to Existing Lines

Connections between new work and existing gas lines, where required, shall
be made in accordance with ASME B31.8 using proper fittings to suit the actual conditions. When connections are made by tapping into a gas main, the connecting fittings shall be the same size as the pipe being connected. Gas meters and associated hardware shall be installed in accordance to manufacturer's recommendation or as shown on plans. The cable from the pulse-transmitting unit shall connect to the MIU. (See routing of cable in 3.0 above.)

4.0 Gas Meter Suppliers and Register

Meters shall include an encoded-type registers (preferred) when possible, otherwise an electronic pulse transmitter (Retrofit Kit) or Form C SPDT contact closure device may be used. The latter (non encoded-type) registers must provide a 10 pulse per drive shaft revolution output signal via a 2-wire cable. Meter registers shall be the clock pointer type (to allow for retrofitting, if needed). Meters shall be pipe or pedestal mounted and shall come with a strainer immediately upstream. Meters shall have provisions for over-pressure protection as specified in ASME B31.8. Meters shall be suitable for accurately measuring and handling gas at pressures, temperatures, and flow rates indicated. Acceptable manufacturers are American Gas Meter Company, Schlumberger or Rockwell/Equimeter. Sources of supply: American Gas meters- Carl Poe Co., Inc. Reinerman St., Houston, TX 77007 (713) 861-3816. Equimeter gas meters- McGuiness Industrial Sales, 3935 Hartdale, Houston, TX 77063 (713)-974-6400.

END OF SECTION

SECTION 02732

SITE SANITARY SEWERAGE SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, accessories, and bedding.

B. Connection of building sanitary drainage system to municipal sewers.

C. Clean-out access.

1.2 RELATED SECTIONS (IF APPLICABLE)

A. Section 02205 - Soil Materials.

B. Section 02207 - Aggregate Materials.

C. Section 02219 - Utility Excavation.

D. Section 03300 - Cast-in-Place Concrete.

1.3 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

B. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

C. ASTM D1556 - Test Methods for Density and Unit Weight of Soil In-Place by the Sand-Cone Method.

D. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

E. ASTM D1785 – Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.

F. ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

G. ASTM D2729 – Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.

H. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

I. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

J. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

K. ASTM D3033 - Type PSP Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.

L. ASTM D3034 - Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.

1.4 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.5 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals.

B. Product Data: Provide data indicating pipe, and pipe accessories.

1.6 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals.

B. Manufacturer's Instructions: Indicate special procedures required to install products specified.

C. Certificates: Certify that products meet or exceed specified requirements.

1.7 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01700 - Contract Closeout.

B. Record location of pipe runs, connections, clean-outs, control points, and invert elevations.

C. Identify, indicate, and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the work of this section.

PART 2 PRODUCTS

2.1 PIPE MATERIALS FOR GRAVITY LINES

A. Plastic Pipe: ASTM D2751, SDR 35 or 42, Acrylonitrile-Butadiene-Styrene (ABS) material; bell and spigot style solvent sealed joint end.

B. Plastic Pipe: ASTM D3033, Type PSP, Poly Vinyl Chloride (PVC) material; bell and spigot style solvent sealed joint end.

C. Plastic Pipe: ASTM D2729, Poly Vinyl Chloride (PVC) material; bell and spigot style solvent sealed joint end.

D. Plastic Pipe: ASTM D3034, Type PSM, Poly Vinyl Chloride (PVC) material; bell and spigot style solvent sealed joint end.

E. Plastic Pipe: ASTM D1785, Schedule 40, Poly Vinyl Chloride (PVC) material; bell and spigot style solvent sealed joint end.

2.2 PIPE MATERIALS FOR FORCEMAINS

A. Forcemain Pressure Ratings: At least equal to system operating pressure, but not less than 150 psig.

B. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.

1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
2. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
3. Gaskets: AWWA C111, rubber.

C. PVC Pressure Pipe: AWWA C900, Class 150, for gasketed joints.

1. PVC Pressure Fittings: AWWA C907, for gasketed joints.
2. Gaskets for PVC Piping: ASTM F 477, elastomeric seals.
3. Ductile-Iron, Compact Fittings: AWWA C153, for push-on joints.
4. Gaskets for Ductile-Iron Fittings: AWWA C111, rubber.

2.3 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, clean-outs, reducers, traps and other configurations required.

C. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Sewer Service" in large letters.

2.4 CLEAN-OUTS

A. Pipe and Cover: Cast iron construction:

1. Nominal Size: 6 inches.
2. Load Design: Vehicular traffic load.

B. Pad: Cast-in-place concrete of type specified in Section 03300.

2.5 BEDDING MATERIALS

A. Aggregate Bedding: Fill Type as specified in Section 02207.

B. Soil Bedding: Fill Type as specified in Section 02219.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 02219 for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom in accordance with Section 02219, level materials in continuous layers not exceeding 6 inches compacted depth, compact to 95 percent.

C. Maintain moisture content of bedding material to plus or minus 2 percent to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM C12, ASTM D2321 and manufacturer's instructions. Seal joints watertight.

B. Install ductile-iron forcemain piping according to AWWA C600.

C. Install PVC forcemain according to AWWA M23.

D. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1:1000.

E. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches; compacted to 95 percent.

F. Refer to Section 02219 for trenching requirements. Do not displace or damage pipe when compacting.

G. Connect to building sanitary sewer outlet and installation sewer system.

H. Connections to existing manholes shall be made by penetrating the manhole wall in such a manner not to damage the integrity of the structure. Penetrations shall not be greater than 12 inches more than the outside diameter of the pipe. Provide polyethylene-isoprene water stops meeting the requirements of ASTM C 923. Masonry shall be placed around the water stop and the remaining opening to form a watertight construction.

I. Install colored marker tape continuous buried 6 inches below finish grade, above pipe line; coordinate with Section 02219.

J. Coordinate the work with termination of sanitary sewer connection outside building, connection to municipal sewer utility service, and trenching.

3.5 INSTALLATION - CLEAN-OUTS

A. Form and place cast-in-place concrete pad with provision for sanitary sewer pipe ends.

B. Establish elevations and inverts for inlets and outlets as indicated.

C. Mount clean-out surface hub level in grout, to elevation indicated.

3.5 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

a. Close open ends of piping at removed structures with at least 8 inch thick, brick masonry bulkheads.
b. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
c. Close open ends of piping at active mains with plug designed for use with the existing piping material. Plug shall be placed within 12 inches of the main.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:

1. Remove structure and close open ends of remaining piping.
2. Remove top of structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
3. Backfill to grade according to Section 02219.

3.6 FIELD QUALITY CONTROL

A. Section 01410 - Testing Services.

B. Request inspection prior to and immediately after placing bedding.

C. Compaction testing will be performed in accordance with ASTM D1556 and ASTM D2922.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to AAFES.

3.7 PROTECTION OF FINISHED WORK

A. Section 01700 - Contract Closeout.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 02930

LAWNS

PART 1 GENERAL

1.1 RELATED WORK SECTIONS

A. Site Clearing: Section 02110.

B. Site Grading: Section 02210.

C. Walks: Section 02630.

1.2 SECTIONS INCLUDE

A. Work shall consist of, but not be limited to:

1. Top soiling.
2. Establishment of lawn areas.
3. Fertilizer.
4. Watering.

1.3 QUALITY ASSURANCE

A. Inspection and Tests: All materials proposed for use shall be subject to sampling and testing in accordance with standard methods.

1. During the course of work or upon completion of the project, a check of the quantities of materials will be made against the areas treated, and if the minimum rates of application have not been met, the Contracting Officer may require the distribution of additional quantities of these materials to make up the minimum applications specified. The Contracting Officer shall be furnished the following:

a. Duplicate copies of invoices for all materials. Invoices for fertilizer shall show the grade furnished.

1.4 SUBMITTALS

A. Submit 6 copies of complete written maintenance instructions at least 10 days prior to end of maintenance period. Include all requirements for proper care, development and maintenance of lawn areas.

B. Submit a label from the manufacturer's container certifying fertilizer content.

1.5 JOB CONDITIONS

A. Seeding shall be done between 15 March and 1 May or from 15 August to 15 September under favorable climate conditions.
B. Sodding shall be done 1 March to 1 May or from 1 August to 30 September.

1.6 SCHEDULING

A. Install sod after trees, shrubs and ground cover plants are installed.

PART 2 PRODUCTS

2.1 TOPSOIL

A. All topsoil shall be placed within the designated areas and to the grading lines. Topsoil shall be kept free from subsoil, clay, lumps, brush, objectionable weed growth, litter, stones larger than ½ inch in diameter, stumps, roots, and other material that would interfere with planting and maintenance operations. Topsoil shall be deposited in storage piles in areas designated on the drawings and approved by the Architect.

B. Topsoil (lawn areas only): Any additional topsoil shall be furnished by the Contractor from approved sources off the construction site. Topsoil shall be fertile, friable, with a natural surface capable of producing satisfactory agricultural crops, and shall be reasonably free of matter that might be harmful to plant growth or a hindrance to grading, seeding and maintenance operations.

2.2 SOD

A. Sod containing a good cover or growing or living grass shall be provided. Living grass is defined as grass that is seasonably dormant during a cold or dry season and capable of renewing growth after the dormant period. At least 90 percent of the plants in the sod shall be turf-type tall fescue/Rebel Jr. or approved equal. Sod shall be produced from areas having growing conditions similar to these areas on which the sod is to be used. Sod shall be furnished that is relatively free of weeds and undesirable plants, large stones, roots and other materials that hinder the development and maintenance of sod. Vegetation more than five inches in height shall be cut to these inches or less, and hay and all other loose materials on the surface shall be removed at least five days before the sod is lifted. When the sod is cut, the height of the grass shall not exceed five inches. All sod required to finish the work shall be furnished from approved sources off the site by the Contractor.

2.3 SEED

A. Seed labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act shall be furnished. Seed shall be furnished in sealed, standard containers unless written exception is granted. Seed that is wet or moldy or that has been otherwise damaged in transit or storage will not be acceptable.

Seed Mix	90% Rebel Jr. or approved equal 10% Lofts 1757 or approved equal.

2.4 WOOD CELLULOSE FIBER MULCH

A. Wood cellulose fiber mulch, for use with the hydraulic application of grass seed and fertilizer, shall consist of specially prepared wood cellulose fiber, processed to contain no growth or germination inhibiting factors, and dyed on appropriate color to facilitate visual metering of application of the materials. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds. The wood cellulose fiber shall not contain in excess of 10 percent moisture, air dry weight basis. The wood cellulose fiber shall be manufactured so that after addition and agitation in slurry tanks with fertilizers, grass seeds, water, and any other approved additives, the fibers in the material will become uniformly suspended to form a homogeneous slurry; and that when hydraulically sprayed on the ground, the material will form a blotter-like ground cover impregnated uniformly with grass seed, and which, after application, will allow rainfall or

mechanical watering to percolate to the underlying soil. Suppliers shall be prepared to certify that laboratory and field testing of their product has been accomplished, and that their product meets all the foregoing requirements based upon such testing.

2.5 SOIL CONTAINER

A. Peat moss shall be a natural product of either sphagnum moss, reed or sedge peat taken from a fresh water site. It shall be shredded or in granular form so that it can pass through a ½ inch screen and shall contain not less than 90 percent organic matter by weight on an oven-dry basis. It may be furnished in bulk or bales.

B. Manure shall be well rotted, weed free, pulverized and sterilized, and may be furnished in bulk.

2.6 FERTILIZER

A. Commercial fertilizer shall contain a minimum of 10 percent nitrogen, 25 percent phosphorous, and 15 percent potash, be uniform in composition, dry and free flowing, delivered in containers labeled in accordance with applicable state regulations and bearing the warranty of the producer for the grade furnished.

2.7 WATER

A. Water will be furnished by the facility from the nearest available source in the vicinity of the project.

PART 3 EXECUTION

3.1 SOIL PREPARATION

A. General: The outline or extent of project areas to be topsoiled and sodded shall be as indicated on the drawings.

B. Debris Removal: Prior to topsoil and tillage operations, all wire, rubbish and other material which might hinder proper grading and subsequent maintenance shall be removed from the site and disposed of as directed.

C. Grading: Grades on the areas to be topsoiled and seeded shall be maintained in a true and even condition. Maintenance shall include necessary repairs to previously graded areas. Where the grades have not been established, the areas shall be graded as shown on the drawings and left in an even and firm condition. On lawn areas, the finished grade, after shrinkage and compaction, shall be 1 ½" for sodded or 1” for seeded areas below the grade of adjoining walks, curbs, or other paved surfaces prior to seeding operations.

D. Topsoiling (lawn areas only): The Contractor shall furnish all topsoil. Immediately prior to dumping and spreading topsoil, the subgrade, where compacted by traffic or hardened by other causes, shall be disked or scarified to a depth of at least 2 inches to permit blending of the topsoil to the subsoil. The topsoil shall be spread evenly to an average depth of 3 inches and a minimum depth of 2 inches. Topsoil shall not be placed when the soils are excessively moist.

E. Tillage: The areas shall be thoroughly tiled to a depth of at least 6 inches on lawn areas by disking, harrowing, or other approved methods until the condition of the soil is acceptable. When conditions are such that satisfactory results are not likely to be obtained, by reason of excessive moisture or other factors, the work will be stopped by

the Contracting Officer and shall be resumed only when directed.

F. Application of fertilizer: Fertilizer shall be distributed uniformly at the rate of 450 pounds per acre on lawn areas to be seeded or sodded (about 10 lbs/1,000 sq. ft). The fertilizer shall be incorporated into the soil to a maximum depth of one inch and may be part of the tillage operation.

G. Leveling: Prior to final leveling, and to insure a firm uniform surface, the area to be seeded shall be thoroughly watered to settle soft spots. Undulations or irregularities shall then be completely removed by the use of a free moving float drag prior to the start of seeding operations. Maintain positive drainage in lawn areas. All small areas or those adjacent to trees, planted areas, walls or other structures shall be fine graded by hand tools.

H. Clean-Up: All wire, rubbish, stones over 1-1/2 inches in diameter and other material which might hinder proper sodding and subsequent maintenance shall be removed from the seedbed. Paved areas over which hauling operations are conducted shall be kept clean. Soil or other dirt deposited on paved surfaces shall be removed promptly.

I. Rolling: Immediately after sodding, the entire area shall be compacted by means of a roller weighing 60 to 90 pounds per linear foot of roller.

J. Protections: Areas susceptible to vehicular or heavy foot traffic shall be protected by erecting suitable barricades and/or placing warning signs of a type approved by the Engineer/Architect immediately after sodding is completed.

3.2 SPECIAL SEEDING AND MULCHING EQUIPMENT

A. Seeder:

1. Equipment to be used for applying a seed-fertilizer mix over prepared slopes shall be a hydraulic seeder designed to pump and discharge a waterborne homogeneous slurry of seed, fertilizer, and wood cellulose fiber at the desired specified rate.

2. The seeder shall be equipped with a power-driven agitator, and shall be capable of discharging up to 200 gallons per minute at 100 pounds pressure from a nozzle with clearance for ½ inch solids.

B. Wood Cellulose Fiber Mulch Spreader:

1. Hydraulic equipment used for the application of fertilizer, seed, and slurry of prepared wood pulp shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry containing up to 40 pounds of fiber plus a combined total of 70 pounds of fertilizer solids for each 100 gallons of water.

2. The slurry distribution lines shall be large enough to prevent stoppage.

3. The discharge line shall be equipped with a set of hydraulic spray nozzles that will provide even distribution of the slurry on the various slopes to be mulched.

4. The slurry tank shall have a minimum capacity of 1,000 gallons and shall be mounted on a traveling unit which may be either self-propelled or drawn by a separate unit that will place the slurry tank and spray nozzles near the areas to be mulched so as to provide uniform distribution without waste.

5. The Contracting Officer may authorize equipment with a smaller tank capacity provided that the equipment has the necessary agitation system and sufficient pump capacity to spray the slurry in a uniform coat over the surface of the area to be mulched.

3.3 PLANTING SEED

A. General:

1. A satisfactory method of sowing shall be employed, using approved mechanical power-drawn drills or seeders, mechanical hand seeders, or other approved methods.

2. When drills are used, markers or other means shall be provided to insure that the successive seeded strips will overlap or be separated by a space no greater than equipment row spacing.

3. When delays in operations extend the work beyond the most favorable planting season for species designated or when conditions are such by reason or drought, high winds, excessive moisture, or other factors that satisfactory results are not likely to be obtained, work shall be halted as directed and resumed only when conditions are favorable or when approved alternate or corrective measures and procedures have been effected.

4. If during or after inspection of seeding operations, there is an indication of areas having been missed, additional seed shall be sown if so directed by the Contracting Officer.

B. Broadcast Seeding:

1. Seed shall be broadcast either by hand or with approved hydraulic seeding equipment, as specified hereinbefore, in combination with fertilizer, or with the approved hydraulic equipment specified hereinbefore, or with other approved sowing equipment at the rate of 10 pounds per 1,000 sq. ft.

2. Seed shall be distributed uniformly over designated areas.

3. Half of seed shall be sown with sewer moving in one direction, and the remainder with sewer moving at right angles to first sowing.

4. Seed shall be covered to an average depth of 1/4 inch by brush harrow, spike-tooth harrow, chain harrow, cultipacker, hand rake with wood tines, or other approved device.

5. Seed shall not be broadcast during windy weather.

C. Drill seeding:

1. Drill seeding shall be accomplished with approved equipment, with drills set not more than 2 inches apart.

2. Seed shall be sown uniformly over designated areas to average depth of 1/4 inch and at a rate of 10 pounds per 1,000 sq. ft.

D. Compacting:

1. Immediately after the seeding operations have been completed, and if hydraulic equipment in combination with wood cellulose fiber mulch and fertilizer is not used for seeding operations, the surface shall be compacted by a cultipacker, roller, or other approved equipment weighing 100 to 160 pounds per linear foot of roller.

2. When planting by machine, the roller shall be operated immediately behind the planter unless otherwise directed. Under certain soil conditions, the Contracting Officer may direct that rolling be delayed for 15 to 30 minutes following planting to avoid balling the soil on the roller or squeezing water out of furrows.

3. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, a pneumatic-tired roller, not wobble-wheel, shall be used.

4. A roller having tires of sufficient size shall be used, or sufficient passes of the roller shall be made, to cover the soil surface completely.

E. Applying and Anchoring Mulch:

1. Straw mulch shall be spread uniformly in a continuous blanket at a rate of 1-1/2 tons per acre.

2. Wood cellulose fiber mulch, if used, shall be spread uniformly in a continuous blanket at a rate of ½ ton per acre.

3. Mulch shall be spread by hand or by a manure spreader, a modified grain combine with straw-spreader attachment, a blower-type mulch spreader, or a blower-type mulch spreader so equipped that straw or hay will be ejected simultaneously with asphalt adhesive, or other suitable equipment.

4. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of a steep slope, and continued uniformly until the area is covered. The mulch shall not be bunched.

5. Immediately following spreading, the mulch shall be anchored to the soil by an approved method that will anchor the mulch firmly to the ground to form a soil-binding mulch and prevent loss or bunching by wind.

F. Watering:

1. Seeded areas: Watering will be required if seeding operations are authorized when the ground is excessively dry. Immediately after final compaction water shall be applied to wet the full depth of the topsoil with seed. Additional applications shall be made as directed.

G. Protection:

1. Protection shall be provided against traffic or other use by erecting barricades immediately after treatment is completed, and by placing warning signs, as directed, at various locations.

3.4 ESTABLISHMENT OF LAWN AREAS

A. Period: The Contractor shall be responsible for the proper care of the sodded areas for 30 days after the completion of the sodding operation.

B. Watering: The sod areas shall be watered immediately after rolling and kept constantly moist during the period of the Contractor's responsibility.

C. Mowing: Grass on the sodded areas shall be mowed with approved equipment to a height of 2 inches whenever the average height reaches 4 inches.

3.5 REPAIR

A. Resodding: When it becomes evident that the sod is not taking root properly on certain areas, the Contracting Officer will require that these areas be resodded or reseeded with the same sod or seed quantity as specified for the initial sodding or seeding. Resodding shall be completed within seven days following notifications and these shall be maintained as specified in above sub-paragraph 3.4 B and C.

B. Areas repaired as a result of damage occurring through no fault of the Contractor shall be maintained only until the termination of the established period specified in paragraph 3.04.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 03300 – Cast-in-Place Concrete: Supply of concrete accessories for placement by this section.

1.3 RELATED SECTIONS

A. Section 03200 – Concrete Reinforcement.

B. Section 03300 – Cast-in-Place Concrete.

1.4 REFERENCES

A. ACI 301 – Structural Concrete for Buildings.

B. ACI 318 – Building Code Requirements for Reinforced Concrete.

C. ACI 347 – Recommended Practice For Concrete Formwork.

D. PS 1 – Construction and Industrial Plywood.

1.5 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to code requirements; resultant concrete to conform to required shape, line and dimension.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347, 301, and 318.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for design, fabrication, erection and removal of formwork.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

B. Deliver void forms and installation instructions in manufacturer's packaging.

1.9 COORDINATION

A. Coordinate this Section with other Sections of work which require attachment of components to formwork.

B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Architect/Engineer before proceeding.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Plywood: Solid one side; sound undamaged sheets with clean, true edges.

B. Lumber: Stud grade; with grade stamp clearly visible.

2.2 PREFABRICATED FORMS

A. Preformed Steel Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

2.3 FORMWORK ACCESSORIES

A. Form Ties: Snap-off type, metal, cone type, 1" inch minimum back break dimension, free of defects that could leave holes larger than 1" in concrete surfaces.

B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

C. Corners: Chamfer, ¾" x ¾" inch size; maximum possible lengths.

D. Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 ERECTION – FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over stressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members which are not indicated on Drawings.

F. Provide chamfer strips on external corners.

3.3 APPLICATION – FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcement steel, anchoring devices, and embedded items.

3.4 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items which will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

3.5 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.6 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

3.7 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

3.8 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.2 RELATED SECTIONS

A. Section 03100 – Concrete Formwork.

B. Section 03300 – Cast-in-Place Concrete.

1.3 REFERENCES

A. ACI 301 – Structural Concrete for Buildings.

B. ACI 318 – Building Code Requirements For Reinforced Concrete.

C. ACI SP-66 – American Concrete Institute – Detailing Manual.

D. ANSI/ASTM A82 – Cold Drawn Steel Wire for Concrete Reinforcement.

E. ANSI/ASTM A185 – Welded Steel Wire Fabric for Concrete Reinforcement.

F. ANSI/ASTM A496 – Deformed Steel Wire Fabric for Concrete Reinforcement.

G. ANSI/ASTM A497 – Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

H. ANSI/AWS D1.4 – Structural Welding Code for Reinforcing Steel.

I. ASTM A615 – Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

J. ASTM A706 – Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

K. AWS D12.1 – Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.

L. CRSI – Concrete Reinforcing Steel Institute – Manual of Practice.

M. CRSI – Placing Reinforcing Bars.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel, bending and cutting schedules.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI 63, 65 and Manual of Practice, ACI 301, and ACI 318.

B. Provide Architect/Engineer with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

1.6 QUALIFICATIONS

A. Welders' Certificates: Submit under provisions of Section 01400 Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.7 COORDINATION

A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars, unfinished.

B. Welded Steel Wire Fabric: ASTM A185 Plain Type in flat sheets unfinished.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type.

B. Bolsters, Bar Supports, Horizontal Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.

C. Special Chairs, Bolsters, Bar Supports, Horizontal Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice, ACI 318.

B. Weld reinforcement in accordance with ANSI/AWS D1.4.

C. Locate reinforcing splices not indicated on drawings, at point of minimum stress. Review location of splices with Architect/Engineer.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Conform to applicable code for concrete cover over reinforcement.

3.2 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01400.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place concrete foundation.

B. Control, expansion and contraction joint devices associated with concrete work, including joint sealants.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 03100 – Concrete Formwork: Placement of joint device anchors in formwork.

1.3 RELATED SECTIONS

A. Section 03100 – Concrete Formwork: Formwork and accessories.

1.4 REFERENCES

A. ACI 301 – Structural Concrete for Buildings.

B. ACI 302 – Guide for Concrete Floor and Slab Construction.

C. ACI 304 – Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

D. ACI 305R – Hot Weather Concreting.

E. ACI 306R – Cold Weather Concreting.

F. ACI 308 – Standard Practice for Curing Concrete.

G. ACI 318 – Building Code Requirements for Reinforced Concrete.

H. ASTM C33 – Concrete Aggregates.

I. ASTM C94 – Ready-Mixed Concrete.

J. ASTM C150 – Portland Cement.

K. ASTM C494 – Chemicals Admixtures for Concrete.

L. ASTM C618 – Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

1.5 SUBMITTALS

A. Product Data: Provide data on joint devices, attachment accessories and admixtures.

B. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent Work.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of embedded utilities and components which are concealed from view.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Acquire cement and aggregate from same source for all work.

C. Conform to ACI 305R when concreting during hot weather.

D. Conform to ACI 306R when concreting during cold weather.

1.8 COORDINATION

A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I – Normal.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

A. Chemical: ASTM C494 Type A – Water Reducing, Type B – Retarding, Type C – Accelerating, Type D – Water Reducing and Retarding, Type E – Water Reducing and Accelerating, Type F – Water Reducing, High Range, Type G - Water Reducing, High Range and Retarding.

B. Fly Ash Calcinated Pozzolan: ASTM C618 Class C or F.

2.3 JOINT DEVICES AND FILLE MATERIALS

A. Joint Filler Type A: ASTM D1751 or ASTM D994; Asphalt impregnated fiberboard or felt.

2.4 CONCRETE MIX

A. Select proportions for normal weight concrete in accordance with ACI 301 Method 1.

B. Use accelerating admixtures in cold weather only when approved by Engineer. Use of admixtures will not relax cold weather placement requirements.

C. Use calcium chloride only when approved by Engineer.

D. Use set retarding admixtures during hot weather only when approved by Engineer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PLACING CONCRETE

A. Place concrete in accordance with ACI 304, ACI 301 and ACI 318.

B. Notify Engineer minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

D. Install joint devices in accordance with manufacturer's instructions.

E. Install construction joint devices in coordination with plans. Set top to required elevations. Secure to resist movement by wet concrete.

F. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

G. Place concrete continuously between predetermined expansion, control, and construction joints.

H. Do not interrupt successive placement; do not permit cold joints to occur, except as detailed.

I. Screed floors level, maintaining surface flatness of maximum ¼ inch in 10 ft.

3.3 CONCRETE FINISHING

A. Provide formed concrete surfaces to be left exposed with smooth rubbed finish.

B. Finish concrete floor surfaces in accordance with ACI 301.

C. Steel trowel surfaces.

3.6 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Spraying: Spray water over floor slab areas and maintain wet for 3 days.

3.7 FIELD QUALITY CONTROL

A. Provide free access to Work and cooperate with Testing Laboratory.

B. Submit proposed mix design to Engineer for review prior to commencement of Work.

C. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

D. Four concrete test cylinders will be taken for every 50 cu yds of concrete placed.

E. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. One slump test will be taken for each set of test cylinders taken.

3.8 PATCHING

A. Allow Architect/Engineer to inspect concrete surface immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

C. Patch imperfections as directed.

3.9 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by the Architect/Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION

SECTION 03370

CONCRETE CURING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Initial and final curing of horizontal and vertical concrete surfaces.

1.2 RELATED SECTIONS

A. Section 03300 – Cast-In-Place Concrete.

1.3 REFERENCES

A. ACI 301 – Structural Concrete for Buildings.

B. ACI 302 – Recommended Practice for Concrete Floor and Slab Construction.

C. ACI 308 – Standard Practice for Curing Concrete.

D. ASTM C171 – Sheet Materials for Curing Concrete.

E. ASTM C309 – Liquid Membrane-Forming Compounds for Curing Concrete.

F. ASTM D2103 – Polyethylene Film and Sheeting.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products under provisions of Section 01600.

B. Deliver curing materials in manufacturer's packaging including application instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Membrane Curing Compound Type A: ASTM C309 Type 1 acrylic clear.

B. Water: Potable, not detrimental to concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions under provisions of Section 01039.

B. Verify that substrate surfaces are ready to be cured.

3.2 EXECUTION – HORIZONTAL SURFACES

A. Cure floor surfaces in accordance with ACI 308.

B. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

C. Membrane Curing Compound: Apply curing compound in accordance with manufacturer's instructions in two coats with second coat applied at right angles to first.

3.3 EXECUTION – VERTICAL SURFACES

A. Cure surfaces in accordance with ACI 308.

B. Spraying: Spray water over surfaces and maintain wet for 7 days.

C. Membrane Curing Compound: Apply compound in accordance with manufacturer's instruction in two coats with second coat applied at right angles to first.

3.4 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Do not permit traffic over unprotected floor surface.

END OF SECTION

SECTION 04100

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mortar and grout for masonry.

1.2 RELATED SECTIONS

A. Section 01410 - Testing Services.

B. Section 04200 - Brick Masonry

C. Section 04300 - Unit Masonry System.

1.3 REFERENCES

A. ACI 530 - Building Code Requirements for Masonry Structures.

B. ACI 530.1 - Specifications For Masonry Structures.

C. ASTM C5 - Quicklime for Structural Purposes.

D. ASTM C91 - Masonry Cement.

E. ASTM C94 - Ready-Mixed Concrete.

F. ASTM C144 - Aggregate for Masonry Mortar.

G. ASTM C150 - Portland Cement.

H. ASTM C199 - Test Method for Pier Test for Refractory Mortar.

I. ASTM C207 - Hydrated Lime for Masonry Purposes.

J. ASTM C270 - Mortar for Unit Masonry.

K. ASTM C387 - Packaged, Dry, Combined Materials, for Mortar and Concrete.

L. ASTM C404 - Aggregates for Masonry Grout.

M. ASTM C476 - Grout for Masonry.

N. ASTM C595 - Blended Hydraulic Cement.

O. ASTM C780 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

P. ASTM C1019 - Method of Sampling and Testing Grout.

Q. ASTM C1072 - Method for Measurement of Masonry Flexural Bond Strength.

R. ASTM C1142 - Ready-Mixed Mortar for Unit Masonry.

S. ASTM E447 - Test Methods for Compressive Strength of Masonry Prisms.

T. ASTM E518 - Test Method for Flexural Bond Strength of Masonry.

U. IMIAC (International Masonry Industry All-Weather Council) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

V. IMIAC (International Masonry Industry All-Weather Council) - Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Include design mix, indicate whether the Proportion or Property specification of ASTM C270 is to be used, required environmental conditions, and admixture limitations.

C. Reports: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C270 and test and evaluation reports to ASTM C780.

D. Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C476.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01600.

B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F (10 degrees C) prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Masonry Cement: ASTM C91, Type S gray.

B. Water: Clean and potable.

2.2 MORTAR COLOR

A. Mortar Color: gray (for concrete masonry unit).

Mortar Color for Brick Veneer: Contractor to verify with Architect prior to making mock up panel.

2.3 ADMIXTURES

As Required

2.4 MORTAR MIXES

A. Mortar For Walls and Partitions: ASTM C270, Type S.

2.5 MORTAR MIXING

A. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Add admixtures in accordance with manufacturer's instructions where required. Provide uniformity of mix and coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within two hours of mixing.

F. Use mortar within two hours after mixing at temperatures of 90 degrees F (32 degrees C), or two-and-one-half hours at temperatures under 50 degrees F (10 degrees C).

2.6 GROUT MIXES

A. See structural drawings for required strength.

2.7 GROUT MIXING

A. Mix grout in accordance with ASTM C94.

B. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

C. Do not use anti-freeze compounds to lower the freezing point of grout.

2.8 MIX TESTS

A. Test mortar and grout in accordance with Section 01410.

B. Testing of Mortar Mix: In accordance with ASTM C270.

C. Testing of Grout Mix: In accordance with ASTM C1019.

PART 3 EXECUTION

3.1 EXAMINATION

A. Request inspection of spaces to be grouted.

3.2 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean-out holes with block masonry units. Brace masonry for wet grout pressure.

3.3 INSTALLATION

A. Install mortar and grout to requirements of the specific masonry section.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 16 inches (400 mm) without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01410.

B. Test and evaluate mortar in accordance with ASTM C780.

C. Test and evaluate grout in accordance with ASTM C1019.

END OF SECTION

SECTION 04200

BRICK MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Brick masonry assemblies consisting of face brick veneer, including flashing for brickwork as indicated on drawings.

B. LEED Requirements:

1. Use of products having recycled content.
2. Use of regional materials.

1.2 RELATED SECTIONS

A. Division 4 Section 04100 "Mortar and Masonry Grout" for brick mortar.

B. Division 5 Section 05500 "Metal Fabrications" for furnishing steel lintels and shelf angles installed in brick masonry assemblies.

1.3 SUBMITTALS

A. Product Data: For brick specified, accessories, and other manufactured products indicated.

B. Samples: Showing the full range of brick color and texture available.

C. Material Test Reports: For face brick.

D. Material Certificates: For type of brick specified.

E. LEED Submittal:

1. Product Data for Credit MR 5.1 and Credit MR 5.2: For documentation indicating percent of building materials (by cost) that are regional materials

1.4 QUALITY ASSURANCE

A. Brick Tests:

1. Test in accordance ASTM C 67.

B. Mortar: specified in Division 4 Section 04100 "Mortar and Masonry Grout".

C. Furnish Sample Panel:

1. Approximately 4 ft long by 3 ft high, showing the proposed color range, texture, bond, mortar and workmanship.
2. Do not start work until AAFES PM or Architect/Engineer has accepted sample panel.
3. Do not destroy panel until work is completed and accepted by AAFES.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Store brick off ground to prevent contamination by mud, dust or materials likely to cause staining or other defects.

B. Cover materials when necessary to protect form elements.

1.6 JOB CONDITIONS:

A. Protection of Work:

1. Wall covering:

During erection, cover top of wall with strong waterproof membrane at end of each day or shutdown.
Cover partially completed walls when work is not in progress.
Extend cover minimum of 24 in. down both sides.
Hold cover securely in place.

B. Staining:

1. Prevent grout or mortar from staining the face or brick to be left exposed:

Remove immediately grout or mortar in contact with face of brick.
Protect all sills, ledges and projections from droppings of mortar; protect door jambs and corners from damage during construction.

1.7 PROJECT CONDITIONS:

A. Cold-Weather Requirements: Do not build on frozen substrates. Remove and replace brickwork damaged by frost or by freezing conditions. Comply with cold-weather construction requirements per ACI 530.1/ASCE 6/TMS 602 and Section 2104.3 of the Uniform Building Code.

B. Hot-Weather requirements: When ambient temperatures exceeds 100 deg F or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set brick within one minute of spreading mortar.

C. Protection requirements for completed masonry and masonry not being worked on:

1. Mean daily air temperature 40 deg F to 32 deg F:

Protect masonry from rain or snow for 24 hr. by covering with weather-resistive membrane.

2. Mean daily air temperature 32 deg F to 25 deg F.

Completely cover masonry with weather-resistive membrane for 24 hr.

3. Mean daily air temperature 25 deg F to 20 deg F.

Completely cover masonry with insulating blankets or equal protection for 24 hr.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Brick for this project shall be furnished by Upchurch-Kimbrough Brick Co. of Houston, Texas through the Palmetto Brick Company plant in Cheraw, South Carolina. Contact Holly Harris, (713) 957.1520.

2.2 FACE BRICK

A. Brick Color #1 –Palmetto Brick Co. - .75 “Greystone”

1. ASTM C216, Grade SW and M, Type FBX.
2. Initial Rate of Absorption: Less than 20 g/30 sq. in. per minute when tested per ASTM C 67.
3. Efflorescence: When tested per ASTM C 67 and brick is rated "not effloresced."
4. Size: Manufactured to the following actual dimensions:

   Modular: 3-1/2 to 3-5/8 inches wide by 2-1/4 inches high by 7-1/2 to 7-5/8 inches long.

B. Brick Color #2 -Palmetto Brick Co. - 2.0 “Greystone”

1. ASTM C216, Grade SW and M, Type FBX.
2. Initial Rate of Absorption: Less than 20 g/30 sq. in. per minute when tested per ASTM C 67.
3. Efflorescence: When tested per ASTM C 67 and brick is rated "not effloresced."
4. Size: Manufactured to the following actual dimensions:

   a. Modular: 3-1/2 to 3-5/8 inches wide by 2-1/4 inches high by 7-1/2 to 7-5/8 inches long.

2.3 TIES AND ANCHORS

A. Materials, General: As follows, unless otherwise indicated:

1. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating for exterior walls.
2. Galvanized Steel Sheet: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153, at exterior walls.

B. Bent Wire Ties: Rectangular units with closed ends and not less than 4 inches wide, made from 3/16-inch- diameter, galvanized steel wire.

C. Adjustable Masonry-Veneer Anchors: Provide 2-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to wall, for attachment over sheathing to wood or metal studs, and that are capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

1. Screw-Attached, Masonry-Veneer Anchors: Units with triangular wire tie and rib-stiffened, sheet metal anchor section with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot for connection of wire tie.

Acceptable Products:

1) Wire - Bond; Type III.
2) Heckman Building Products, Inc.; 315-D with 316.
3) Hohmann & Barnard, Inc.; DW-10.

2.4 CONCEALED FLASHING

A. Concealed Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Manufacturer's standard composite flashing product consisting of a pliable and highly adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of 0.030 inch.

a. Acceptable Products:

1) Dur-O-Wal, Inc.; Dur-O-Barrier.
2) Hohmann & Barnard, Inc.; Textroflash.
3) Williams Products, Inc.; Everlastic MF-40.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

B. Wicking Material: Cotton or polyester rope, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity between wythes.

C. Cavity Drainage Material: 2-inch- thick, free-draining mesh; made from polyethylene strands.

1. Acceptable Products:

a. Advanced Building Products, Inc.; Mortar Break.
b. CavClear; CavClear Masonry Mat.
c. Mortar Net USA, Ltd.; Mortar Net.

2.6 MASONRY CLEANERS

A. Brick Cleaner – Use only products recommended by brick manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

A. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

3.2 LAYING BRICK WALLS

A. Lay out walls in advance for accurate spacing of brick patterns with uniform joint thicknesses and for accurate location of openings, returns, and offsets.

B. Brick Patterns: Brick shall be laid in common bond, stack bond and soldier coursing as indicated on drawings.

C. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

D. Joining of Work:

1. Where fresh masonry joins partially set masonry:

a. Remove loose brick and mortar.
b. Clean and lightly wet exposed surface of set masonry.

2. Stop off horizontal run of masonry by racking back 1/2 length of unit in each course.
3. Toothing is not permitted.

E. Tooling:

1. Tooling:

a. Tool exposed joints when "thumb-print" hard with a round jointer, slightly larger than width of joint.
b. Concave tool exterior joints below grade.
c. Flush cut all joints not tooled.

F. Flashing:

1. Clean surface of masonry smooth and free from projections which might puncture flashing material.

a. Place through-wall flashing on bed of mortar.
b. Cover flashing with mortar.

G. Weep Holes:

1. Provide weep holes in head joints in first course immediately above all flashing by:

a. Placing and leaving sash cord in joint.

2. Maximum spacing: 32 in. o.c.
3. Keep weep holes and area above flashing free of mortar droppings.

H. Sealant Recesses:

1. Leave joints around outside perimeters of exterior doors, window frames and other wall openings:

a. Depth: uniform 3/4 in.
b. Width: 1/4 in. to 3/8 in.

I. Mortar Joint Thickness:

1. Lay all brick with 3/8 in. joints. Where brick is backed by concrete block allow for 3 brick courses per block course.

3.3 CAVITIES

A. Keep cavities clean of mortar droppings and other materials during construction.

1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.

3.4 ANCHORING BRICKWORK

A. Anchor brick veneers to wall steel stud framing with wall ties specified to comply with the following requirements:

1. Fasten each anchor section through sheathing to wall framing with two metal fasteners of type specified here-in.
2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.5 LINTELS

A. Set steel lintels as furnished under other Sections.

3.6 CLEANING

A. Clean brickwork by dry brushing to remove mortar fins and smears before tooling joints, as work progresses.

B. After mortar is thoroughly set and cured, clean exposed brick work using only materials and methods recommended by the brick manufacturer:

END OF SECTION

SECTION 04451

SIMULATED CUT STONE VENEER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Simulated cut limestone veneer at exterior wall.

B. Metal anchors, mortar, and joint pointing.

C. Joint sealant.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 05400:Cold Metal Framing: Placement of wall anchors and devices.

1.3 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 05500 - Metal Fabrications: Metal fabricated items for building into cut stone.

B. Section 07620 - Sheet Metal Flashings and Trim: Sheet metal sill flashings.

1.4 RELATED SECTIONS

A. Section 01410 - Testing Laboratory Services: Testing laboratory services.

B. Section 04100 - Mortar: Bedding and pointing mortar.

C. Section 05120 - Structural Steel 05500 - Metal Fabrications: Masonry anchors from structural steel framing members.

D. Section 05500 - Metal Fabrications: Anchors and supports.

E. Section 05400: Formed steel framed supporting stud wall.

F. Section 07620 - Sheet Metal Flashing and Trim: sill flashings.

G. Section 07900 - Joint Sealers: Sealant for perimeter, control, and expansion joints.

1.5 REFERENCES

A. ASTM A36 - Structural Steel.

B. ASTM A123 - Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.

C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

D. ASTM C270 - Mortar for Unit Masonry.

E. ASTM C387 - Packages, Dry, Combined Materials for Mortar and Concrete.

F. ASTM C503 - Marble Building Stone (Exterior).

G. ASTM C568 - Limestone Building Stone.

H. ASTM C615 - Granite Building Stone.

I. ASTM C616 - Sandstone Building Stone.

J. ASTM C629 - Slate Building Stone.

K. ILI (Indiana Limestone Institute of America, Inc).

L. IMIAC (International Masonry Industry All-Weather Council) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate layout, pertinent dimensions, anchorages, reinforcement, jamb, and sill opening details, expansion jointing methods.

C. Product Data: Provide data on stone units, mortar products, sealants, reinforcements, and anchors.

D. Submit two (2) samples 8 x 8 inch in size, illustrating minimum and maximum stone sizes, color range and texture, markings, surface finish, mortar color.

E. Submit stone fabricator's installation instructions and field erection or setting drawings.

F. Indicate on setting drawings, panel identifying marks and locations.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with ILI.

1.8 QUALIFICATIONS

A. Stone Supplier: Company specializing in quarrying cut stone with minimum ten (10) years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum ten (10) years experience.

C. Design anchors and supports under direct supervision of a registered Professional Structural Engineer, registered in the State of Texas or North Carolina.

1.9 MOCKUP

A. Provide mockup of cut stone wall under provisions of Section 01400

B. Construct stone wall mockup, 5’ feet long by 2’-4” high, including stone anchor accessories, sill and flashings, window frame, corner condition, typical control joint, and anchors

C. Mockup may not remain as part of the Work.

1.10 PRE-INSTALLATION CONFERENCE

A. Non Required for stone work

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01600.

B. Store stone panels vertically on edge, resting weight on panel edge.

C. Protect stone from discoloration.

1.12 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and ambient air to a minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of work.

B. During temporary storage on site, at the end of working day, or during rainy weather, cover stone work exposed to weather with non-staining waterproof coverings, securely anchored.

1.13 SEQUENCING

A. Sequence work under the provisions of Section 01010.

B. Sequence work to coordinate the installation of stone work with installation of adjacent construction.

PART 2 PRODUCTS

2.1 ACCEPTABLE STONE SUPPLIERS

A. Arriscraft International

2.2 LIMESTONE

A. Limestone: As selected by the Architect from the Manufacturers standard sample board.

B. Grade: Standard.

C. Color: Suede

D. Surface Texture: Smooth Finish

2.3 MORTAR

A. Mortar: As specified in Section 04100.

B. Water: Clean and potable.

C. Admixtures: Not permitted.

2.4 ACCESSORIES

A. Anchors, Dowels, Ties: Steel, hot dipped galvanized after fabrication to ASTM A123 of sizes and configurations required for support of stone and applicable superimposed loads.

B. Supports: Steel, hot dipped galvanized after fabrication to ASTM A123

C. Bolts, Washers and Nuts: Hot dipped Galvanized steel

D. Setting Shims: Plastic type.

E. Spacers: Per Manufacturers specifications

F. Flashings: Galvanized metal sill.

G. Cavity Vents: As by manufacturers recommendations.

H. Weeps: As by manufacturers recommendations.

I. Joint Filler: Closed cell neoprene foam

J. Bond Breaker: “Tyvek” moisture barrier building paper.

K. Sealant: color to match stone color.

L. Cleaning Solution: Type which will not harm stone, joint materials, or adjacent surfaces.

2.5 MORTAR MIX

A. Setting Mortar: Type N using the Property Method.

B. Pointing Mortar: Type N using the Property Method.

C. Add mortar color in accordance with manufacturer's instructions. Ensure uniformity of mix and coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within two hours of mixing.

F. Use mortar within two hours after mixing at temperatures of 80 degrees F (26 degrees C), or

two-and-one-half hours at temperatures under 50 degrees F (10 degrees C).

2.6 STONE FABRICATION

A. Thickness: 2 inch nominal.

B. Face Size: As indicated on drawings or by Manufacturers specifications, cut square.

C. Fabrication Tolerances:
1. Per Manufacturers specifications

D. Grain Direction: Horizontal.

E. Fabricate units for uniform coloration with adjacent units and over the full area of the installation.

F. Form external corners to square joint profile.

G. Slope exposed top surfaces of stone and horizontal sill surfaces for natural wash.

H. Cut drip slot in work projecting more than 1/2 inch over window frame Size slot not less than 3/8 inch wide and 1/4 inch deep; full width of projection.

2.7 MIX TESTS

A. Test mortar and grout in accordance with Section 01410.

B. Testing of Mortar Mix: In accordance with ASTM C780.

C. Test mortar mix for compressive strength consistency mortar aggregate ratio water content air content splitting tensile strength.

D. Testing of Grout Mix: In accordance with ASTM C1019.

E. Test mortar mix for compressive strength and slump

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that support work and site conditions are ready to receive work of this section.

B. Establish lines, levels, and coursing. Protect from disturbance.

3.2 PREPARATION

A. Establish lines, levels, and coursing. Protect from disturbance.

B. Verify that items built-in under other sections are properly located and sized.

C. Clean stone prior to erection. Do not use wire brushes or implements which will mark or damage exposed surfaces.

3.3 INSTALLATION

A. Install flashings of longest practical length and seal water tight to back-up. Lap end joint minimum 6 inches and seal watertight.

B. Erect stone in accordance with stone supplier's instructions and erection drawings.

C. Arrange stone pattern to provide a consistent joint width of 3/8 inch .

D. Provide setting bed and pointing mortar in accordance with Section 04100.

E. Place setting buttons and set stone in full mortar setting bed to support stone over full bearing surface and to establish joint dimensions.

F. Shore up units until setting bed will maintain panel in position without movement.

G. Fill dowel and lifting holes with mortar.

H. Install sealant and backing rod at joints.

I. Install cavity vents per manufacturers specs at a spacing of 24 inches on center, horizontally.

J. Install weeps in vertical stone joints at 24 inches on center, horizontally; immediately above horizontal flashings, at bottom of walls. Do not permit mortar accumulation in cavity space.

3.4 TOLERANCES

A. Positioning of Elements: Maximum 1/4 inch,from true position.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet 1/2 inch in 50 feet.

C. Maximum Variation Between Face Plane of Adjacent Panels: 1/16 inch

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in any two stories.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 feet ,1/4 inch in 10 feet ,1/2 inch maximum.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.5 CUTTING AND FITTING

A. Obtain approval prior to cutting or fitting any item not so indicated on Drawings.

B. Do not impair appearance or strength of stone work by cutting.

3.6 CLEANING

A. Remove excess mortar and sealant upon completion of work.

B. Clean soiled surfaces with cleaning solution.

C. Use non-metallic tools in cleaning operations.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural steel framing members, and all accessory members associated with connections, bracing, etc.

1.2 REFERENCES

A. ASTM A36 – Structural Steel.

B. ASTM A325 – High Strength Bolts for Structural Steel Joints.

C. AWS A2.0 – Standard Welding Symbols.

D. AWS D1.1 – Structural Welding Code.

E. AISC – "Code of Standard Practice for Steel Buildings and Bridges," with Commentary, except: Paragraph 4.2.1 delete the following sentence: "This approval constitutes the Owner's acceptance of all responsibility for his design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings."

F. AISC – Specification for the Design, Fabrication and Erection of Structural Steel for Buildings including Commentary and Supplements there to as issued.

G. SSPC – Steel Structures Painting Council.

1.3 SUBMITTALS

A. Shop Drawings:

1. Connections.
2. Field welder's qualifications.

1.4 FIELD MEASUREMENTS

A. Verify all field measurements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Structural Steel Members including rolled steel plates, shapes and bars: ASTM A36, ASTM A1992.

B. Unfinished Bolts and Nuts: ASTM A307, Grade A.

C. Welding Materials: AWS D1.1; type required for materials being welded.

D. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.2 FABRICATION

A. Welded Construction: Comply with AWS Code for procedures, appearance, and quality of welds, and for methods used in correction welding work.

2.3 FINISH

A. Prepare structural component surfaces with shop primer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 ERECTION

A. Comply with AISC Code and Specifications and code of Standard Practice and with specified requirements. Maintain work in safe and stable condition during erection.

B. Set Structural members to the line and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.

C. Field weld components indicated on Drawing or shop drawings.

D. Do not field cut or alter structural members without approval of Architect and Engineer.

E. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

3.3 ERECTION TOLERANCES

A. Maximum Variation From Plumb: ¼ inch.

3.4 FIELD QUALITY CONTROL

A. Field Welding: Inspect during erection of structural steel. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

B. Inspection by Independent Certified Inspector.

END OF SECTION

SECTION 05210

STEEL JOISTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Open web steel joists with bridging, attached seats, and anchors.

B. Loose bearing plates and anchor bolts for site placement.

C. Framed roof openings greater than 12 inches.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 03300 – Cast-In-Place Concrete: Anchors for casting into concrete.

B. Section 03470 – Tilt-Up Precast Concrete: Anchors for embedding into concrete.

C. Section 04340 – Reinforced Unit Masonry System: Anchors for embedding into masonry.

1.3 RELATED SECTIONS

A. Section 05120 – Structural Steel.

B. Section 05311 – Steel Roof Deck: Support framing for small openings in roof deck.

C. Section 09900 – Painting.

1.4 REFERENCES

A. ASTM A307 – Carbon Steel Threaded Standard Fasteners.

B. ASTM A325 – High Strength Bolts for Structural Steel Joints.

C. AWS D1.1 – Structural Welding Code.

D. FS TT-P-636 – Primer Coating, Alkyd, Wood and Ferrous Metal.

E. SJI – Standard Specifications for Open Web Steel Joists K Series.

F. SSPC – Steel Structures Painting Council.

1.5 SUBMITTALS

A. Shop Drawings:
   1. Indicate standard designations, configuration, sizes, spacing, locations of joists, joist leg extensions.
   2. Joist coding, bridging, connections, and attachments.
   3. Cambers.
   4. Special loadings.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with SJI Standard Specifications, Load Tables, and Weight Tables, including headers and other supplementary framing.

1.7 QUALIFICATIONS

A. Fabricator: Company specializing in performing the work of this Section with minimum 5 years experience.

B. Erector: Company specializing in performing the work of this Section with minimum 5 years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of SJI requirements.

B. Store and protect products under provisions of SJI requirements.

C. Protect joists from distortion or damage.

1.9 FIELD MEASURMENTS

A. Verify that field measurements are as shown on Drawings.

PART 2 PRODUCTS

2.1 MATERIALS

A. Open Web Joists Members: SJI Type K open web, SJI Type DLH open web.

B. Anchor Bolts, Nuts, and Washers: ASTM A307 or A325.

C. Primer: FS TT-P-636.

D. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36.

E. Welding Materials: AWS D1.1; type required for materials being welded.

F. Steel Plate: A36.

2.2 FABRICATION

A. Provide bottom and top chord extensions as indicated.

2.3 FINISH

A. Shop prime joists. Do not prime surfaces that will be field welded. Apply one shop coat of steel joist primer paint to a continuous dry paint film thickness of not less than 0.50 mil.

PART 3 EXAMINATION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment until completion of erection and installation of permanent bridging and bracing.

C. Coordinate placement of anchors in concrete construction for securing bearing plates and angles.

D. After joist alignment and installation of framing, field weld joist seat to bearing angles.

E. Position and field weld joist chord extensions and wall attachments as detailed.

F. Frame floor and roof openings with supplementary framing as detailed.

G. Do not permit erection of decking until joists are braced, bridged, and secured.

H. Do not field cut or alter structural members without approval of joist fabricator.

I. After erection, prime welds, abrasions, and surfaces not shop primed.

3.2 ERECTION TOLERANCES

A. Maximum Variation From Plumb: ¼ inch.

B. Maximum Offset From True Alignment: ¼ inch.

END OF SECTION

SECTION 05311

STEEL ROOF DECK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel roof deck and accessories.

B. Framing for openings up to and including 18 inches.

C. Bearing plates and angles.

1.2 RELATED SECTIONS

A. Section 05120 – Structural Steel: Structural framed openings larger than 18 inches.

B. Section 05210 – Steel Joists: Structural framed openings larger than 18 inches.

1.3 REFERENCES

A. AISI – Specification for the Design of Cold-Formed Steel Structural Members.

B. ASTM A36 – Structural Steel.

C. ASTM A446 – Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

D. ASTM A525 – Steel Sheet, Zinc-Coated, Galvanized by the Hot-Dip Process.

E. ASTM A611 – Steel, Cold-Rolled Sheet, Carbon, Structural.

F. AWS D1.1 – Structural Welding Code.

G. SDI – Design Manual for Composite Decks, Form Decks, Roof Decks.

1.4 PERFORMANCE REQUIREMENTS

A. Design metal decking in accordance with SDI Design Manual for Composite Decks, Form Decks, and Roof Decks.

B. Calculate to structural working limit stress design and maximum vertical deck deflection of 240.

C. Lateral deflection of diaphragm shall not exceed 1/500 of the height of the wall.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate decking plan, support locations, projections, openings and reinforcement, pertinent details, and accessories. Indicate temporary shoring of decking where required.

C. Product Data: Provide deck profile characteristics and dimensions, structural properties, and finishes.

D. Manufacturer's Installation Instructions: Indicate specific installation sequence, and special instructions.

1.6 QUALIFICATIONS

A. Installer: Company specializing in performing the work of this Section with minimum 5 years documented experience.

B. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Texas.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store decking on dry wood sleepers; slope for positive drainage.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Steel: ASTM A611, painted.

B. Bearing Plates and Angles: ASTM A36 steel, unfinished.

C. Welding Materials: AWS D1.1.

D. Touch-Up Primer: Zinc chromate Red oxide type.

2.2 ACCESSORIES

A. Flute Closures: Closed cell foam rubber, one inch thick; profiled to fit tight to the decking.

2.3 FABRICATION

A. Metal Decking: Sheet steel, configured as follows:

Span Design	Multiple
Minimum Metal Thickness (Excluding Finish):	22 gage
Nominal Height:	1-1/2 inch fluted profile to SDI WR (Type B)
Formed Sheet Width:	36 inch
Side Joints:	Lapped

Flute Sides: Plain vertical face

B. Fasteners: Stainless Galvanized hardened steel, steel-tapping, painted to match pre-coated deck color.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. Erect metal decking in accordance with manufacturer's instructions.

B. Bear decking on steel supports with 1-1/2 inch minimum bearing. Align and level.

C. Fasten ribbed deck to steel support members at ends and intermediate supports with fusion welds or mechanical fasteners as directed.

D. Weld in accordance with AWS D1.1.

E. Mechanically fasten male/female side laps at as directed.

F. Reinforce steel deck openings from 6 to 18 inches in size with 2 x 2 x ¼ inch steel angles. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld or mechanically attach to deck at each flute.

G. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.

H. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up prime paint.

END OF SECTION

SECTION 05400

COLD FORMED METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formed steel purlins.

1.2 REFERENCES

A. AISI – American Iron and Steel Institute – Cold-Formed Steel Design Manual.

B. AWS D1.3 – Light Steel Welding Code.

C. SSPC (Steel Structures Painting Council) – Steel Structures Painting Manual.

D. MFMA (Metal Framing Manufacturers Association) – Guidelines for the Use of Metal Framing.

1.3 SUBMITTALS

A. Product Data: Provide data on standard framing members; describe materials and finish, product criteria.

B. Field welder qualifications.

1.4 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated.

1.5 COORDINATE

A. Coordinate with the existing roof structure.

1.6 FRAMING MATERIALS

A. Purlins: As noted on plans.

B. Bearing Wall: As noted on plans.

1.7 FASTENERS

A. Self-drilling, Self-tapping Screws, Bolts, Nuts and Washers.

B. Welding: In conformance with AWS D1.1 and AWS D1.3.

1.8 FINISHES

A. Purlins: Prime paint.

B. Plates, Gussets, Clips: Same finish as framing members.

PART 2 EXECUTION

2.1 EXAMINATION

A. Verify that building framing components are ready to receive work.

2.2 ERECTION OF PURLINS

A. Verify that building framing components are ready to receive work.

2.3 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1”.

2.4 FIELD WELDING

A. Work by qualified welder.

B. Inspection by Independent Certified Inspector.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated ferrous metal items.

B. LEED Requirements:

1. Use of products having recycled content.

1.2 RELATED SECTIONS

A. Section 05120 - Structural Steel.

B. Section 09900 - Painting: Paint finish.

C. Section 03300 - Cast-In-Place Concrete: Placement of metal fabrications in concrete.

D. Section 04300 - Unit Masonry System: Placement of metal fabrications in masonry.

1.3 REFERENCES

A. ANSI A14.3 - Ladders, Fixed, Safety Requirements.

B. ASTM A36 - Structural Steel.

C. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.

D. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A283 - Carbon Steel Plates, Shapes, and Bars.

F. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

G. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

H. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

I. AWS A2.0 - Standard Welding Symbols.

J. AWS D1.1 - Structural Welding Code.

K. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

D. LEED Submittal:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by sum of post-consumer and pre-consumer recycled content.

a. Include statement indicating costs for each product having recycled content.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. General: Use steel with recycled content, unless indicated otherwise on Structural Drawings, or not approved by Architect or Contracting Officer.

B. Steel Sections: ASTM A36.

C. Steel Tubing: ASTM A500, Grade B. ASTM A501.

D. Plates: ASTM A283.

E. Pipe: ASTM A500, Grade B

F. Fasteners: Anchors as required for securing work in place..

G. Bolts, Nuts, and Washers: ASTM A307. Galvanized to ASTM A153 for galvanized components.

H. Welding Materials: AWS D1.1; type required for materials being welded.

I. Ladders: ANSI A14.3.

J Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

K. Touch-Up Primer for Galvanized Surfaces: SSPC 20 Type I Inorganic.

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted

otherwise.

2.3 FINISHES - STEEL

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime paint items with one coat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on shop drawings.

D. Perform field welding in accordance with AWS D1.1.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed galvanized, except surfaces to be in contact with concrete.

3.4 SCHEDULE

A. The following Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.

B. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.

C. Lintels: As detailed; galvanized finish.

D. Door Frames for Overhead Door and Wall Openings: As detailed; galvanized finish.

END OF SECTION

SECTION 06112

FRAMING AND SHEATHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sill flashings at windows.

B. Preservative treatment of wood.

C. Fire retardant treatment of wood.

D. Miscellaneous framing and sheathing.

E. Telephone and electrical panel back boards.

F. Concealed wood blocking for support of toilet and bath accessories wall cabinets wood trim and miscellaneous decorative moldings.

G. LEED Requirements:

1. Provide products having recycled content.
2. Provide regional materials.
3. Provide products containing certified wood.
4. Provide materials with adhesives having low VOC content and no urea formaldehyde.

1.2 RELATED SECTIONS

A. Section 05120 -Structural Steel: Prefabricated steel structural supports.

B. Section 05500 - Metal Fabrications: Placement of steel fabrications

C. Section 07533 - Single Ply Roofing - Mechanically Attached - Conventional: Metal Roof Decking to deceive wood curbs.

D. Section 07620 - Sheet Metal Flashing and Trim: Wood Nailers.

1.3 REFERENCES

A. ALSC (American Lumber Standards Committee) - Softwood Lumber Standards.

B. ANSI A208.1 - Mat-Formed Wood Particleboard.

C. APA (American Plywood Association).

D. AWPA (American Wood Preservers Association) C1 - All Timber Products - Preservative Treatment by Pressure Process.

E. AWPA (American Wood Preservers Association) C20 - Structural Lumber Fire Retardant Treatment by Pressure Process.

F. NFPA (National Forest Products Association).

G. WWPA (Western Wood Products Association).

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

C. LEED Submittals:

1. Product Data for Credit(s) MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content

a. Include statement indicating costs for each product having recycled

2. Credit MR 5.1 and Credit MR 5.2: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery or each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.

4. Credit EQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate

a. VOC content in g/L calculated according to 40 CFR 59, Subpart D.

5. Product Data for Credit EQ 4: For installation adhesives, including printed statement of VOC content.

a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.

1.5 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.

B. Manufacturer's Certificate: Certify that Products conform to specified requirements.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with the following agencies:

1. Lumber Grading Agency: Certified by ALSC.
2. Plywood Grading Agency: Certified by APA.

B. Design structural shop fabricated trusses under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State where the project is located.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

A. Lumber Grading Rules: NFPA. and SPIB. 19 percent maximum moisture content.

B. Non-structural Light Framing: Southern pine species, No. 3 grade, dimension lumber size classification, 19 percent maximum moisture content.

C. Studding: Southern pine species, Stud grade, dimension lumber size classification, 19 percent maximum moisture content.

D. Miscellaneous Framing: Southern pine species, 19 percent maximum moisture content, pressure preservative treatment

2.2 SHEATHING MATERIALS

A. Telephone and Electrical Panel Boards: Plywood.

2.3 UNDERLAYMENT MATERIALS

A. Plywood Underlayment (If Applicable): APA Rated Sheathing Structural I, Span Rating 48/24; Exposure Durability 1; unsanded.

2.4 SHEATHING AND UNDERLAYMENT LOCATIONS

A. Roof Parapet Sheathing: ½ inch thick, 48 x 96 inch sized sheets, square edges, exterior exposure pressure treated.

2.5 ACCESSORIES

A. Fasteners and Anchors:

1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

B. Structural Framing Connectors: Hot dipped galvanized steel, sized to suit framing conditions, manufactured by Simpson ties.

C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width closed cell polyethylene or urethane foam from continuous rolls.

D. Sill Flashing: 6 mil thick, black polyethylene sheet.

E. Building Paper: No. 30 asphalt felt.

2.6 FACTORY WOOD TREATMENT

A. Wood Preservative Pressure Treatment: AWPA Treatment C1 using water borne preservative with 0.25 percent retainage.

PART 3 EXECUTION

3.1 FRAMING

A. Set structural members level and plumb, in correct position.

B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Place horizontal members crown side up.

D. Bridge joists framing in excess of 8 feet span as detailed. Fit solid blocking bridging at ends of members.

E. Place full width continuous sill flashings under framed walls on cementitious foundations. Lap flashing joint 4 inches.

F. Place sill gasket directly on sill flashing. Puncture gasket clean and fit tight to protruding foundation anchor bolts.

G. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

H. Coordinate curb installation with installation of decking and support of deck openings, parapet construction.

3.2 SHEATHING

A. Install telephone and electrical panel back boards with plywood sheathing material where required. Size the back board by 12 inches beyond size of electrical panel.

END OF SECTION

SECTION 06114

WOOD BLOCKING AND CURBING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof curbs and perimeter nailers.

B. Blocking in wall and roof openings.

C. Wood furring and grounds.

D. Concealed wood blocking for support of toilet and bath accessories wall cabinets wood trim and Miscellaneous Hardware Decorative Moldings.

E. Telephone and electrical panel back boards.

F. Preservative treatment of wood.

G. LEED Requirements:

1. Provide products having recycled content.
2. Provide products containing certified wood.
3. Provide materials with adhesives having low VOC content and no urea formaldehyde.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete: Concrete openings to receive wood blocking.

B. Section 04300 - Unit Masonry System: Masonry openings to receive wood blocking.

C. Section 07620 - Sheet Metal Flashing and Trim.

D. Section 08100 - Steel Doors and Frames.

1.3 REFERENCES

A. ALSC (American Lumber Standards Committee) - Softwood Lumber Standards.

B. ANSI A208.1 - Mat-Formed Wood Particleboard.

C. APA (American Plywood Association).

D. AWPA (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.

E. AWPA (American Wood Preservers Association) C20 - Structural Lumber Fire Retardant Treatment by Pressure Process.

F. NFPA (National Forest Products Association).

G. WWPA (Western Wood Products Association).

1.4 SUBMITTALS

A. LEED Submittals:

1. Product Data for Credit(s) MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content

a. Include statement indicating costs for each product having recycled.

2. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
3. Credit EQ 4: Manufacturers' product data for construction adhesive, including printed statement of VOC content and composite wood manufacturer's product data for each composite wood product used indicating that bonding agent used contains no urea formaldehyde.
4. Credit EQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate

a. VOC content in g/L calculated according to 40 CFR 59, Subpart D.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the following agencies:

1. Lumber Grading Agency: Certified by ALSC.
2. Plywood Grading Agency: Certified by APA.

PART 2 PRODUCTS

2.1 MATERIALS

A. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

1. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Contact Adhesive: 250 g/L.

B. Lumber Grading Rules: NFPA.WWPA.

C. Miscellaneous Framing: Stress Group D species, 19 percent maximum moisture content, pressure preservative treat.

D. Plywood: APA Structural I, Grade C-D. Exposure Durability 1.

E. Particleboard: APA rated Oriented Strand Board; wood shavings set with waterproof resin binder.

2.2 ACCESSORIES

A. Fasteners and Anchors:

1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

2. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.

2.3 FACTORY WOOD TREATMENT

A. Wood Preservative (Pressure Treatment: AWPA Treatment C1 using water borne preservative with 0.25 percent retainage.

PART 3 EXECUTION

3.1 FRAMING

A. Set members level and plumb, in correct position.

B. Place horizontal members crown side up.

C. Construct curb members of single pieces.

D. Space framing and furring 16 inches (400 mm) oc.

E. Curb roof openings, except where prefabricated curbs are provided. Form corners by alternating lapping side members.

F. Coordinate curb installation with installation of decking and support of deck openings, parapet construction, and Coping Mfg.

3.2 SHEATHING

A. Secure sheathing to framing members with ends over firm bearing and staggered.

B. Install telephone and electrical panel back boards with plywood sheathing material where required. Size the back board by 12 inches (300 mm) beyond size of electrical panel.

3.3 SCHEDULES

A. Roof Blocking: S/P/F species, 19 percent maximum moisture content, pressure preservative treatment.

B. Telephone and Electrical Panel Boards: 3/4 inch (19 mm) thick, square edges, site brush applied preservative treated.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items, other than shop prefabricated casework.

B. Hardware and attachment accessories.

C. LEED Requirements:

1. Provide products having recycled content.
2. Provide regional materials.
3. Provide products containing certified wood.
4. Provide materials with adhesives having low VOC content and no urea formaldehyde.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 06410 - Custom Casework: Installation of recessed wood blocking.

1.3 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 08710 - Door Hardware: Supply of hardware and attachment accessories.

B. Section 10260 - Wall and Corner Guards.

C. Section 10441 - Plastic Signs.

D. Section 10522 - Fire Extinguishers, Cabinets and Accessories.

1.4 RELATED SECTIONS

A. Section 06114 - Wood Blocking and Curbing: Grounds and support framing.

B. Section 06410 - Custom Casework: Shop fabricated custom cabinetwork.

C. Section 08800 - Glazing: Glass and glazing of wood doors.

D. Section 09900 - Painting: Painting and finishing of finish carpentry items.

1.5 REFERENCES

A. ANSI A208.1 - Mat Formed Wood Particleboard.

B. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

C. AWI - Quality Standards.

D. AWPA (American Wood Preservers Association) C2 - Lumber, Timbers, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes.

E. AWPA (American Wood Preservers Association) C20 - Structural Lumber Fire Retardant

Treatment by Pressure Process.

F. BHMA A156.9 - Cabinet Hardware.

G. FS MMM-A-130 - Adhesive, Contact.

H. HPMA (Hardwood Plywood Manufacturer's Association) HP - American Standard for Hardwood and Decorative Plywood.

I. FS L-P-508F - Plastic Sheet, Laminated, Decorative.

J. NHLA (National Hardwood Lumber Association).

K. PS 1 - Construction and Industrial Plywood.

I. PS 20 - American Softwood Lumber Standard.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate materials, component profiles, fastening methods and jointing details, accessories, to a minimum scale of 1-1/2 inch to 1 ft.

C. Product Data: Provide data on fire retardant treatment materials and application instructions.

D. Samples: Submit two samples of finish plywood, 12” x 12” in size illustrating wood grain and specified finish.

E. Submit two samples of wood trim 12” long.

F. LEED Submittals:

1. Product Data for Credit(s) MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content

   a. Include statement indicating costs for each product having recycled

2. Credit MR 5.1 and Credit MR 5.2: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery or each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.

4. Credit EQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate

   a. VOC content in g/L calculated according to 40 CFR 59, Subpart D.

5. Product Data for Credit EQ 4: For installation adhesives, including printed statement of VOC content.

   a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.

b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with AWI Custom quality.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire retardant requirements.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

1.10 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.11 COORDINATION

A. Coordinate the work with plumbing and electrical rough-in, installation of associated and adjacent components.

PART 2 PRODUCTS

2.1 FABRICATORS

A. Approved by AWI

2.2 LUMBER MATERIALS

A. Softwood Lumber: PS 20; Graded in accordance with AWI Custom.

B. Hardwood Lumber: Graded in accordance with AWI Custom.

2.3 SHEET MATERIALS

A. Fiberglass Reinforced Panels.

1. Manufacturing.

a. Kemlight Company Inc.
b. Nudo Products Inc.
c. Structoglass Sequentia Corporation.
d. Marlite.

2. Material.

a. 4' x 8', 9' or 10" x 3/32" or 4' x 8' or 10' x 5/8".
b. Class A FRP (ASTM E-84).
c. Matching corner, base, division and edge moldings.

2.4 ADHESIVE

A. Adhesive: Type recommended by laminate manufacturer to suit application.

1. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

a. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1) Contact Adhesive: 250 g/L.

2.5 FASTENERS

A. Fasteners: Of size and type to suit application; finish in exposed locations.

B. Concealed Joint Fasteners: Threaded steel.

2.6 ACCESSORIES

A. Lumber for Shimming and Blocking. Softwood lumber of white pine or cedar species.

B. Glass: Type as specified in Section 08800.

C. Primer: Water base primer sealer type.

D. Wood Filler: Water base, tinted to match surface finish color.

2.7 WOOD TREATMENT PROCESSES

A. Fire retardant (FR-S Type): Chemically treated and pressure impregnated.

B. Wood Preservative by Pressure Treatment (PT Type): AWPA Treatment C2 using water borne preservative with 0.25 percent retainage.

2.8 HARDWARE

A. See Section 08710 - Door Hardware.

2.9 FABRICATION

A. Fabricate to AWI Custom standards.

B. Shop assemble work for delivery to site, permitting passage through building openings.

C. Cap exposed plywood edges with material of same finish and pattern of plastic laminate finish.

D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

E. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes to minimize jointing. Fit corners and joints hairline; secure with concealed fasteners.

2.10 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.

D. Seal, stain and varnish exposed to view surfaces. Brush apply only.

E. Seal, stain and varnish semi-exposed to view surfaces. Brush apply only.

F. Seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (1 mm). Do not use additional overlay trim to conceal larger gaps.

C. Install hardware supplied by Section 08710 in accordance with manufacturer's instructions.

3.3 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.5 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.7 mm).

3.4 SCHEDULE

A. Exterior:

1. Enclosing Structural Members: Softwood lumber; "PT" preservative treat.
2. Enclosing Soffit Spaces: As detailed.
3. Soffits and Facias: Prepare for paint finish.

B. Interior:

1. Door, Glazed Light.
2. Moldings, Bases, Casings, and Miscellaneous Trim.
3. Loose Shelving: Birch plywood.

END OF SECTION

SECTION 06410

CUSTOM CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Special fabricated cabinet units for “Snack Avenue”, Checkout counter, Office. Provided by (Pan-Osten Company)

B. Countertops. (Plastic Laminate).

C. Cabinet hardware.

D. Prefinished surfaces. Preparation for site finishing.

E. Preparation for installing utilities.

F. LEED Requirements:

1. Provide products having recycled content.
2. Provide regional materials.
3. Provide products containing certified wood.
4. Provide materials with adhesives having low VOC content and no urea formaldehyde.

1.2 RELATED SECTIONS

A. Section 06114 - Wood Blocking and Curbing: Grounds and support framing.

B. Section 06200 - Finish Carpentry: Related trim not specified in this section.

C. Section 09900 - Painting: Site finishing of cabinet exterior and interior.

1.3 REFERENCES

A. ANSI A135.4 - Basic Hardboard.

B. ANSI A208.1 - Mat Formed Wood Particleboard.

C. AWI (Architectural Woodwork Institute) - Quality Standards.

D. FS L-P-508F - Plastic Sheet, Laminated, Decorative.

E. FS MMM-A-130 - Adhesive, Contact.

F. HPMA (Hardwood Plywood Manufacturer's Association) HP - American Standard for Hardwood and Decorative Plywood.

G. NHLA (National Hardwood Lumber Association).

H. PS 1 - Construction and Industrial Plywood.

I. PS 20 - American Softwood Lumber Standard.

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit two, 8 x 10 inch size samples, illustrating cabinet finish and color.

E. Samples: Submit two, 8 x 10 inch size samples, illustrating counter top finish and color.

F. Samples: Submit two samples of drawer pulls, hinges, latches and drawer slides, illustrating hardware finish and type.

G. LEED Submittals:

1. Product Data for Credit(s) MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content

   a. Include statement indicating costs for each product having recycled

2. Credit MR 5.1 and Credit MR 5.2: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery or each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
4. Product Data for Credit EQ 4: For installation adhesives, including printed statement of VOC content.

   a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
   b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.

5. Credit EQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.

   a. VOC content in g/L calculated according to 40 CFR 59, Subpart D.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with AWI Custom quality.

1.6 PRE-INSTALLATION MEETING

A. Section 01039 – Progress Meetings: Pre-installation meeting.

B. Convene one week before starting work of this section.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Protect units from moisture damage.

1.8 ENVIRONMENTAL REQUIREMENTS

A. During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Pan-Osten Company or site built.

2.2 WOOD MATERIALS

A. Softwood Lumber: PS 20; graded in accordance with AW I Custom average moisture content of 6 to 8 percent.

B. Hardwood Lumber: NHLA; graded in accordance with AWI Custom average moisture content of 6 to 8 percent.

2.3 PANEL MATERIALS

A. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

B. Softwood Plywood: PS 1; graded in accordance with AWI, core materials of veneer lumber particleboard.

C. Hardwood Plywood: PS 51; HPMA; graded in accordance with AWI, core materials of veneer lumber particleboard, type of glue recommended for application.

D. Wood Particle board: ANSI A208.1; AWI standard, composed of wood chips, medium density, made with high waterproof resin binders water resistant adhesive; of grade to suit application.

E. Hardboard: ANSI A135.4; Pressed wood fiber with resin binder, standard tempered grade, 1/4 inch thick, smooth one two sides.

2.4 MANUFACTURERS - PLASTIC LAMINATE

A. Manufacturers:

1. Formica Corporation.
2. Nevamar Corp.
3. Wilson Art

2.5 LAMINATE MATERIALS

A. Laminate cladding for exposed surfaces: High pressure decorative laminate complying with the following requirements:

1. Countertops: GP-50.

2. Horizontal surfaces other than tops: GP-50 GP-28.
3. Postformed surfaces: PF-42.
4. Vertical surfaces: GP-50 GP-28.
5. Edges: GP50 GP-28.

B. Laminate Backing Sheet: 0.020 inch Backing Sheet grade, undecorated plastic laminate or thermoset decorative overlay.

C. Wood Veneer Laminate: Softwood plywood; PS 1 Grade C-D; Graded in accordance with AWI Custom.

2.6 SOLID SURFACING

A. Hardwood Lumber Surfacing: Graded in accordance with AWI Custom; wood species, maximum moisture content of 6 to 8 percent; exposed edge grain, of quality suitable for transparent finish.

2.7 ACCESSORIES

A. Adhesive: Type recommended by AWI to suit application.

1. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

a. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1) Contact Adhesive: 250 g/L.

2. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

a. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application.

D. Concealed Joint Fasteners: Threaded steel.

E. Grommets: Plastic material for cut-outs.

2.8 HARDWARE

A. Shelf Standards and Rests: Formed steel channels and rests, cut for fitted rests spaced at 1 inch (25 mm) centers; chrome satin finish.

B. Shelf Brackets: Formed steel brackets, formed for attachment with lugs; chrome satin finish.

C. Drawer and Door Pulls: Extruded aluminum pull, full width of drawer, polished satin finish. "U" shaped pull, steel with chrome satin finish aluminum with polished satin finish bronze with satin finish plastic to be verified with architect, 4 inch (100 mm) centers.

D. Sliding Door Pulls: Circular Oval Elongated shape, steel with chrome satin finish, aluminum with polished satin finish, bronze with satin finish. Plastic, verify with architect.

E. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome satin

finish, bronze with satin finish.

F. Catches: Magnetic. Touch type.

G. Drawer Slides: Galvanized steel construction, ball bearings separating tracks, full extension type.

H. Hinges: Butt Pivot Pin Knuckle disappearing type, steel with chrome satin finish.

I. Sliding Door Track Assemblies: Galvanized steel construction, ball bearing carriers fitted within tracks, multiple pendant suspension attachments for door.

2.9 FINISHING MATERIALS

A. Stain, Varnish and Finishing Materials: As required by AWI.

2.10 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. Fit shelves, doors, and exposed edges with 3/8-inch (9.5 mm) matching hardwood matching veneer edging. Use one piece for full length only.

C. Cap exposed plastic laminate finish edges with material of same finish and pattern.

D. Door and Drawer Fronts: 3/4 inch thick; flush overlay style.

E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

F. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

G. Apply laminate backing sheet to reverse side of plastic wood laminate finished surfaces.

H. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, fixtures and fittings. Verify locations of cutouts from on-site dimensions. Prime paint Seal cut edges.

2.11 FACTORY FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.

D. Finish work in accordance with AWI Finish System TR-2-catalyzed lacquer or TR-4-conversion varnish.

E. Prime paint Seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Progress Meetings: Verification of existing conditions before starting work.

B. Verify adequacy of backing and support framing.

C. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. Set and secure casework in place; rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units counter tops.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinet and counter bases to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.3 ADJUSTING

A. Section 01700 - Project Closeout: 01400 - Quality Control: Adjust installed work. Test installed work for rigidity and ability to support loads.

B. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

A. Section 01700 - Project Closeout: Cleaning installed work.

B. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07105

BITUMINOUS MEMBRANE WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hot applied asphalt bitumen waterproofing , with fabric reinforcement.

B. Cant strips.

C. Protective cover.

1.2 RELATED SECTIONS

A. Section 02223 - Backfilling.

B. Section 03300 - Cast-In-Place Concrete: Concrete foundation surfaces.

C. Section 04300 - Unit Masonry System: Parged masonry foundation surfaces.

D. Section 07212 - Board Insulation: Perimeter and horizontal insulation protective cover.

1.3 REFERENCES

A. ASTM D41 - Asphalt Primer Used in Roofing, Dampproofing and Waterproofing.

B. ASTM D449 - Asphalt Used in Dampproofing and Waterproofing.

C. ASTM D43 - Creosote Primer Used in Roofing, Dampproofing, and Waterproofing.

D. ASTM D173 - Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing.

E. ASTM D226 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

F. ASTM D1668 - Glass Fabrics (Woven and Treated) for Roofing and Waterproofing.

G. ASTM D2822 - Asphalt Roof Cement.

H. NRCA (National Roofing Contractors Association) - Waterproofing Manual.

1.4 SYSTEM DESCRIPTION

A. Waterproofing System: Capable of resisting water head of 150 feet and preventing moisture migration to interior.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate membrane flexible flashings, control and expansion joints, sealing at openings, projections, reglets and waterproofing of holes, slots, and sleeves.

C. Product Data: Provide properties of primer, bitumen, mastics, and characteristics of reinforcement fabric.

1.6 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.

B. Certificate: Certify that products meet or exceed specified requirements.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.7 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01700 - Project Closeout: Procedures for submittals.

B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.8 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Waterproofing Manual.

B. Applicator: Company specializing in performing the work of this section with minimum three years documented experience.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application until membrane has cured.

1.10 WARRANTY

A. Section 01700 - Project Closeout.

B. Correct defective Work within a five-year period after Date of Substantial Completion.

C. Provide five-year manufacturer warranty for waterproofing failing to resist penetration of water.

D. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Barret Company

B. Or Approved equal.

2.2 HOT ASPHALTIC MATERIALS

A. Asphalt: Conforming to ASTM D449, Type I.

B. Asphalt Primer: ASTM D41, compatible with substrate.

C. Glass Fiber Fabric: ASTM D1668, Type I, woven, asphalt treated.

D. Asphaltic Sealing Mastic: ASTM D449, Type I.

2.3 ACCESSORIES

A. Protection Board: 1/4 Heavy Duty Protection Board.

B. Flexible Flashings: Neoprene rubber as recommended by Waterproofing Membrane Manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Progress Meetings: Verification of existing conditions before starting work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items which penetrate surfaces to receive waterproofing are securely installed.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.

C. Do not apply waterproofing to surfaces unacceptable to manufacturer or applicator.

D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.3 APPLICATION

A. Prime surfaces in accordance with manufacturer's instructions.

B. Apply hot moppings of bitumen and embed fabric reinforcement in accordance with manufacturer’s instructions.

C. Apply bitumen at a temperature limited by equiviscous temperature (EVT) plus or minus 25 degrees F (14 degrees C); finish blowing temperature not to be exceeded for four hours.

D. Extend membrane up intersecting surfaces at membrane perimeter minimum 6 inches above horizontal surface for first ply and 12 inches at subsequent plies laid in shingle fashion.

E. Extend membrane and flexible flashing into drain clamp flange, apply adequate coating of mastic to assure clamp ring seal. Coordinate with drain installation.

F. Terminate top edge of membrane and flexible flashing under counter flashings, seal with mastic. Coordinate with metal flashing installation.

G. Apply reinforced membrane over control and expansion joints in accordance with reinforcement manufacturer's instructions.

H. Seal protrusions through membrane with multiple plies of reinforcement and flood coating, mastic and flexible flashings. Seal watertight.

3.4 INSTALLATION PROTECTION BOARD

A. Place protection board directly against membrane; butt joints.

B. Adhere protection board to substrate with mastic to tacky surface. Scribe and cut boards around projections, penetrations, and interruptions.

3.5 FIELD QUALITY CONTROL

A. Section 01650 - Starting of Systems: Field inspection, testing, adjusting, and balancing.

B On completion of horizontal membrane installation, dam installation area in preparation for flood testing.

C. Flood to minimum depth of 1 inch with clean water. After 48 hours, inspect for leaks.

D. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Contracting Officer; repeat flood test. Repair damage to building.

E. When area is proven watertight, drain water and remove dam.

3.6 PROTECTION OF FINISHED WORK

A. Section 01700 - Project Closeout: Protecting installed work.

B. Do not permit traffic over unprotected or uncovered membrane.

C. Protect membrane and board from damage.

END OF SECTION

SECTION 07110

SHEET MEMBRANE WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Adhesive applied elastomeric sheet membrane waterproofing.

B. Cant strips.

C. Drainage panels and Protective cover.

1.2 RELATED SECTIONS (if applicable)

A. Section 03300-Cast-In-Place Concrete: Concrete substrate.

B. Section 07212 - Board Insulation: Perimeter and horizontal insulation protective cover.

C. Section 07900 - Joint Sealers.

1.3 REFERENCES

A. ASTM D412 - Rubber Properties in Tension.

B. ASTM D624 - Rubber Property - Tear Resistance.

C. ANSI/ASTM D746 - Brittleness Temperature of Plastics and Elastomers by Impact.

D. ASTM D822 - Operating Light and Water-Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Coatings and Materials.

E. ASTM D1004 - Initial Tear Resistance of Plastic Film and Sheeting.

F. ASTM D2240 - Rubber Property - Durometer Hardness.

G. ASTM D2581 - Polybutylene (PB) Plastics Molding and Extrusion Materials.

H. ASTM D3020 - Polyethylene and Ethylene Copolymer Plastic Sheeting for Pond, Canal, and Reservoir Lining.

I. ASTM E96 - Water Vapor Transmission of Materials.

J. NRCA (National Roofing Contractors Association) - Waterproofing Manual.

1.4 SYSTEM DESCRIPTION

A. Waterproofing System: Capable of resisting water head of 150 feet and preventing moisture migration to interior.

1.5 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Product Data: Provide data for surface conditioner, flexible flashings, joint cover sheet, and joint

and crack sealants, with temperature range for application of waterproofing membrane.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.6 SUBMITTALS FOR INFORMATION

A. Section - 01300 - Submittals: Procedures for submittals.

B. Certificate: Certify that products meet or exceed specified requirements.

C. Manufacturer’s Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.7 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01700 - Contract Closeout: Procedures for submittals.

B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner’s name and registered with manufacturer.

1.8 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Waterproofing Manual.

B. Applicator: Company specializing in performing the work of this section with minimum three years experience.

C. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with three years experience.

D. Applicator: Company specializing in performing the work of this section with minimum three years documented experience.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.10 WARRANTY

A. Section 01700 - Project Closeout.

B. Correct defective Work within a five-year period after Date of Substantial Completion.

C. Provide five-year manufacturer warranty for waterproofing failing to resist penetration of water.

D. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Meadows, W.R. Meadows, Inc.

B. Other Acceptable Manufacturers:

1. W.R. Grace & Co.

2. Nicolon Mirafi Group, Nicolon Corporation. .

2.2 MEMBRANE MATERIALS

A. Rubberized Asphalt Membrane: A composite sheet consisting of a minimum of 56 mils of rubberized asphalt and 4 mils of cross laminated polyethylene conforming to the following criteria:

Property	Value	Test
Color	Dark Gray-black	
Pliability 180ıF bend over 1" mandrel at -25ıF -32ıC	Unaffected	ASTM D-146
Tensile Strength - membrane (psi)	250 minimum	ASTM D-412 (Die C) modified
Tensile Strength - film (psi)	4000 minimum	ASTM D-412 (Die C) modified
Elongation - ultimate failure of rubberized asphalt (%)	300 minimum	ASTM D-412 (Die C) modified
Cycling over crack at 15ıF (-26ıC)	No effect 100 cycles	
Cycling over 1" joint at 15ıF (-26ıC)	No effect 1000 cycles	
Peel Adhesion (lb/in. width)		
7 days dry 70ıF 21ıC + 7 days dry 120ıF 49ıC + 7 days dry 70ıF 21ıC	5.0 minimum	
7 days dry 70ıF 21ıC + 7 days dry 120ıF 49ıC + 7 days dry 70ıF 21ıC	5.0 minimum	
Puncture Resistance (lb) stretched by blunt object	40 minimum	ASTM E-154
Exposure of fungi in soil 16 weeks	Unaffected	GSA-PBS 07115
Permanence - perms (grains/sq.ft./hr./in./Hg)	0.1 maximum	ASTM E-96 Method B
Water Absorption 72 hrs (% by weight)	0.2 maximum	ASTM D-570

B. Seaming Materials: As recommended by membrane manufacturer.

2.3 ADHESIVE MATERIALS

A. Surface Conditioner: Compatible with membrane.

B. Adhesives: As recommended by membrane manufacturer.

C. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

2.4 ACCESSORIES

A. Sealant: As recommended by membrane manufacturer.

B. Protection Board: Type recommended by waterproofing sheet manufacturer.

C. Cant Strips: Premolded composition material Bitumen impregnated fiberboard.

D. Flexible Flashings: Type recommended by waterproofing sheet manufacturer.

E. Counter Flashings: Galvanized steel type, 20 inch gauge thick.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Progress Meetings: Verification of existing conditions before starting work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items which penetrate surfaces to receive waterproofing are securely installed.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions. Vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to manufacturer or applicator.

D. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer in accordance with Section 07900.

E. Apply surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

3.3 INSTALLATION - ADHESIVE BONDED

A. Install membrane waterproofing in accordance with manufacturer's instructions.

B. Roll out membrane. Minimize wrinkles and bubbles.

C. Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.

D. Lap sides and ends in accordance with membrane manufacturer's instructions.

E. Overlap edges and ends and seal with contact adhesive a minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

F. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or moving.

G. Weatherlap joints on sloped substrate in direction of drainage. Seal joints and seams.

H. Install flexible flashings. Seal watertight to membrane.

I. Seal membrane and flashings to adjoining surfaces.

J. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 6 inches above horizontal surface for first ply and 12 inches at subsequent plies laid in shingle fashion.

K. Seal items protruding to or penetrating through membrane and install counter flashing membrane material.

3.4 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

A. Place drainage board panel directly against membrane, butt joints, place to encourage drainage downward.

B. Place protection board panel directly against drainage panel membrane; butt joints.

C. Adhere protection board panel and drainage panel to substrate with mastic to tacky dampproofing surface. Scribe and cut boards around projections, penetrations, and interruptions.

3.5 FIELD QUALITY CONTROL

A. Section 01650 - Starting of Systems: Field inspection, testing, adjusting, and balancing.

B. On completion of horizontal membrane installation, dam installation area in preparation for flood testing.

C. Flood to minimum depth of 1 inch with clean water. After 48 hours, inspect for leaks.

D. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Contracting Officer; repeat flood test. Repair damage to building.

E. When area is proven watertight, drain water and remove dam.

3.6 PROTECTION OF FINISHED WORK

A. Section 01700 - Project Closeout: Protecting installed work.

B. Do not permit traffic over unprotected or uncovered membrane.

C. Protect membrane from damage by adhering protection board, applied with mastic over membrane surface. Scribe and cut boards around projections and interruptions.

END OF SECTION

SECTION 07212

BOARD INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Board insulation at roof deck and exterior sheathing.

B. LEED Requirements:

1. Provide products having recycled content.

1.2 RELATED SECTIONS

A. Section 07213 - Batt Insulation: at underside of roof deck.

B. Section 07533 - Single Ply; Roofing – Mechanically attached – (EPDM)

1.3 REFERENCES

A. ASTM C578 - Preformed, Cellular Polystyrene Thermal Insulation.

B. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

C. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

1.4 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials in Section 07213 - Batt Insulation and Section 07533 Single Ply Roofing - Mechanically Adhered.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

C. LEED Submittal:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by sum of post-consumer and pre-consumer recycled content.

a. Include statement indicating costs for each product having recycled content.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.7 SEQUENCING

A. Sequence work to ensure fireproofing, firestop, vapor retarder, and air barrier materials are in place before beginning the Work of this section.

PART 2 PRODUCTS

2.1 MANUFACTURERS - INSULATION MATERIALS

A. Amoco Foam Products Company.

B. Diversi Foam Products.

C. Dow Chemical Company

D. Owens Corning

E. Pactiv Building Products

F. Johns Manville

2.2 INSULATION MATERIALS

A. Extruded Polystyrene Insulation: ASTM C578 Type IV; cellular type, conforming to the following:

1. Board Density: 1.6-lb/cu ft
2. Board Thickness: As indicated on Drawings.
3. Thermal Resistance: As indicated on Drawings.
4. Water Absorption: In accordance with ASTM D2842 0.3 percent by volume maximum.
5. Compressive Strength: Minimum 25 psi.
6. Board Edges: Square Shiplap Tongue and groove edges.
7. Flame/Smoke Properties: 75/450 in accordance with ASTM E84.

2.3 ADHESIVES

A. Adhesive: Type recommended by insulation manufacturer for application.

2.4 ACCESSORIES

A. Sheet Vapor Retarder: Black polyethylene film reinforced with glass fiber square mesh, 6 mil thick.

B. Tape: Bright aluminum Polyethylene Polyester self-adhering type, mesh reinforced, 2 inch wide.

C. Insulation Fasteners: Impaling clip of galvanized steel with washer retainer, to be mechanically fastened to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, and adjacent materials, are dry and ready to receive insulation and

adhesive.

B. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances that may impede adhesive bond.

3.2 INSTALLATION - FOUNDATION PERIMETER

A. Adhere a 8" inch wide strip of polyethylene sheet over construction joints with double beads of adhesive each side of joint.

1. Tape seal joints.
2. Extend sheet full height of joint.

B. Apply adhesive in three continuous beads per board length to full bed 1/8 inch thick.

C. Install boards on foundation wall perimeter, horizontally.

1. Place boards in a method to maximize contact bedding.
2. Stagger end joints.
3. Butt edges and ends tight to adjacent board and to protrusions.

D. Extend boards over control and expansion joints, unbonded to foundation 8 " inches on one side of joint.

E. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

3.3 INSTALLATION - EXTERIOR WALLS

A. Adhere a 8 inch wide strip of polyethylene sheet over control and expansion joints with double beads of adhesive each side of joint.

1. Tape seal joints between sheets.
2. Extend sheet full height of joint.

B. Apply adhesive in three continuous beads per board length to full bed 1/8 inch thick. Daub adhesive tight to protrusions.

C. Install boards on wall surface, horizontally.

D. Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.

E. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

F. Place 8 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window/door frame. Tape seal in place to ensure continuity of vapor retarder and air seal.

3.4 INSTALLATION - CAVITY WALLS

A. Secure impale fasteners to substrate at a frequency of 6 per insulation board per 10 sq ft.

B. Adhere a 8 inch wide strip of polyethylene sheet over control and expansion joints with double beads of adhesive each side of joint between sheets. Extend sheet full height of joint.

C. Apply adhesive in three continuous beads per board length to full bed 1/8 inch thick on

substrate. Daub adhesive tight to protrusions to ensure continuity of vapor retarder and air seal.

D. Install boards horizontally between wall reinforcement.

E. Use mechanical anchorage to provide permanent placement and support of units.

F. Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and no protrusions. Place impale fastener locking discs.

G. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

3.5 INSTALLATION - UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor barrier and pouring concrete slab.

3.6 PROTECTION OF FINISHED WORK

A. Do not permit work to be damaged prior to covering insulation.

END OF SECTION

SECTION 07213

BATT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Batt insulation and vapor barrier in exterior wall construction.

B. LEED Requirements:

1. Provide products having recycled content.
2. Provide materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 05400 - Cold Formed Metal Framing: Supporting construction.

B. Section 07241 - Exterior Insulation and Finish System: Rigid insulation.

C. Section 09260 - Gypsum Board Systems: Acoustic insulation.

1.3 REFERENCES

A. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

B. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

1.4 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements. in conjunction with thermal insulating materials in Section 07212.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

C. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by sum of post-consumer and pre-consumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit EQ 4: Including printed statement of VOC content.

1.6 COORDINATION

A. Coordinate work under provisions of Section 01039.

PART 2 PRODUCTS

2.1 MANUFACTURERS - INSULATION MATERIALS

A. CertainTeed Corporation.

B. Guardian Fiberglass, Inc.

C. Johns Manville

D. Knauf Insulation

E. Owens-Corning Fiberglas Corporation.

2.2 MATERIALS

A. Batt Insulation: ASTM C665; preformed glass fiber batt blanket; conforming to the following:

1. Thermal Resistance: R of 21 for exterior walls.
2. Facing: Faced on one side with craft paper.
3. Flame/Smoke Properties: 25/50 in accordance with ASTM E84.

B. Sheet Vapor Barrier: Black polyethylene film reinforced with glass fiber square mesh, 6 mil thick.

C. Staples: Galvanized steel wire; type and size to suit application.

D. Tape: Bright aluminum Polyethylene Polyester self-adhering type, mesh reinforced, 2 inch wide.

E. Insulation Fasteners: Steel impale spindle and clip on flat metal base, self-adhering backing, length to suit insulation thickness, capable of securely and rigidly fastening insulation in place.

F. Eave Ventilation Troughs: Preformed rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

2.3 EXAMINATION

A. Verify that substrate and adjacent materials are dry and ready to receive insulation.

2.4 INSTALLATION

A. Install insulation and vapor barrier in accordance with insulation manufacturer's instructions.

B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

C. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.

D. Install with factory applied vapor barrier membrane facing warm side of building spaces. Lap ends and side flanges of membrane over between framing members.

E. Attach facing flanges in place at maximum 6 inches oc to truss.

F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

G. Metal Framing: Place vapor barrier on warm side of insulation; lap and seal sheet barrier joints over member face.

H. Extend vapor retarder tight to full perimeter of adjacent window and door frames and other items interrupting the plane of membrane. Tape seal in place.

END OF SECTION

SECTION 07270

FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fireproof firestopping materials and accessories.

B. LEED Requirements:

1. Provide materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 09260 - Gypsum Board Systems: Gypsum wallboard fireproofing.

B. Division 15: Mechanical work requiring firestopping.

C. Division 16: Electrical work requiring firestopping.

1.3 REFERENCES

A. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM E814 - Test Method of Fire Tests of Through Penetration Firestops.

1.4 DEFINITION

A. Firestopping: A sealing or stuffing material or assembly placed in spaces between building materials to arrest the movement of smoke, heat, gases, or fire through wall or floor openings.

1.5 SYSTEM DESCRIPTION

A. Firestopping Materials: ASTM E814 to achieve a fire rating as noted on Drawings.

B. Surface Burning: ASTM E84 with a flame spread / smoke developed rating of 25/450.

C. Firestop all interruptions to fire rated assemblies, materials, and components.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on product characteristics, performance and limitation criteria.

C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. LEED Submittal:

1. Product Data for Credit EQ 4: Including printed statement of VOC content.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three three years experience.

B. Applicator: Company specializing in performing the work of this section with minimum five years experience and approved by manufacturer.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings and surface burning characteristics.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

B. Maintain this minimum temperature before, during, and for 3 days after installation of materials.

C. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 SILICONE ELASTOMERIC COMPOUND

A. Manufacturers:

1. Dow Corning Firestop Sealant.
2. Pensil Firestop Sealant, General Electric Co.
3. Metacaulk, The Rector Seal Corporation.
4. Substitutions: Under provisions of Section 01600.

B. Material: Single Multiple component silicone elastomeric compound and compatible silicone sealant; conforming to the following:

1. Elongation: 1200 percent.
2. Density: 18 to 25 lb/cu ft.

2.2 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

B. Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

B. Remove incompatible materials which may affect bond.

C. Install damming materials to arrest liquid material leakage.

3.3 APPLICATION

A. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

B. Apply primer and materials in accordance with manufacturer's instructions.

C. Apply firestopping material in sufficient thickness to achieve rating.Place sealant to completely seal junctions with adjacent dissimilar materials.

D. Remove dam material after firestopping material has cured.

3.4 CLEANING

A. Clean Work under provisions of Section 01700.

B. Clean adjacent surfaces of firestopping materials.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07420

ALUMINUM COMPOSITE METAL PANEL SYSTEM

PART 1 GENERAL

1.01. General

This section includes Aluminum Composite Material (ACM) panels, with dry seal gasket mounting system including fasteners, shims, furring, and gaskets, as well as related flashing and sealant to form a complete exterior cladding for new buildings and retrofit applications.

1.02. Related sections

A. 05100 Structural metal framing

B. 05400 Metal framing

C. 06100 Rough carpentry

D. 07100 Bituminous dampproofing

E. 07160 Cementitious crystalline waterproofing

F. 07600 Metal flashing

G. 07900 Sealants

H. 09800 Finishes

1.03. References and standards

A. Aluminum Association Construction Manual - Aluminum sheet metal work and building construction

B. ASTM B209/B209M Aluminum and aluminum alloy sheet and plate

C. ASTM D 3363-74: Method for film hardness by pencil test

D. ASTM D 3359-90: Methods for measuring adhesion by tape test

E. ASTM D 2794-90: Resistance of organic coatings to the effects of rapid deformation (impact)

F. ASTM D 1308-87 Effect of household chemicals on clear and pigmented organic finishes.

G. ASTM D 2247-90 Practice for testing water resistance of coatings in 100% relative humidity.

H. ASTM D 822: Practice for operating light and water exposure apparatus (carbon-arc type) for testing paint, varnish, lacquer and related products.

1.04 Submittals

A. Shop drawings: indicate layout, configuration, unit identification marks, connection details, support items, dimensions, openings, edge details, and relationship to adjacent components. Indicate locations for blocking and embedded items.

B. Samples: submit two panels approximately 4” x 6” illustrating surface finish, color, texture and gloss. These samples may include evaluation reports and/or test reports supporting the use of the product.

1.05 Product delivery, handling and storage

A. Panel finish and edges shall be protected in transit by crates and interleafed coated paper. Panels shall have a protective film over the finish to be removed after installation is complete.

B. Materials shall be stored in an area safe from damage and protected from the weather.

PART 2 PRODUCTS

2.01 Composite panels

A. Panels shall be Reynobond□ PE aluminum composite material as manufactured by Reynolds Metals Company, or approved equal.

B. Panels shall be 3mm thick (.118”) consisting of two skins of .020 aluminum bonded to a polyethylene core.

C. Panel finish shall be Colorweld 3000 Duragloss poymer coating, or approved equal.
1. Blue – match PMS 293C
2. Yellow – match PMS 130C
3. White - match Exxon white P1 per Exxon control chip

D. Film thickness nominal 1 mil ASTM D1400

E. Gloss 80% ASTM D523@60□

F. Gloss retention no less than 80% of original over 10 years ASTMD2244

G. Film hardness HB – H

H. Abrasion resistance > 40 liters of falling sand ASTM D968

I. Impact resistance – no cracking or paint removal per ASTMB2794

J. Salt spray resistance – over 3000 hr ASTM B117

2.02 Extruded retainer

A. Retainers shall be extruded in 6061 alloy aluminum tempered to T6.

B. Retainers shall be pre-cut and pre-drilled for installation with stainless steel clips pre-installed.

C. Stainless steel clips shall be stamped from stainless

2.03 Extruded gasket

A. Retainer gasket shall be extruded from neoprene 70 –90 Durometer

B. Gasket shall be designed to retain panels in conjunction with the extruded retainer and stainless steel clips, and allow expansion and contraction of the panels within a 170□F range.

2.04 Fabrication

A. Factory score and notch to the profiles shown on the drawings. Internal and external corners: same material as face of panels. Provide trim, closures, pieces, caps, and flashing as required for a finished application.

B. Field form panels and cut and score as required for field fitting. Panel breaks and lines shall be sharp, smooth, and free of warps or buckles.

2.05 Accessories

A. All exposed fasteners shall be Phillips K-lathe head self-drilling with corrosion resistant finish matching the panels.

B. All hidden fasteners shall be zinc plated.

C. Shimming and furring strips as required shall be roll formed from 22 gauge galvanized steel.

D. Flashing and mounting angles as required shall be fabricated from 16 gauge galvanized steel.

E. Sealants shall be compatible with the panel materials and gasket.

PART 3 EXECUTION

3.01 Inspection

A. Panel substructure shall be level and plumb within ¼" over 20ft.

B. Panel substructure shall be within agreed upon dimensions +- 1".

C. Panel substructure shall be structurally sound as determined by Architect/Engineer and be free of defects detrimental to work.

D. Cutouts for signs and power stub outs shall be ready for connection to signs as required.

E. Waterproofing shall be completed on all frame and masonry surfaces.

F. Parapet caps and flashing shall be complete.

G. Panel installer shall inspect substructure and shall not proceed with work until any deviations are corrected.

3.02 Installation

A. Install furring strips as required, plumb and level. Shim as necessary. Install per site layout in proper alignment and relation to substructure framing and established lines.

B. Install extruded retainers in proper alignment, plumb and level, within +-1 1/16" tolerance, non-cumulative.

C. Install panels in accordance with an approved set of shop drawings. Temporary setting blocks may be used to retain panels as work proceeds. Panel alignment is to be +- 1/32" non-cumulative.

D. Notch and fold corners and trim joints as required to form a neat and clean appearance. Field cut panels as required to fit site conditions, following manufacturers recommendations.

E. Install gasket continuously horizontally, and cut to fit compressed vertically. Do not stretch gasket as it is installed. Joint should be 3/8" +- 1/16"

F. Seal vertical and horizontal joints with black silicone sealant. Do not caulk entire panel, only the seam between gaskets.

G. Attach panels securely per engineering recommendations and in accordance with approved shop drawings to allow for thermal movement and structural support. The system must not generally have any visible fasteners, telegraphing, or fastening on the panel faces or any other compromise of a neat and flat appearance

3.03 Adjusting and cleaning

A. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the general contractor.

B. Repair panels with minor damage.

C. Clean all foreign matter from panel system and surrounding area.

D. Remove strippable film coating as soon as possible after surrounding area has been completed and cleaned.

SECTION 07533

SINGLE PLY ROOFING - MECHANICALLY ATTACHED - (EPDM)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulation.

B. Membrane roofing, protective coating, base flashings roofing membrane expansion joints, cant strips and counter flashings.

C. LEED Requirements:

1. Roofing materials shall comply with LEED requirements to reduce heat islands (thermal gradient differences between developed and undeveloped areas) and to achieve Sustainable Site (SS) Credit 7.2 in accordance with USGBC LEED for New Construction, Version 2.2.
2. Use of products having recycled content.

1.2 RELATED SECTIONS

A. Section 05310 - Steel Roof Deck.

B. Section 07620 - Sheet Metal Flashing and Trim: Counter flashing

1.3 REFERENCES

A. ASTM D297 - Standard Test Methods for Rubber Products - Chemical Analysis.

B. ASTM D412 - Rubber Properties in Tension.

C. ASTM D471 - Standard Test Method for Rubber Property - Effect of Liquids.

D. ASTM D624 - Rubber Property - Tear Resistance.

E. ASTM D746 - Brittleness Temperature of Plastics and Elastomeric by Impact.

F. ASTM D816 - Standard Test Methods for Rubber Cements.

G. ASTM D1149 - Standard Test Methods for Rubber Deterioration - Surface Ozone Cracking in a Chamber.

H. ASTM D2240 - Standard Test Method for Rubber Property - Durometer Hardness.

I. ASTM E96 - Water Vapor Transmission of Materials.

J. FM 4470 (Factory Mutual Engineering Corporation) - Roof Assembly Classifications.

K. NRCA (National Roofing Contractors Association) - Roofing and Waterproofing Manual.

L. UL 790 - Fire Hazard Classifications.

1.4 SYSTEM DESCRIPTION

A. Elastomeric Sheet Membrane Conventional Roofing System: One ply membrane system with vapor retarder insulation and mechanically attached membrane.

1.5 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Product Data: Provide characteristics on membrane materials, flashing materials, insulation, vapor retarders and mechanical attachment.

C. Shop Drawings: Shop drawings shall be submitted for approval by the Contracting Officer and manufacturer and shall include the following:

1. Outline of roof and size.
2. All standard and special details.
3. Location and type of all penetrations.
4. Number of membrane sheets and their respective sizes and locations of splices.
5. Number of flashing rolls by width.
6. Insulation type, brand and thickness.
7. Warranty type and period.

D. LEED Submittals:

1. Product Data for Credit SS 7.2: For products to reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.
2. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

1.6 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.

B. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention and identifying all materials and accessories which the roofing manufacturer approves as being a complete roofing system.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Warranty: Type and period.

1.7 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with five years experience.

B. Applicator: Company specializing in performing the work of this section with five years experience and approved by system manufacturer.

C. Perform Work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for roof assembly fire hazard requirements.

B. UL 790: Class A Fire Hazard Classification.

C. FM 4470: Roof Assembly Classification, of Class 1 Construction, wind uplift requirement of I-90, in accordance with FM Construction Bulletin 1-28.

1.9 PRE-INSTALLATION MEETING

A. Section 01039 - Progress Meetings: Pre-Roofing meeting.

B. Prior to the beginning of any roofing work, a Pre-Roofing Conference will be held at the site. Shop drawings and submittals shall have been submitted prior to this conference.

C. Attendees: Contracting Officer, Contractor's Representative, the Roofer, his Superintendent, Sheet
Metal Contractor and Representative of the Roofing Manufacturer.

D. Review preparation, installation procedures, coordinating and scheduling required with related work.

E. Requirements for the work and conditions which could possible interfere with successful performance of the work, including existing conditions, deck surfaces, roof insulation, flashing, safety procedures and any other item related to the roof system.

1.10 DELIVERY, STORAGE, AND PROTECTION

A. Store products in weather protected environment, clear of ground and moisture.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not apply roofing membrane during inclement weather or when existing and forecasted weather conditions would not permit work to be performed according to manufacturer's recommendations and warranty requirements.

B. Do not apply roofing membrane to damp or frozen deck surface.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.12 COORDINATION

A. Coordinate the work with the installation of associated metal flashings, as the work of this section proceeds.

1.13 WARRANTY

A. A manufacturer's technical representative shall inspect the installation of this roofing system and upon approval, a 15-year Membrane Systems Warranty shall be issued.

PART 2 PRODUCTS

2.1 GENERAL

A. Components of the roofing system shall be product of one manufacturer or approved by the Contracting Officer.

2.2 MANUFACTURERS - MEMBRANE MATERIAL

A. Carlisle Syntec Systems, Brite-Ply Mechanically Fastened Roofing System.

B. Firestone Building Products Co., RubberGard Mechanically Anchored.

2.3 MEMBRANE

A. Membrane: EPDM (Ethylene Propylene Diene Monomer) non-reinforced .060 inch thick by the largest sheet possible as determined by job conditions conforming to the following criteria:

Property	Test Method	Minimum Performance
Specific Gravity	ASTM D-297	1.15 E .05
Tensile Strength (9.0 MPa)	ASTM D-412	1305 psi minimum
Factory Seam Strength	Modified ASTM D-816	Membrane Rupture
Elongation	ASTM D-412	300% minimum
Tear Resistance (26.27 N/mm)	ASTM D-624	150 lbs/in minimum
Shore A. Durometer	ASTM D-2240	65 ∀ 10
Ozone Resistance 7 days/100 pphm @ 100□ F with 50% extension	ASTM D-1149	No cracks
Heat Aging 28 days @ 240□ F Elongation min. 200%	ASTM D-573	Tensile minimum 1205 psi (8.3 MPa)
Brittleness Temp	ASTM D-746	-49□ F(-45□C)
Water Resistance change in weight after Immersion 7 days @ 150□ F. %	ASTM D-471	+ 8, -2
Water vapor permeability Max, perm mils	ASTM E-96	2.0
Tolerance on Nominal thickness, %	ASTM D-412	+/- 10

Membrane Color: White

2.4 MECHANICAL ANCHORS

A. Batten Strips: As recommended by membrane manufacturer.

B. Fasteners: As recommended by membrane manufacturer.

C. Batten Cover Strip: As recommended by membrane manufacturer.

2.5 ROOF INSULATION

A. Manufacturers:

1. Atlas Roofing Corp., Type II
2. N.R.G. Barriers, Type II
3. Firestone, Type II

B. Insulation: Rigid polyisocyanurate foam board with a non-asphaltic coated glass fiber facing, with the following characteristics:

1.	Board Density	20 lb/cu ft.
2.	Board Size	48" x 96" inch.
3.	Board Thickness	3" inches
4.	Thermal Conductivity	K factor of 0.36
5.	Board Edges	square ship lap

C. Roof Saddles shall be tapered polyisocyanurate foam board with a non-asphaltic coated glass fiber facing. (Federal Specifications HH-I-1972 GEN and HH-I-1972/1.2) or MFG approved system.

D. Fasteners: As furnished or recommended by Roofing Systems Manufacturer; Factory Mutual approved for Class I Insulated Steel Deck Construction, uplift rating for I-90 classification.

2.6 FLASHINGS

A. Flexible Flashings: Same material as membrane.

B. Prefabricated Control or Expansion Joint Flashing: 36 mil, uncured EPDM/Neoprene over close cell foam backing seamed to metal flanges.

2.7 ACCESSORIES

A. Molded Pipe Flashing: Compatible with materials with which it is used, furnished by membrane manufacturer.

B. Night Seal: Compatible with materials with which it is used, furnished by membrane manufacturer.

C. Pourable Sealer: Compatible with materials with which it is used, furnished by membrane manufacturer.

D. Fiber Cant Strip.

E. Sheathing Joint Tape: Paper Heat resistant type.

F. Roofing Nails: Galvanized, hot dipped or non-ferrous type, size as required to suit application.

G. Insulation Fasteners: Appropriate for purpose intended and approved by Factory Mutual and system manufacturer; length required for thickness of material with metal washer, and anchor.

H. Sealants: As recommended by membrane manufacturer.

I. Strip Reglet Devices: Galvanized steel or Extruded plastic; maximum possible lengths per location, with attachment flanges.

J. Wood Nailers: Pressure treated (Wolmanized or Osmose K-33)

K. Walkway Pads: As manufactured by membrane manufacturer.

L. Stack Boots: Flexible boot and collar for pipe stacks through membrane.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains valleys, or eaves (min. □" per 1'-0").

D. Verify deck surfaces are dry and free of snow or ice. Confirm dry deck by moisture meter with 12 percent moisture maximum.

E. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and wood cant strips wood nailing strips and reglets are in place.

3.2 PREPARATION - METAL DECK

A. Install gypsum sheathing on metal deck.

B. Lay sheathing with long side at right angle to flutes; stagger end joints; provide support at ends.

C. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface. Tape joints.

D. Mechanically fasten sheathing to roof deck, in accordance with Factory Mutual and manufacturer's instructions.

3.3 VAPOR RETARDER APPLICATION

A. Apply vapor retarder to deck sheathing surface with adhesive in accordance with manufacturer's instructions.

B. Extend vapor retarder under cant strips and blocking to deck edge.

C. Lap flexible flashing over vapor and air barrier of wall construction to provide continuity of vapor and air barrier seal.

3.4 SUBSTRATE INSPECTION

A. Contractor shall be responsible for providing proper substrate to receive the roofing system. Contractor shall notify the Contracting Officer in writing of defects in the substrate, and work shall not proceed until defects have been corrected. If possible, install starting at the high point of the roof working to the lowest point.

3.5 INSTALLATION

A. Insulation:

1. Insulation boards shall be laid in parallel courses, in moderate contact with adjoining units. Boards shall be cut to fit nearly, without forcing, with no joints exceeding 1/4 inch. Boards shall be attached to the metal decking with Factory Mutual approved mechanical fasteners 1'-0" o.c.
2. Roof Saddles: Roof saddles shall be installed where shown on the drawings. Roof saddles shall be attached to the metal decking with Factory Mutual approved mechanical fasteners 1'-0" o.c.
3. No more insulation shall be laid than can be covered by the roofing membrane the same day. Exposed edges of the insulation shall be protected by temporary cutoffs (Night Seal) at the end of each day or prior to precipitation.
4. Mechanically fasten insulation to deck in accordance with the insulation manufacturer's instructions.
5. Place the second layer of insulation with joints staggered minimum 6 inches from joints of first layer.
6. Place 1 fastener per 2 sq ft.

3.6 WOOD NAILER INSTALLATION

A. Locate and install as detailed on drawings or noted in membrane manufacturer's details.

B. Wood nailer shall match total thickness of insulation, be firmly fastened to the deck, and tapered so that it will be flush at point of contact with the insulator.

3.7 MEMBRANE INSTALLATION

A. Place Membrane and Allow to Relax: Place the membrane, without stretching, over the acceptable substrate, and allow it to relax for a minimum of 30 minutes prior to attachment. Position subsequent membrane sheets in the same manner, overlapping a minimum of three (3) inches.

B. Splice the Lap: Splice the outside edge of the top sheet.

C. Layout Batten Strips: Layout batten strips in the pattern designated by the project designer, and to comply with the minimum requirements for attachment provided in manufacturer's design manual.

D. Batten Strip Installation: Lap Splice as follows:

1. Install Batten Strips: Install the batten strips using manufacturer's fasteners appropriate for the particular deck type as specified in the design manual.
2. Secure Batten Strips: Place the first fastener starting 1" in from the end of the manufacturer's batten strip, then every 12" (unless a more frequent fastener spacing is required due to pull-out requirements) using the pre-punched holes in the battens.

3. Batten Strip Intersections: Do not intersect batten strips at intersections or at corner intersections. Battens shall be lapped along batten runs, and attached with a common fastener. When batten strips must be field cut, the batten must be rounded. Assure that all burrs created by cutting are removed. Where field drilling of metal battens is necessary, use a 1/4" diameter drill bit.
4. Start Fastening Batten Strips from One End: When fastening batten strips, start at one end and work towards the other. Fastening the two ends of the batten strip at the same time may cause buckling between fasteners.
5. Install Fasteners: Install each fastener so that it is properly engaged in the deck and the head is flush with the batten strip surface. Use caution not to over drive the fasteners as this will cause the batten strip to buckle between the fasteners.
6. Apply General Purpose Sealant: After all batten strips have been properly attached, cleaned and primed, apply General Purpose Sealant over and around each fastener head (refer to Manufacturer's Details).
7. Install Batten Cover Strip: All batten strips must be covered prior to the end of the work day. Should inclement weather strike before the batten cover strip is installed, some method of drying may be required to ensure that the batten bar and the membrane surface beneath the bar is dry. As an option in particularly unpredictable climates, a 3/8" bead of Lap Sealant may be installed beneath the batten bar, to reduce moisture migration into the roof system.

E. Membrane Attachment at Perimeters: Perimeters may be adhered using manufacturer's bonding adhesive or mechanically attached with batten strips, fasteners, and cover strips in accordance with manufacturer's recommendations and details.

F. Membrane Lap Splicing: Install all field splices in accordance with manufacturer's splicing requirements.

1. Clean and Prime Batten Strip Area. Using Manufacturer's scrubber, apply prime to the membrane and batten area a minimum of 3" on each side of the batten. Additional cleaning at factory splices and areas of excessive dusting agent is required. Allow prime to flash off.
2. Apply General Purpose Sealant: After all batten strips have been properly attached, cleaned and primed, apply general purpose sealant over and around each fastener head.
3. Place Seam Batten Cover Roll: Place the roll of seam batten cover on the roof a few feet ahead of the application starting point, positioned so that it unrolls from the top of the roll (release paper will be on top).
4. Install Seam Batten Cover: Starting a minimum of 4" ahead of the EPDM protection pad, center the seam batten cover and install to the cleaned and primed surface.
5. Advance the Roll: Advance the roll along the batten strip, peeling away the release paper as you apply the seam batten cover. End laps shall be a minimum of one inch.
6. Cut the seam Batten Cover: Cut the seam batten cover and release paper to extend 4" beyond the end of the end of the EPDM protection pad.
7. Apply Pressure and Roll the Splice: Apply pressure along the entire length of the seam batten cover by hand to completely mate the two surfaces. Using a 1-1/2" wide silicone or silicone sleeved steel hand roller, roll the entire batten cover with positive pressure towards the outside edge of the batten, then along the entire length of the batten cover.
8. Install Seam Flashing at End Laps: Apply prime to the end lap of the seam batten cover and allow to flash off. Install a 12" long section of seam flashing over the end lap. Roll the seam flashing with a 1-1/2" wide silicone or silicone sleeved steel hand roller. Apply prime or splice adhesive to edges of the seam flashing and apply lap

sealant as shown in manufacturer's details.

F. Perimeter Attachment

1. Membrane shall be mechanically fastened to all perimeter and penetration nailers using methods, procedures, and materials in accordance with the manufacturers recommendations and details.

3.8 FLASHING INSTALLATION

A. Flashing shall be installed at all roof penetrations, interruptions, and any roof intersections including roof edges with vertical or sloped surfaces using the longest pieces practicable. Flashings shall be extended vertically a minimum of twelve (12) inches, or as otherwise approved by roofing membrane company.

B. The lap between the flashing membrane and the roofing membrane shall be effected with splice adhesive before bonding the flashing membrane to the vertical surface. All laps shall be sealed a minimum of three (3) inches beyond the fasteners which attach the roofing membrane to the horizontal nailer.

C. Bonding adhesive shall be applied evenly to both the flashing and the surface to which it is being bonded. Allow the bonding adhesive to dry to where it will not string or stick to the touch of a dry finger, then roll the flashing into the adhesive evenly and carefully so as not to cause wrinkles. After pressing flashing to its substrate, peel off the release paper and dispose. Flashing membrane must be contoured to fit the substrate to which it is being bonded so as not to allow a bridging or gapping effect.

D. Flashing previously bonded to a vertical surface shall be fastened at the top a maximum of twelve (12) inches on center with one (1) inch minimum head diameter fasteners or continuous washer strips when under an appropriate counterflashing.

E. All pipes and similar penetrations are to be flashed with flashing membrane. Flashings are to be field fabricated to assure a custom fit for each penetration.

F. Roof drains are membrane flashed.

G. Expansion joints shall generally be membrane covered.

H. Pitch pockets shall be installed and properly flashed around clusters of pipes or other unusual penetrations.

3.9 SHEET METAL WORK

A. Counterflashings, coping, and other perimeter or penetration metal work shall be properly fastened and sealed by the roofing contractor or others and it shall be their responsibility to maintain in a watertight condition.

3.10 TEMPORARY CLOSURE

A. Temporary closures may be needed to prevent water from flowing beneath the roof system during inclement weather.

1. The roof membrane shall be extended at least two (2) feet over the last row of insulation (where applicable) and a continuous layer of a night sealant (mix two parts

thoroughly per instructions on label) applied onto the substrate ten (10) inches from the membrane edge. Mating surfaces must be smooth and free of any loose foreign material.

2. Firmly embed roof membrane into night sealant and provide continuous pressure over the length of the cut-off by using lumber and sufficient ballast.
3. Upon resumption of work, pull sheet free before installation is continued.

3.11 ROOF WALKWAYS

A. A walkway system shall be provided, where shown on the drawings, to permit servicing of mechanical rooftop equipment, or to accommodate any other excessive foot traffic. Walkways shall consist of traffic pads, provided or approved by the membrane manufacturer. **(See Roof Plan Dwg for quantity and size.)**

3.12 FIELD QUALITY CONTROL

A. Inspection: Upon completion of the roofing system a roofing representative shall make a thorough inspection of the installation to determine that the roof system has been applied according to standards and specifications. Upon approval of the installation, the roofing company will issue its applicable guarantee per current guidelines.

3.13 CLEANING

A. Section 01700 – Project Closeout: Cleaning installed work.

B. In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

C. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.14 PROTECTION OF FINISHED WORK

A. Section 01700 - Project Closeout: Protecting installed work.

B. Protect building surfaces against damage from roofing work.

C. Where traffic must continue over finished roof membrane, protect surfaces.

3.15 INSPECTION

A. Upon completion of the roofing system a roofing representative shall make a thorough inspection of the installation to determine that the roof system has been applied according to standards and specifications. Upon approval of the installation, the roofing company will issue its applicable guarantee per current guidelines.

3.16 CONSULTATION

A. Authorized Representative of the roofing company shall be consulted with respect to any and all deviations from current roofing company standards or guide specifications.

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coping, parapet, cap, sill, lintel, and wall flashings.

B. Facias

C. Counterflashings over bituminous, base flashings.

D. Counterflashings at roof mounted equipment and vent stacks.

NOTE: ALL COPINGS, CAPS, SCUPPERS AND GUTTERS DOWNSPOUTS AND EXPOSED FLASHINGS SHALL BE FACTORY MANUFACTURED BY THE SAME COMPANY.

E. LEED Requirements:

1. Provide products having recycled content.
2. Provide regional materials.

1.2 RELATED SECTIONS

A. Section 06114 - Wood Blocking and Curbing: Wood blocking and battens for metal roofing substrate profiles.

B. Section 07533 - Single Ply Roofing - Mechanically Attached - Conventional

C. Section 07631 - Gutters and Downspouts.

D. Section 07900 - Joint Sealers.

E. Section 09900 - Painting: Prime and finish painting.

1.3 REFERENCES

A. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate.

B. ASTM A361 - Steel Sheet, Zinc - Coated (Galvanized) of the Hot - Dip process for roofing and siding.

C. ASTM A4446 - Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process, structural (physical) quality.

D. ASTM B32 - Solder Metal.

E. ASTM B209 - Aluminum and Alloy Sheet and Plate.

F. ASTM B370 - Copper Sheet and Strip for Building Construction.

G. ASTM B486 - Paste Solder.

H. ASTM D2178 - Asphalt - Impregnated Glass Mat for roofing and waterproofing.

I. ASTM D4586 - Asphalt Roof Cement, Asbestos-Free.

J. CDA (Copper Development Association) - Contemporary Copper, A Handbook of Sheet Copper Fundamentals, Design, Details and Specifications.

K. CDA - Copper Roofing - A Practical Handbook.

L. FS O-F-506 - Flux, Soldering, Paste and Liquid.

M. NRCA (National Roofing Contractors Association) - Roofing Manual.

N. SMACNA - Architectural Sheet Metal Manual.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples, 12 inches long illustrating typical coping fascia material and finish.

D. Submit two samples 6x6 inch in size illustrating metal finish color.

E. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by sum of post-consumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Credit MR 5.1and Credit MR 5.2: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.

a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with CDA SMACNA NRCA standard details and requirements.

1.6 QUALIFICATIONS

A. Fabricator and Installer: Company specializing in sheet metal flashing work with five years experience.

1.7 PRE-INSTALLATION CONFERENCE

A. Convene one week prior to commencing work of this section, under provisions of Section 01039.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Stack preformed and refinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials which may cause discoloration or staining.

1.9 COORDINATION

A. Coordinate with the work of other Sections for installing flashing reglets.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Copper: ASTM B370, cold rolled, natural lacquered finish.

B. Through Wall Flashing.

1. Three (3) ounce cold rolled copper sheet with a layer of asphalt impregnated cotton or fiberglass fabric bonded to each side.

2.2 ACCESSORIES

A. Fasteners: Galvanized steel Aluminum Stainless steel Copper Same material and finish as flashing metal , with soft neoprene washers.

B. Underlayment: ASTM D2178, No. 15 asphalt saturated roofing felt. FS L-P-512, 6 mil (0.15 mm) polyethylene.

C. Slip Sheet: Rosin sized building paper.

D. Primer: Zinc chromate Galvanized iron Iron oxide linseed oil, approved for metal type.

E. Protective Backing Paint: Zinc chromate alkyd. Bituminous., approved for metal type.

F. Sealant: Acrylic Polyurethane type, specified in Section 07900. And approved for metal type.

G. Bedding Compound: Rubber-asphalt Butyl, approved for metal type.

H. Plastic Cement: ASTM D4586, Type I.

I. Reglets: Surface mounted Recessed type, galvanized steel rigid extruded PVC; face and ends covered with plastic tape.

J. Gutter and Downspout Anchorage Devices: SMACNA requirements.

K. Gutter Supports: Brackets. Straps. Spikes and ferrules.

L. Downspout Supports: Brackets. Straps.

M. Solder: ASTM B32; 50/50 type.

2.3 COMPONENTS

A. Gutters: Square (Box) SMACNA style profile.

B. Downspouts: Square profile.

C. Accessories: Profiled to suit gutters and downspouts.

D. Splash Pans: Conform to SMACNA details, plate 36.

E. Downspout Boots Shoes: Steel. Cast iron. Plastic.

2.4 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum (verify existing) inches wide, interlockable with sheet.

C. Form pieces in longest possible lengths. in single length sheets.

D. Hem exposed edges on underside ½ inch; miter and seam corners.

E. Form material with standing batten flat lock seams.

F. Pretin edges of copper sheet. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.

G. Fabricate corners from one piece with minimum 18 inch long legs; seam solder for rigidity, seal with sealant.

H. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

I. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

J. Form sheet metal pans (pitch pockets) 6-inch nominal size, with 3-inch upstand, and 4-inch flanges.

K. Fabricate snow guards in accordance with SMACNA Plate 159. as detailed.

2.5 FINISH

A. Prepare copper surfaces in accordance with Section 09900

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

3.3 INSTALLATION

A. Conform to drawing details included in the CDA SMACNA NRCA manual.

B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

C. Apply plastic cement compound between metal flashings and felt flashings.

D. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Seal metal joints watertight.

F. Install snow guards (verify existing); inch up slope from eaves and valleys.

G. Secure gutters and downspouts in place using concealed fasteners.

H. Slope gutters 1/4 inch per foot minimum.

I. Set splash pans (conc.) under downspouts.

J. Seal metal joints watertight.

3.4 FIELD QUALITY CONTROL

A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07631

GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Precoated Galvanized steel Aluminum Copper Terne coated PVC gutters and downspouts.

B. Precast concrete splash pads.

C. LEED Requirements:

1. Provide products having recycled content.
2. Provide regional materials.

1.2 RELATED SECTIONS

A. Section 07620 - Sheet Metal Flashing and Trim.

B. Section 09900 - Painting: Field painting of metal surfaces.

1.3 REFERENCES

A. ASTM A361 - Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process for Roofing and Siding.

B. ASTM A446 - Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

C. ASTM B32 - Solder Metal.

D. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

E. ASTM B370 - Copper Sheet and Strip for Building Construction.

F. ASTM B486 - Paste Solder.

G. FS O-F-506 - Flux, Soldering, Paste and Liquid.

H. SMACNA - Architectural Sheet Metal Manual.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

C. Product Data: Provide data on prefabricated components.

D. Samples: Submit two samples, 6 inch long illustrating component design, finish, color, and configuration.

E. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by sum of post-consumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Credit MR 5.1 and Credit MR 5.2: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.

a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.5 QUALITY ASSURANCE

A. Conform to SMACNA Manual for sizing components for rainfall intensity determined by a storm occurrence of 1 in 10 years.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for size and method of rainwater discharge.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.8 COORDINATION

A. Coordinate with the work of other sections for installing gutter and downspouts.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pre-Coated Galvanized Steel: ASTM A446, Grade A, G90 zinc coating; 22 gage core steel, shop pre-coated with modified silicone coating of paint color as selected to match metal roofing panels.

2.2 COMPONENTS

A. Gutters: SMACNA Rectangular Square Semi-circular style profile.

B. Downspouts: SMACNA Square profile.

C. Accessories: Profiled to suit gutters and downspouts.

D. Splash Pans: Conform to SMACNA details, Plate 36.

E. Downspout Boots Shoes.

2.3 ACCESSORIES

A. Anchorage Devices: SMACNA requirements.

B. Gutter Supports: Brackets. Straps. Spikes and ferrules.

C. Downspout Supports: Brackets. Straps.

D. Fasteners: Galvanized steel Aluminum Copper, with soft neoprene washers. Finish exposed fasteners same as flashing metal.

E. Primer: Zinc chromate Galvanized Iron oxide linseed oil. Type approved for metal.

F. Protective Backing Paint: Zinc chromate alkyd Iron oxide linseed oil paint. Type approved for metal.

G. Solder: ASTM B32; 50/50 type.

H. Flux: FS O-F-506.

2.4 FABRICATION

A. Form gutters and downspouts of profiles and size sizes indicated, to SMACNA requirements.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Pretin edges of copper sheet. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.

F. Fabricate gutter and downspout accessories; solder seal watertight.

2.5 FINISHES

A. Prepare copper surfaces in accordance with Section 09900.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.2 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Join lengths with formed seams sealed soldered watertight. Flash and seal solder gutters to downspouts and accessories.

C. Slope gutters 1/4 inch per foot minimum.

D. Seal metal joints watertight.

END OF SECTION

SECTION 07724

ROOF HATCHES

PART 1 -GENERAL

A. SECTION INCLUDES

i) Prefabricated roof hatches, with integral support curbs, operable hardware, and counter flashings.

ii) Fire Smoke rated vents, with release mechanism.

B. RELATED SECTIONS

i) Section 05500 - Metal Fabrications: Formed steel curbs.

ii) Section 06114 - Wood Blocking and Curbing: Wood curbs.

iii) Section 07553 - Roof system.

iv) Section 07620 - Sheet Metal Flashing and Trim: Flashing to roof system.

v) Section 09900 - Painting: Field painting.

C. REFERENCES

i) FM - Roof Assembly Classifications.

ii) UL - Fire Hazard Classifications.

D. SUBMITTALS FOR REVIEW

i) Section 01300 - Submittals: Procedures for submittals.

ii) Product Data: Provide data on unit construction, sizes, configuration, jointing methods and locations when applicable, and attachment method.

E. SUBMITTALS FOR INFORMATION

i) Section 01300 - Submittals: Procedures for submittals.

ii) Manufacturer's Installation Instructions: Indicate special installation criteria, interface with adjacent components.

F. REGULATORY REQUIREMENTS

i) Conform to applicable code for UL and FM requirements as applicable to [fire rated] roof hatches. [heat smoke vents.]

ii) Provide certificate of compliance from authority having jurisdiction indicating approval of [fire smoke rated] units.

PART 2) PRODUCTS

A. ROOF HATCH VENT

1. Manufacturers:
   (1) Babcock: Davis Hatchways Inc.
   (2) Bilco, Inc.
   (3) Milcor, Inc.
   (4) Section 01600 - Materials and Equipment: Product options and substitutions. Substitutions: Permitted.

2. Unit: Reference drawings.

3. Integral Steel Curb: 14 gage galvanized prime painted steel with 1 inch rigid glass fiber foam insulation; integral cap flashing to receive roof flashing; extended flange for mounting.

4. Hardware: Cadmium plated finish:
   (5) Compression spring operator and shock absorbers;
   (6) Steel manual pull handle for interior and exterior operation;
   (7) Steel hold open arm with vinyl covered grip handle for easy release,
   (8) [Automatic opening upon break of 160 degree F fusible link Automatic opening upon activation of fire alarm system.]
   (9) Padlock hasp.
   (10) Hinges: Manufacturer's recommended type Heavy duty pintle type.

2.2FABRICATION

A. Fabricate components free of visual distortion or defects. Weld corners and joints.

ii) Provide for removal of condensation occurring within components or assembly.

iii) Fit components for weather tight assembly.

PART 3) EXECUTION

A. INSTALLATION

i) Install in accordance with manufacturer's instructions.

ii) Coordinate with installation of roofing system and related flashings for weather tight installation.

iii) Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals.

iv) Adjust hinges for smooth operation.

END OF SECTION

SECTION 07800

STANDING SEAM METAL ROOF

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Section includes: Standing Seam Metal Roofing System at back loading dock area.

B. LEED Requirements:

1. Roofing materials shall comply with LEED requirements to reduce heat islands (thermal gradient differences between developed and undeveloped areas) and to achieve Sustainable Site (SS) Credit 7.2 in accordance with USGBC LEED for New Construction, Version 2.2.
2. Provide products having recycled content.

1.2 SYSTEM DESCRIPTION

A. Roofing Assembly: The roofing assembly includes preformed sheet metal panels, related accessories, valleys, hips, ridges, eaves, corners, rakes, miscellaneous flashing, and attaching devices.

1.3 SUBMITTALS

A. Submit detailed drawings showing layout of panels, anchoring details, joint details, trim, flashing, and accessories. Show details of weatherproofing, terminations, and penetrations of metal work.

B. Submit a sample of each type of roof panel, complete with factory finish.

C. Submit results indicating compliance with minimum requirements of the following performance tests:

1. Air Filtration - ASTM E 283-84
2. Water Filtration - ASTM E 331-86
3. Wind Uplift - U.L. 90

B. Submit calculations with registered engineer seal, verifying roof panel and attachment method resists windpressures imposed on it pursuant to applicable building codes.

C. LEED Submittals:

1. Product Data for Credit SS 7.2: For products to reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.
2. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

1.4 QUALITY ASSURANCE

A. Manufacturer: - Company specializing in Architectural Sheet Metal Products with ten (10) years minimum experience.

B. No product substitutions shall be permitted without meeting specifications.

C. Substitutions shall be permitted 10 days prior to Bid Date and acceptance put forth in an addendum.

D. No substitutions shall be made after Bid Date.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt of panels and other materials, installer shall examine the shipment for damage and completeness.

B. Panels should be stored in a clean, dry place. One end should be elevated to allow moisture to run off.

C. Panels with strippable film must not be stored in the open, exposed to the sun.

D. Stack all materials to prevent damage and to allow for adequate ventilation.

1.6 PROJECT/SITE CONDITIONS

Environmental requirements:

1. Roofing shall not be applied during precipitation and shall not be started when there is a probability of precipitation during installation.

B. Protection:

1. Protection against any damage shall be provided for adjacent surfaces during installation of roofing.

1.7 WARRANTY

A. Paint finish shall have a twenty-year guarantee against cracking, peeling, and fade (not to exceed 5 N.B.S. units).

B. Galvalume material shall have a twenty-year guarantee against failure due to corrosion, rupture or perforation.

C. Applicator shall furnish guarantee covering watertightness of the roofing system for the period of two (2) years from the date of substantial completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Berridge Manufacturing Company, 1720 Maury Street, Houston, Texas 77026; (800) 223-8127 Outside TX; (713) 223-4971 in TX; Fax: (713) 236-9422.

B. Specifications are based on information as provided by Berridge Manufacturing Company.

2.2 SHEET MATERIALS

A. Prefinished Metal shall be Hot-Dipped galvanized- ASTM A446-85 Grade C G90 Coating A525-86 24 Gauge core steel or prefinished Galvalume-ASTN 792-86 AZ-55.

B. Unfinished Metal shall be Grade C Galvalume ASTM 792-86, AZ 55," Satin Finish".

C. Finish shall be full strength Kynar 500 Fluoropolymer coating to match Sherwin Williams Paint color #SW xxxx “NAME”. Coating, is to be applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Kynar 500-finish supplier.

D. Strippable film shall be liquid applied to the top side of the paint coil to protect the finish during fabrication, shipping and field handling. This strippable film must be removed before installation.

2.3 ACCESSORIES:

A. Fasteners: Galvanized Steel with washers where required.

B. Sealant: As specified by Berridge Manufacturing Company.

C. Vinyl Weatherseal Insert.

2.4 FABRICATION

A. All exposed adjacent flashing shall be of the same material and finish as the roof panels.

B. Hem all exposed edges of flashing on underside, 1/2 inch.

2.5 PREFORMED METAL PANELS

A. Berridge Cee-Lock Standing Seam Panel:

1. Panels shall have 1-1/2" high vertical legs, spaced 16 1/2" on center or match existing profile on other base buildings.
2. Standing seam to be of an interlocking, "snap-lock" design.
3. Panels shall be site-formed with the Berridge Model CL-21 Portable Roll Former in continuous lengths from ridge to eave or factory-formed to maximum 40'.
4. Continuous Cee Rib to be 2-1/8" wide and 1-3/8" in height. Rib shall be connected to purlin with two #12-14 x 1" self-drilling/tapping fasteners Cee-Clips at 3'-0" max.
5. Optional Vinyl Weatherseal (U.S. Patent No. 4641475) to be factory/machine-installed over Continuous Cee Rib.
6. When required, Panel assembly to bear Underwriter's Laboratories Label UL90, pursuant to Construction Number 34 and applicable Fire Ratings.
7. Certification shall be submitted, based on independent testing laboratory, indicating no measurable water penetration or air leakage though the system when tested in accordance with ASTM E- 331-86 and E-283-84.

PART 3 EXECUTION

3.1 EXAMINATION

A. Substrate:

1. Examine metal deck to ensure proper attachment to framing.
2. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves or projections, level to 1/4" in 20', and properly sloped to [valleys] (or) [eaves].
3. Verify roof openings, curbs, pipes, sleeves, ducts, or vents though roof are solidly set, cant strips and reglets in place, and nailing strips located.
4. Verify deck is dry and free of snow or ice. Flutes in steel deck to be clean and dry.

3.2 INSTALLATION - GENERAL

A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation.

B. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.

C. Install standard and edge trim before installing roof panels.

D. Remove protective strippable film prior to installation of roof panels.

E. Attach panels using manufacture's standards clips and fasteners, spaced in accordance with approved shop drawings.

F. Install sealants for preformed roofing panels as approved on shop drawings.

G. Do not allow panels or trim to come into contact with dissimilar materials.

H. Do not allow traffic on completed roof. If required, provide cushioned walk boards.

I. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.

J. Remove and replace any panels or components, which are damaged beyond successful repair.

3.3 CLEANING

A. Clean any grease, finger marks or stains from the panels per manufacturer's recommendations.

B. Remove all scrap and construction debris from the site

3.4 FINAL INSPECTION

A. Final inspection will be performed by Contracting Officer and Architect.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparing substrate surfaces.

B. Sealant and joint backing.

C. LEED Requirements:

1. Provide Use materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 02625 - Curbs and Gutters: Sealants required in conjunction with curbs and gutters.

B. Section 03300 - Cast-In Place Concrete: Sealants required in conjunction with cast-in-place concrete.

C. Section 06200 - Finish Carpentry: Sealants required in conjunction with Finish Carpentry components.

D. Section 06410 - Custom Casework: Sealants required in conjunction with Custom Casework.

E. Section 07533 - Single Ply Roofing – Mechanically attached – Conventional sealants required in conjunction with roofing.

F. Section 07620 - Sheet Metal Flashing and Trim: Sealants required in conjunction with metal flashings and trim.

G. Section 08410 - Aluminum Entrances and Storefronts: Sealants required in conjunction with Aluminum Entrances and Storefront.

H. Section 08800 - Glazing: Sealants required in conjunction with glazing methods.

I. Section 09511 - Suspended Acoustical Ceilings: Sealants required in conjunction with acoustic ceilings.

1.3 REFERENCES

A. ASTM C790 - Use of Latex Sealing Compounds.

B. ASTM C804 - Use of Solvent-Release Type Sealants.

C. ASTM C834 - Latex Sealing Compounds.

D. ASTM C919 - Use of Sealants in Acoustical Applications.

E. ASTM C920 - Elastomeric Joint Sealants.

F. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

G. ASTM D1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, color availability and special adhesion requirements.

C. Samples: Submit two samples, 1/2x4 inch in size illustrating sealant colors for selection.

D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation and perimeter conditions requiring special attention.

E. LEED Submittals:

1. Product Data for Credit EQ 4: Including printed statement of VOC content.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform acoustical sealant application work in accordance with ASTM C919.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years experience.

B. Applicator: Company specializing in performing the work of this section with minimum five years documented and approved by manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.8 COORDINATION

A. Coordinate the work with all sections referencing this section.

1.9 WARRANTY

A. Provide five-year warranty under provisions of Section 01700.

B. Warranty: Include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal, and exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 SEALANTS

A. Acrylic Emulsion Latex Interior Joints: ASTM C834, single component; color as selected; AC-20 manufactured by Pecora Corp. Or Sonolac manufactured by Sonneborn.

B. Polyurethane Sealant Exterior Joints: ASTM C920,Type M, Grade NS,; two component, chemical curing, non-staining, non-bleeding, type; color as selected; Dynatrol II manufactured by Pecora Corp. Or Sonolastic NP2 manufactured by Sonneborn.

1. Elongation Capability 50 percent

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056 D1565; round, open cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions.

D. Protect elements surrounding the work of this section from damage or disfiguration.

3.3 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required 2:1 width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints to a slightly concave surface.

3.4 CLEANING

A. Clean work under provisions of 01700.

B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Section 01500.

B. Protect sealants until cured.

END OF SECTION

SECTION 08100

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel doors and frames as shown on Drawings and as specified within this Section.

B. LEED Requirements:

1. Provide products having recycled content.
2. Provide regional materials.

1.2 SUBMITTALS

A. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit MR 5.1: For each regional material, including its source.

a. Include statement indicating cost and the fraction by weight that is considered regional.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Doors and frames shall be furnished by the same Manufacturer.

B. Approved Manufacturers:

1. Steelcraft Manufacturing Co.
2. Curries Company
3. The Ceco Corporation
4. The Kewanee Corp.
5. Republic Builders Products
6. Security Metal Products

2.2 MATERIALS

A. Doors: ANSI/SDI-100 Grade II, 18 gauge, Model 2 flush seamless steel with honeycomb core.

B. Frames: ANSI/SDI 100, 16 gauge steel.

C. Steel: ASTM 366 cold-rolled or ASTM A569 hot-rolled. Electrolytic zinc-coated meeting ASTM A591, Class B for exterior openings.

D. Paint: Non-lifting, rust-inhibiting gray primer meeting ANSI A224.1, compatible with field finish specified in Section 09900, applied after bonderizing.

2.3 FABRICATION- DOORS

A. Construct hollow metal doors, flush and vision lite types as schedule on Drawings, in accordance with ANSI/SDI-100 with core as specified above. Reinforce top and bottom of doors horizontally by 14 gauge (1.6mm) steel channels, full width, spot welded to each face at least 3 inches (75mm) on center. Bevel edge of lock stile.

B. Joints at the edges of doors shall be mechanically interlocked or shall have a channel continuously welded where face sheets meet.

C. Where heavy duty hinges have been specified, provide 8 gauge reinforcing at hinge cut outs. Coordinate with hardware schedule.

D. Reinforce openings in doors for and vents on all sides with 14 gauge (1.6mm) steel channel.

E. Provide double doors with one-piece astragals of 14 gauge (1.6mm) steel. Provide solid drip cap at top of exterior out-swinging doors.

F. Accurately mortise doors for locks and hinges. Provide adequate box type reinforcement with steel plates welded to the interior reinforcing channels and drilled and tapped. Provide reinforcement for all other items of hardware.

2.4 FABRICATION - FRAMES

A. Construct to shapes and sizes shown, meeting various wall thicknesses in accordance with ANSI/SDI-100.

B. Back weld corners (inside face) and grind outside face to remove any material which comes through seam. Treat all ground surfaces with liquid spot galvanizing coating, Zinc oxide conforming with FS TT-P-641.

C. Mortise, reinforce, drill and tap for standard weight, full mortise template hinges and template strike.

D. Provide not less than three 18 gauge (1.0mm) anchors per jamb, or as shown on Drawings, spaced for maximum stiffness. . Provide adjustable 18 gauge (1.0mm) floor clips at each jamb, welded to back face of jamb, punched for securing to floor with two spaced anchors.

E. Make cutouts for required hardware specified under Section 08710, from templates furnished. Reinforce butt cutouts with minimum 8 gauge thick steel plate drilled and tapped and welded in place. When heavy duty hinges are specified, provide high frequency reinforcing at frames for hinges. Coordinate with hardware vendor. Provide strike stops of frames with holes for three rubber door silencers; on double door frames, provide for two silencers per door at head.

F. For openings over 42 inches (1066mm) wide and at double openings, reinforce head members full length with a matching profile of 12 gauge (2.0mm) steel. Provide anchor at midpoint of door, if practical.

2.5 PAINTING

A. Bonderize and prime doors and frames with one shop coat of rust inhibiting primer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install metal door frames plumb, level and rigidly secure in place. Properly brace until built in. Follow recommendations of SDI-100.
B. Fill backs of frames solid with mortar at concrete and masonry construction.

END OF SECTION

SECTION 08331

OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrically operated overhead coiling doors, operators, controls and accessories.

1.2 RELATED SECTIONS

A. Division 5 Sections: Metal Fabrications for steel supports.

B. Division 8 Sections: Hardware, Locks.

C. Division 9 Sections: Finish Painting, Field Painting.

D. Division 16 Sections: Electrical connections and service for powered door operators.

1.3 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Submit manufacturer's product data and installation instructions.

C. Shop Drawings: Provide drawings indicating guide details, head and jamb conditions, clearances, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.

D. Quality Assurance Submittals: Submit the following:

1. Certificates: Submit manufacturer's certificate that products meet or exceed specified requirements.
2. Certificates: Submit installer qualifications.

E. Closeout Submittals: Submit the following:

1. Warranty documents available at www.raynor.com or your Raynor authorized dealer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity, and trained and authorized by the door dealer to perform the work of this Section.

B. Regulatory Requirements and Approvals: Underwriters Laboratories (UL).

C. Installer: Installation of overhead coiling doors shall be performed by the authorized representative of the manufacturer.

D. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one (1) manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

E. Preinstallation Meetings: Verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Progress Meetings Section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 for Product Requirements.

B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.7 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. 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.

1.8 MAINTENANCE

A. Extra Materials: Provide additional material for use by owner in building maintenance. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Project Closeout Section. Service and repair should be performed by an authorized Raynor dealer.

1. Quantity: As indicated on Drawings.

B. Maintenance Service: Submit for Owner's consideration and acceptance maintenance service agreement for products installed

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer: Raynor Door.

1. Contact: P.O. Box 448, 1101 East River Road, Dixon, IL 61021-0448; Telephone: (800) 472-9667, or Contracting Officer or Architect approved equal.

B. Manufacturer Product Designation: FIRECOIL STANDARD.

2.2 DOOR OPERATORS

A. Provide doors designed for electric motor operation.

1. Drive Orientation: For electric motor operated doors, orient the drive from the right-hand side when facing the reference side of the door (side with counterbalance or hood exposed.

B. Manufacturer Product Designation: Raynor PowerHoist Standard (Model Series PHS) or Raynor ControlHoist Standard with Solid State motor controller (Model Series CHS).

1. Type: Jackshaft.
2. Motor Horsepower Rating: Continuous 1/2 HP.
3. Electrical Requirements: 230 volt three phase.
4. Duty Cycle: 30 cycles/hour.
5. Control Wiring: Contractor Style Motor starter 24 volt control with provisions for connection of safety edge to reverse and external radio control hook-up. Three button momentary contact "open-close-stop". Solid State motor controller 24 volt control with provisions to select up to 6 standard wiring types plus delay on reverse, mid stop, maximum run timer, and door lock feature.

2.3 CURTAIN

A. Material: Interlocking steel slats, 22 gauge (0.030 inch minimum thickness), roll-formed from commercial quality hot-dipped galvanized (G-90) steel in compliance with ASTM A-653.

1. Slat Type: Flat Slat.

B. Mounting: Between-Jamb Mounting: fasten between jambs of wall opening.

C. Color and Finish: One finish coat of Gray polyester paint.

D. Endlocks: Lateral movement of the slats to be contained by means of zinc-plated malleable endlocks fastened with two zinc-plated steel rivets.

E. Bottom Bar and Seal: Two roll-formed galvanized steel angles, minimum 2 inches by 2 inches by 3/16 inch (51 mm x 51 mm x 4.8 mm). Structural angle bottom bar to receive one coat of rust-inhibitive primer.

2.4 GUIDES

A. Guide Assemblies: To consist of three structural steel angles, minimum 3 inches by 2 inches by 3/16 inch (76 mm by 51 mm by 4.8 mm) and fitted with removable curtain stops. Steel guides to be provided with one coat of rust-inhibitive primer.

B. Jamb Construction: [Steel Jambs with self-tapping fasteners] [Masonry Jambs with anchor bolt fasteners].

C. Weather Seal: Guide brush seal.

2.5 COUNTERBALANCE SYSTEM

A. Headplates: Minimum 1/4 inch (6.4 mm) steel plate, attached to wall angle of guide assembly with 1/2 inch (12.7 mm) diameter class 5 case hardened bolts. Inside of drive bracket fitted with sealed ball bearing. Provide head plates with one coat of rust-inhibitive primer.

B. Barrel: Minimum 4-1/2 inches (114.3 mm) O.D. and 0.120 inch (3.1 mm) wall thickness structural steel pipe. Deflection of pipe under full load shall not exceed 0.03 inch (0.8 mm) per foot of span.

C. Counterbalance: Provide torsion counterbalance mechanism as follows: Weight Counterbalance.

2.6 ENCLOSURES

A. Hood: Round hood enclosure.

B. Headplate Cover: 24 gauge steel finish-painted to match curtain.

C. Flame Baffle: Provide flame baffle to comply with listing agency.

2.7 RELEASE SYSTEM

A. Descent Control: Rolling fire door operation mechanism shall be disengaged during automatic closing of the door. Descent of door under fire conditions shall be controlled by: Sure Test Viscous Governor (weight counterbalance only).

B. Release Type: Automatic closing of rolling fire door under fire conditions to be initiated by: FireShield (weight counterbalance only).

C. Detection Type: Device used in conjunction with the release type to initiate the automatic closing of rolling fire door: Photoelectronic smoke detector with Heat Sensor Detector.

2.8 HARDWARE

A. Furnish door system with: Interlock switch with cylinder lock.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions and recommendations of door manufacturer.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify through direct observation and field measurement that site conditions are acceptable for installation of doors, operators, controls and accessories. Ensure that openings square, flush and plumb.

B. Do not proceed with installation of doors, operators, controls and accessories until unacceptable conditions are corrected.

3.3 INSTALLATION

A. General: Install door, guide and operating equipment complete with all necessary accessories and hardware according to shop drawings, manufacturer's instructions.

B. Related Products Installation: Refer to Related Sections paragraph for related products installation.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: At Owner's request, provide manufacturer's field service consisting of product installation and use recommendations, and periodic site visits to observe and ensure product installation is done in accordance with manufacturer's recommendations.

3.5 ADJUSTING

A. General: Lubricate bearings and sliding parts and adjust doors for proper operation, balance, clearance and similar requirements.

3.6 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.

END OF SECTION

SECTION 08410

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum doors and frames.

B. Vision glass

C. Door hardware.

D. LEED Requirements:

1. Provide products having recycled content.
2. Provide regional materials.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Steel fabricated attachment devices in framed openings.

B. Section 07900 - Joint Sealers: System perimeter sealant and back-up materials.

C. Section 08710 - Door Hardware: Mortised hardware reinforcement requirements affecting framing members.

D. Section 08800 - Glazing.

1.3 REFERENCES

A. AA (Aluminum Association) - Designation System for Aluminum Finishes.

B. AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

C. AAMA - Curtain Wall Manual #10 - Care and Handling of Architectural Aluminum From Shop to Site.

D. AAMA 603.8 - Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.

E. AAMA 605.2 - Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.

F. AAMA 606.1 - Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum.

G. AAMA 607.1 - Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.

H. AAMA 608.1 - Specification and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum.

I. AAMA SFM-1 - Aluminum Storefront and Entrance Manual.

J. ANSI A117.1 - Safety Standards for the Handicapped.

K. ASTM A36/A36M - Structural Steel.

L. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

M. ASTM A446/A446M - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

N. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

O. ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

P. ASTM E283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.

Q. ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

R. SSPC (Steel Structures Painting Council) - Paint 20 Zinc Rich Coating.

S. SSPC (Steel Structures Painting Council) - Paint 25 Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments).

1.4 SYSTEM DESCRIPTION

A. Aluminum entrances and storefront system includes tubular aluminum sections with supplementary internal support framing, shop fabricated, factory finished, vision glass, glass insulated metal panel infill, related flashings, anchorage and attachment devices.

B. System Assembly: Site assembled. Shop unitized assembly.

1.5 PERFORMANCE REQUIREMENTS

A. System Design: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall:

1. To a design pressure of 70 lb/sq ft inward and 70 lb/sq ft outward acting normal to the plane of the wall.

B. Deflection: Limit mullion deflection to 1/175 of span or ¾"; with full recovery of glazing materials.

C. System Assembly: Accommodate without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.

D. Air Infiltration: Limit air leakage through assembly to 0.06 cfm/min/sq ft (0.0003 cu m/s/sq m) of wall area, measured at a reference differential pressure across assembly of 1.57 psf (75 Pa) as measured in accordance with ASTM E283.

E. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.

F. Water Leakage: None, when measured in accordance with ASTM E331 with a test pressure

difference of 6.24 lbf/sq ft 136.85 N/sq m.

G. Expansion / Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 180 degrees F 100 degrees C over a 12 hour period without causing detrimental effect to system components and anchorage.

H. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

1.6 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details and finishes.

C. Design Data: Provide framing member structural and physical characteristics, calculations, dimensional limitations.

D. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.

E. Submit two samples 6x6 inches in size illustrating finished aluminum surface, glass units, infill panels, glazing materials.

F. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit MR 5.1: For each regional material, including its source.

a. Include statement indicating cost and the fraction by weight that is considered regional.

1.7 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.

B. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.8 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01700 - Project Closeout:

B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

C. Manufacturer’s certifications that materials used comply with recycled content and regional material documentation regarding LEED requirements.

1.9 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA SFM-1 and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Conform to requirements of ANSI A117.1.

C. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum five years experience.

D. Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the place where the Project is located.

1.10 DELIVERY, STORAGE, AND PROTECTION

A. Handle Products of this section in accordance with AAMA - Curtain Wall Manual #10.

B. Protect finished aluminum surfaces with wrapping strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.11 PROJECT CONDITIONS

A. Coordinate the Work with installation of firestopping, air barrier, vapor retarder, and components or materials.

1.12 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C) during and 48 hours after installation.

1.13 WARRANTY

A. Section 01700 - Project Closeout.

B. Correct defective Work within a five year period after Substantial Completion.

C. Warranty: Include coverage for complete system for failure to meet specified requirements.

D. Provide five year minimum manufacturer warranty for glazed units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. YKK AP America, Inc., Austell, GA. 30168; (678) 838-6000

B. Other Acceptable Manufacturers:

1. Amarlite Architectural Products.
2. PPG Industries.
3. Kawneer, Inc.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B221.

B. Sheet Aluminum: ASTM B209.

C. Sheet Steel: ASTM A446.

D. Steel Sections: ASTM A36; shaped to suit mullion sections.

E. Fasteners: Stainless Galvanized steel.

2.3 COMPONENTS

A. Frame: YHS 50-TU, 5” nominal dimension; thermally broken, impact resistant with interior tubular section insulated from exterior; flush applied glazing stops; drainage holes; internal weep drainage system. Frames for interior glazing need not to be thermally broken. Frames to be Dark Bronze; YKK AP YB5N.

B. Reinforced Structural Mullion: nominal dimension; profile of extruded sheet aluminum cladding with internal reinforcement of shaped steel structural section.

C. Doors: 1-3/4 thick, medium stile, wide bottom rail; square glazing stops.

D. Flashings: .026 inch thick minimum dark bronze finish to match mullion sections where exposed.

2.4 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials: As specified in Section 08800 of Types described below:

1. Glass in Exterior Lights:
2. Glass in Interior Lights:
3. Glass in Door
4. Glass Infill Panels:

B. Glazing Materials: As specified in Section 08800. Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.5 SEALANT MATERIALS

A. Sealant and Backing Materials:

1. Sealant Used within System (Structural Silicone Sealant): Type recommended by entrance manufacturer for system.

2.6 HARDWARE

A. Weather Stripping, Sill Sweep Strips, Thresholds, Hinges, Push/Pull Handles, Panic Device, Closer, Manufacturers standard type to suit application, match existing finish.

B. Sill Sweep Strips: Retracting resilient seal type, of neoprene compound.

C. Threshold: Extruded aluminum, one piece per door opening, ribbed non-slip surface.

D. Hinges: Center Swing clear butt type; top and bottom top, intermediate, and bottom.

E. Push/Pull: style.

F. Closer: See Section 08710 - Door Hardware.

G. Cylinder Lock Thumb Turn: See Section 08710 - Door Hardware.

2.7 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners and attachments to conceal from view.

E. Prepare components with internal reinforcement for door hardware and door operator hinge hardware.

F. Reinforce framing members for imposed loads.

2.8 FINISHES

A. Finish Coatings: Conform to AAMA 603.8 AAMA 605.2 AAMA 606.1 AAMA 607.1 AAMA 608.1.

B. Exterior Exposed Aluminum Surfaces: AA, A31, Class II, 0.4 mil thick A41, Class I, 0.7 mil thick, prepared with a mechanical M12 chemical C22 pre-treatment, anodized to clear color.

C. Exposed Aluminum Surfaces: High performance organic fluoropolymer coating, AAMA 605.2 to color as selected.

D. Interior Surface of Infill Panel Surfaces: Field painted in accordance with Section 09900 Anodized to clear color Enamelled to color as selected.

E. Concealed Steel Items: Galvanized in accordance with ASTM A123 to 2.0 oz/sq ft (610 gm/sq m) Primed with iron oxide paint.

F. Apply one coat or coats of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

G. Shop and Touch-Up Primer for Steel Components: SSPC Paint 25 red oxide.

H. Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20 zinc rich.

I. Extent of Finish:

1. Apply factory coating to all surfaces exposed at completed assemblies.
2. Apply finish to surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
3. Apply touch-up materials recommended by coating manufacturer for field application to cut ends and minor damage to factory applied finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Progress Meetings: Verification of existing conditions before starting work.

B. Verify dimensions, tolerances, and method of attachment with other work.

C. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install operating sash.

J. Install flashings.

K. Set thresholds in bed of mastic and secure.

L. Install hardware using templates provided. Refer to Section 08710 for installation requirements.

M. Install glass and infill panels in accordance with Section 08800, to glazing method required to achieve performance criteria exterior wet/dry dry method of glazing.

3.3 ERECTION TOLERANCES

A. Section 01400 - Quality Control: Tolerances.

B. Maximum Variation from Plumb: 0.06 inches every 3 ft (1.5 mm/m) non-cumulative or 1/16 inches per 10 ft (1.5 mm/3 m), whichever is less.

C. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.4 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control; Section 01650 - Starting of Systems: Field inspection, testing, adjusting, and balancing.

B. Inspection will monitor quality of installation and glazing.

3.5 ADJUSTING

A. Section 01700 - Contract Closeout; 01650 - Starting of Systems: Adjusting installed work.

B. Adjust operating hardware and sash for smooth operation.

3.6 CLEANING

A. Section 01700 - Project Closeout: Cleaning installed work.

B. Remove protective material from pre-finished aluminum surfaces.

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by method acceptable to sealant manufacturer.

3.7 PROTECTION OF FINISHED WORK

A. Section 01700 - Project Closeout: Protecting installed work.

B. Protect finished Work from damage.

END OF SECTION

SECTION 08462

AUTOMATIC SLIDING GLASS DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Automatic sliding glass doors as shown on Drawings and as specified within this Section.

B. LEED Requirements:

1. Provide products having recycled content.
2. Provide regional materials.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 07900 - Joint Sealers

B. Section 08410 - Aluminum Entrances and Storefronts

C. Section 08710 - Door Hardware

D. Section 08800 - Glazing

E. Section 09250 - Gypsum Board Systems

1.3 ACCEPTABLE MANUFACTURERS

A. Only those manufacturers regularly engaged in the manufacture of sliding door systems, doors, hardware, and automatic operators will be acceptable. All sliding doors, operators, and hardware shall be Stanley, or approved equal. Where references are made to models, styles, patterns, etc., Stanley is used as a basis for reference only.

1.4 SUBMITTALS

A. Two 4 inch samples showing the PPG Duranar to be provided for the complete sliding glass door system.

C. Shop drawings showing the location and type of each door; the complete framing systems showing sizes and location and methods of attachment; type, location and methods of attachment of all hardware.

D. Manufacturer's literature describing all items provided.

E. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit MR 5.1: For each regional material, including its source.

a. Include statement indicating cost and the fraction by weight that is considered regional.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aluminum Frames and Doors.

1. Aluminum frames and doors shall be fabricated of 6061-T6 alloy. Support beam shall be capable of spanning 15'-0 without intermediate supports.
2. Door carrier(s) shall incorporate two (2) steel roller wheels per active door leaf for operation over a replaceable Delrin track and two (2) anti-rise devices per leaf. Roller wheels shall be double journal with sealed oil impregnated bearings.
3. Vertical jambs shall be 1-3/4" x 4-1/2" extruded aluminum. The header shall be 8-1/8" x 6-1/4" and shall incorporate a continuous integral hinge for header covers.
4. Door leaf fabrication shall be of medium stile extrusions.
5. Door shall have 1/4" laminated clear safety glass. See Section 08800 for glass description.
6. Finish shall be anodized aluminum.

2.3 OPERATION

A. Automatic sliding door Stanley Model #DG 3000 shall be powered by means of an electric motor and mechanical gear assembly transmitted to the active leaf by a cogged drive belt. Chain drive will not be acceptable. The door(s) shall be powered closed after receiving a closing signal from the patented Stan-Guard Detector. The system shall be equipped with emergency release hardware which allows for the active lead and fixed panel to swing out in the direction of egress.

2.4 ACTIVATION AND HOLD OPEN

A. Furnish and install the Eye-Cue system consisting of the following components.

1. Main Microprocessor Control.
2. Adjustable-Pattern Motion Detector(s).
3. One (1) Self-Adjusting Presence Detectors.
4. Tinted Acrylic Housing.
5. Interior Cabling.

B. Operation: The Eye-Cues system shall be center-mounted above the doorway threshold on <u>both</u> <u>sides</u> of the automatic sliding door header and shall provide both motion and presence detection.

C. Presence Detection: The presence zone shall run the complete width of the door opening and shall extend up to 16" on either side of the active leaf. The system shall detect motionless people and/or inanimate objects. The detector shall remain energized and monitor the doorway at all times. The presence detection zone shall not be turned off before or during the door closing cycle.

Microprocessor software controlling presence detection shall be programmed to provide a 'learn mode' so that self-adjustment to changes in floor conditions will be made automatically.

D. Motion Detection: Built into the Stan-Guard system shall be an adjustable motion detection field running the complete width of the doorway and up to 60" out from the doorway. Both presence and motion detection systems shall be capable of operation within -20F (-28C) and 125F (52C), and be unaffected by ambient light, radio, or ultrasonic frequencies. The entire system shall not be impulsed by rain, snow, or frost and shall comply with ANSI Standard 156.10-1985 for detection field sizes and function. Function shall be de-energized through the Stanley position switch system when doors are not in use.

2.5 WATCHDOG (TM) MONITORING

A. Microprocessor software shall be designed to constantly monitor system operations. Should operations deviate from design criteria ranges, the Watch Dog control circuit shall assume command of the system by holding door(s) open. A redundant supervisory circuit shall monitor the main Watch Dog control circuit every 250 door cycles, ready to perform as a back up.

2.6 SLIDING DOOR OPERATOR

A. The Power Glide shall be a microprocessor control, electro-mechanical operator consisting of a DC permanent magnet motor and a mechanical drive assembly. The microprocessor system shall automatically define and set the opening and closing speed and checks of the door system. Mechanical limit switches will not be accepted. The control shall include an adjustable time delay (1 to 60 seconds). Software shall incorporate a self-diagnosing system for easy serviceability.

2.7 ENERGY SAVING DEVICES

A. Through microprocessor programmed intelligence, the Power-glide 3000 system shall automatically regulate door opening size to preset, field-adjustable dimensions in response to traffic volumes. The package shall exceed ASHRAE Standards/IES 90A-1980 for air leakage.

Guarantee: Stanley Automatic Entrance Systems shall be guaranteed to be free of defects in material or workmanship for a period of one (1) year in accordance with Stanley's Limited Warranty.

2.8 4-POSITION SWITCH OFF/EXIT/AUTO/OPEN MODES

A. OPERATION

1. GENERAL: During any power interruption the lock is de-energized, securing door(s) in closed position. Means of egress is accomplished by panic exit devices.
2. SWITCH "OFF" MODE (Maximum Security Position)
   Doors locked. All activities devices including security activating devices are disconnected. Means of egress accomplished by panic device which meets NFPA Life Safety Code 101 and local fire codes.
3. SWITCH "EXIT" MODE (Automatic Egress Position)
   Doors are locked. Exterior activating devices disconnected. Interior activating devices connected, allowing normal automatic egress after which doors are relocked. Security devices and switched are connected allowing controlled ingress.
4. SWITCH "AUTO" MODE (Normal Automatic Position)
   Doors unlocked. Interior and exterior activating devices connected.
5. SWITCH "OPEN" MODE (Hold Open Position)

Doors remain in open position.

2. SUPPLIED BY Stanley

A. Duro Glide 3000 sliding door package.

B. 4-Position Access Security Package consists of: 4-position key switch, tamper proof panic exit device, fail secure lock with impulse blocking, two motion detectors. NOTE: Provide a switch that will accept best cylinder.

PART 3 EXECUTION

3.1 INSPECTION

A. The Contractor shall verify all measurements at the building site and shall be responsible for dimensions, fitting and the proper attachment of sliding door system items directly connected to the entrance, storefront, and adjacent walls installation.

3.2 INSTALLATION

A. All sliding door systems shall be installed plumb, level and in alignment. Frames shall be securely anchored to adjoining construction in accordance with the manufacturer's recommendations and approved shop drawings.

3.3 PROTECTION

A. Sliding Door Systems shall be protected from damage during transportation and shall be stored under cover at the site. After installation, doors and frames shall be protected from damage during subsequent construction activities.

3.4 ADJUSTMENT AND CLEANING

A. After installation and glazing, make final adjustments to ensure all doors and hardware are working properly.

B. After final adjustment, all metal surfaces shall be cleaned in accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 08625

TUBULAR DAYLIGHTING DEVICE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tubular daylighting device, consisting of roof dome, reflective tube, and diffuser assembly; configuration as indicated on the drawings.

B. Accessories.

1.2 RELATED SECTIONS

A. Section 07530 - Electrometric Membrane Roofing: Flashing of skylight base.

B. Section 07600 – Flashing: Metal flashings.

1.3 REFERENCES

A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008a.

C. ASTM A 463/A 463M - Standard Specification for Steel Sheet, Aluminum Coated, by the Hot Dip Process; 2006.

D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized), by the Hot Dip Process; 2007.

E. ASTM E 283 - Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.

F. ASTM E 308 - Standard Practice for Computing the Colors of Objects by Using the CIE System; 2006.

G. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls and Doors; 2002.

H. ASTM E 547 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain walls by Cyclic Air Pressure Difference; 2000.

I. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

J. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricane

K. ASTM D 635 - Test Method for Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position; 2006.

L. ASTM D-1929 - Test Method for Ignition Properties of Plastics; 1996 (2001).

M. UL 181 - Factory Made Air Ducts and Air Connectors

N. ICC AC-16 - Acceptance Criteria for Plastic Skylights; 2008.

O. Florida Building Code TAS 201 – Impact Test Procedures.

P. Florida Building Code TAS 202 – Criteria for Testing Impact and Non Impact Resistant Building Envelope Components Using Uniform Static Air Pressure Loading.

Q. Florida Building Code TAS 203 – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading

1.4 PERFORMANCE REQUIREMENTS

A. Completed tubular daylighting device assemblies shall be capable of meeting the following performance requirements:
   1. Air Infiltration Test: Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
   2. Water Resistance Test: No uncontrolled water leakage at 10.5 psf pressure differential with water rate of 5 gallons/hour/sf when tested in accordance with ASTM E 547.
   3. Uniform Load Test:
      a. No breakage, permanent damage to fasteners, hardware parts, or damage to make daylighting system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 150 psf (7.18 kPa) or Negative Load of 70 psf (3.35 kPa).
      b. All units shall be tested with a safety factor of (3) for positive pressure and (2) for negative pressure, acting normal to plane of roof in accordance with ASTM E 330.
   4. Hurricane Resistance:
      a. Meets Florida Building Code TAS, 201, TAS, 202 and TAS 203 for Impact and non impact components.
      b. Meets ASTM E 1886 and ASTM E1996 for missile and cyclic pressure differential testing.
   5. Fire Testing:
      a. When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the 2006 International Building Code.
      b. Self-Ignition Temperature - Greater than 650 degrees F per ASTM D-1929.
      c. Smoke Density - Rating no greater than 450 per ASTM Standard E 84 in way intended for use. Classification C.
      d. Rate of Burn and/or Extent - Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2 per ASTM D 635.

e. Rate of Burn and/or Extent - Maximum Burn Extent: 1 inch (25 mm) Classification CC-1 per ASTM D 635.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings. Submit shop drawings showing layout, profiles and product components, including anchorage, flashings and accessories.

D. Verification Samples: As requested by Architect.

E. Test Reports: Independent testing agency or evaluation service reports verifying compliance with specified performance requirements.

F. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
1. List of Daylight Credits available for the products specified.
2. Data on Energy Optimization Performance Credits for the products specified.
3. Data on Regional Credits which may be available for the project location. (LEED 2.1)
4. Data on Perimeter and Non-Perimeter Controllability of Systems for use of Daylight Dimmer option with the products specified.
5. Data on potential Innovation in Design Credits which may be available for the innovative use of the products specified.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engaged in manufacture of tubular daylighting devices for minimum 15 years.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 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.

1.9 WARRANTY

A. Daylighting Device: Manufacturer's standard warranty for 10 years.

B. Electrical Parts: Manufacturer's standard warranty for 5 years, unless otherwise indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Solatube International, Inc.; 2210 Oak Ridge Way, Vista, CA 92081. ASD. Tel. Toll Free: 888-765-2882. Tel: (760) 477-1120. Fax: (760) 597-4488. Email: commsales@solatube.com. Web: www.solatube.com.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

D. General Contractor will bear responsibility for costs associated with substitution review.

E. Requests for substitutions will be considered provided a lighting layout with photometric data is supplied to demonstrate light levels will meet original design intent.

2.2 TUBULAR DAYLIGHTING DEVICES

A. Tubular Daylighting Devices General : Transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ICC AC-16.

B. Sola Master Series: Solatube Model 330 DS-O Open Ceiling, 21 inch (530 mm) Daylighting System:
   1. Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
      a. Glazing: Type DA, 0.143 inch (3.7 mm) minimum thickness injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV C), impact modified acrylic blend.
   2. Light Tracker Reflector, made of aluminum sheet, thickness 0.015 inch (0.4 mm) with Spectralight Infinity. Positioned in the dome to capture low angle sunlight.
   3. Roof Flashing Base:
      a. One Piece: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A 653/A 653M or ASTM A 463/A 463M, 0.028 inch (0.7 mm) thick.
         1) Base Style: Type F4, Self mounted, 4 inches (102 mm) high.
         2) Base Style: Type F8, Self mounted, 8 inches (203 mm) high.
         3) Base Style: Type F11, Self mounted, 11 inches (279 mm) high.
         4) Base Style: Type FC, Curb cap, with inside dimensions of 27 inches by 27 inches (685 mm x 685 mm) to cover curb as specified in Section 07600.
      b. Two Piece: Two-piece, inverted flange Metal Roof Flashing for Standing Seam Rib roof profile with greater than 14-3/8 inch (365 mm) minimum distance between ribs permitting a required greater than 2 inch (51 mm)

clearance between flashing and rib: Type FSM. Aluminum 1060 Alloy, corrosion resistant conforming to ASTM B 209, 0.059 inch (1.5 mm) thick.

4. Flashing Insulator: Type FI, Thermal isolation material for use under flashing.
5. Dome Edge Protection Band: Type PB, For fire rated roofs with turret height less than 8 inches (203 mm). Galvanized steel. Nominal thickness of 0.039 inch (1 mm).
6. Roof Flashing Turret Extensions: Provide manufacturer's standard extensions for applications requiring:
   a. Type T12: Additional lengths of 12 inches (300 mm) extension.
   b. Type T24: Additional lengths of 24 inches (600 mm) extension.
   c. Type T36: Additional lengths of 36 inches (900 mm) extension.
   d. Type T48: Additional lengths of 48 inches (1200 mm) extension.
7. Tube Ring: Attached to top of base section; 0.090 inch (2.3 mm) nominal thickness injection molded high impact PVC; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.
8. Tube Ring Seal: Attached to the base of the dome ring; butyl glazing rope, 0.24 inch (6 mm) diameter; to minimize air infiltration.
9. Dome Seal: Adhesive backed weatherstrip, 0.63 inch (16 mm) tall by 0.28 inch (7 mm).
10. Reflective Tubes: Aluminum sheet, thickness 0.018 inch (0.5 mm).
    a. General:
       1) Interior Finish: Spectralight Infinity high reflectance specular finish on exposed reflective surface. Specular reflectance for visible spectrum (400 nm to 760 nm) greater than 99 percent. Total solar spectrum reflectance (400 nm to 2500 nm) less than 80.2 percent.
       2) Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.
    b. Top Tube Angle Adapter, Type TA:
       1) Reflective 45 degree adjustable Top Tube Angle Adapter, 16 inches (406 mm) long.
    c. Bottom Tube Angle Adapter, Type BA:
       1) Reflective 45 degree adjustable Bottom Tube Angle Adapter, 16 inches (406 mm) long
    d. Top Tube Angle Adapter and Bottom Top Tube Angle Adapter Kit, Type AK:
       1) Reflective 45 degree adjustable top and bottom angle adapters (one each), 16 inches (406 mm) long
    e. Extension Tube:
       1) Reflective extension tube, Type EXX, Notched for Open Ceiling diffuser attachment, 24 inches (610 mm) long
    f. Reflective 90 degree Adjustable tube:
       1) Extension Tube Angle Adapter: Provide manufacturer's standard adapters for applications requiring:
          (a) Type A1 one 0 to 90 degree extension tube angle adapter.
          (b) Type A2 two 0 to 90 degree extension tube angle adapters.
11. Diffuser Assemblies for Tubes Not Penetrating Ceilings (Open Ceiling): Solatube Model 330 DS-O. 21 inch (530 mm) diameter diffuser attached directly to bottom of tube.

a. Lens: Type L1 OptiView Fresnel lens design to maximize light output and diffusion. Visible Light Transmission shall be greater than 90 percent at 0.022 inch (0.6 mm) thick. Classified as CC2.
b. Lens: Type L2, Prismatic lens designed to maximize light output and diffusion. Visible Light Transmission shall be greater than 90 percent at 0.100 inch (2.5 mm) thick. Classified as CC2.
c. Diffuser Seal: Open cell foam, acrylic adhesive backed, 0.75 inch (19 mm) wide by 0.125 inch (3.2 mm) thick to minimize condensation and bug, dirt and air infiltration per ASTM E 283.
d. Diffuser Trim Ring: Injection molded acrylic. Nominal wall thickness 0.172 inches (4.4 mm).
e. Secondary Diffuser: Type SS, Acrylic plastic classified as CC2 material. Thickness shall not be less than 0.100 inches.

12. Accessories:
    a. Security Bar: Type B Security Bar 0.375 inch (95 mm) stainless steel bar across flashing diameter opening.
    b. Security Kit: Type SK Dome Security Kit, rivets with nylon spacers to replace dome screws.
    c. Open ceiling trim ring: Type R, Aluminum. Nominal thickness of 0.018 inches (0.5 mm).
    d. Wire Suspension Kit: Type E, Use the wire suspension kit when additional bracing to the structure is required.
    e. Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use: Provided with dimmer switch and cable.
        1) Daylight Dimmer: Type D Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02: circuited, 4 conductor, size 22 cable; providing daylight output between 2 and 100 percent. Provided with dimmer switch and cable.
        2) Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note: only one switch is required per set of synchronously controlled dimmers.
        3) Cable: Type CA, Two conductor low voltage cable (500 foot) for multiple unit DC connection.

2.3 ACCESSORIES

A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.

B. Suspension Wire: Steel, annealed, galvanized finish, size and type for application and ceiling system requirement.

C. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. After installation of first unit, field test to determine adequacy of installation. Conduct water test in presence of Owner, Architect, or Contractor, or their designated representative. Correct if needed before proceeding with installation of subsequent units.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hardware for hollow steel, aluminum storefront doors, and gates.

B. Thresholds.

C. Weatherstripping, seals, and door gaskets.

D. Electrical, Electro-Magnetic, and Electro-Mechanical Locks.

1.2 RELATED SECTIONS

A. Section 06200 - Finish Carpentry: Wood door frames. (Not used)

B. Section 06410 - Custom Casework: Cabinet hardware.

C. Section 08410 - Aluminum Entrances and Storefronts: Hardware for same except cylinders.

D. Section 10441 - Plastic Signs.

E. Section 16123 - Building Wiring and Cable: Power supply to electric hardware devices.

F. Section 16130 - Boxes: Power supply to electric hardware devices.

1.3 RELATED WORK SPECIFIED ELSEWHERE:

A. Finish Carpentry and Cabinets: Section 06200.

1.4 REFERENCES

A. AWI (Architectural Woodwork Institute) - Architectural Woodwork Quality Standards.

B. BHMA (Builders Hardware Manufacturers Association) - A156 series.

C. DHI (Door and Hardware Institute) - A115 series.

D. DHI (Door and Hardware Institute) - WDHS.3 - Architectural Hardware for Wood Flush Doors.

E. NFPA 80 - Fire Doors and Windows.

F. NFPA 101 - Life Safety Code.

G. NFPA 252 - Fire Tests of Door Assemblies.

H. UL 10B - Safety Fire Tests of Door Assemblies.

I. UL 305 - Safety Panic Hardware.

J. Americans with Disabilities Act.

1.5 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Shop Drawings:

1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts, electrical characteristics and connection requirements.
2. Submit manufacturer's parts lists, templates, and local suppliers.
3. Samples will be incorporated into the Work. Samples will be returned to supplier.

1.6 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.

B. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.7 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01700 - Project Closeout: Procedures for submittals.

B. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

C. Keys: Deliver with identifying tags to local facility AAFES General Manager by security shipment direct from hardware supplier.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in AAFES's name and registered with manufacturer.

1.8 SUBMITTALS

A. Material List:

1. Before any finish hardware is ordered or purchased for this project, submit through the Contractor to the Contracting Officer, four copies of the complete list of all finish hardware proposed to be furnished for this work, giving manufacturer’s name and catalog number for each item and cut of item identified.
2. The schedule of materials to be supplied shall have a clear cross reference identifying door location, room number, direction of door swing, door and frame material and hardware items to be installed.
3. This shall in no way be constructed as permitting substitutions other than listed in paragraph 2.12.
4. Make all submittals, and resubmittals if necessary.
5. After approval of schedule, delivery hardware templates and/or physical hardware, as required, to door and frame manufacturers.

B. Manufacturer’s Recommendations: Prior to installation, deliver to all installing personnel, complete recommendations from the manufacturers regarding installation methods.

C. Deliver to the Contracting Officer one copy each of all installation and adjustment instructions for his permanent maintenance files.

1.9 QUALITY ASSURANCE

A. Perform Work in accordance with the following requirements:

1. AWI.
2. BHMA A156 series.
3. DHI - A115 series.
4. DHI - WDHS.3.
5. NFPA 80.
6. NFPA 101.
7. NFPA 252.
8. UL 10B.
9. UL 305.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

C. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with five years experience. approved by manufacturers.

D. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section, check the installation of all finish hardware and make recommendations for adjustments and/or replacements before confirming completeness of the installation.

1.10 PRODUCT HANDLING

A. Packaging:

1. Furnish all finish hardware with each unit clearly marked or numbered in accordance with the Hardware Schedule.
2. Pack each item complete with all necessary pieces and fasteners.
3. Properly wrap and cushion each item to prevent damage during delivery and storage.

B. Delivery:

1. Deliver all finish hardware to the General Contractor in a timely manner to ensure orderly progress of the total work.
2. The General Contractor shall receive, take charge of, and distribute hardware at the building. He shall provide and arrange temporary shelving for the storage of all hardware.
3. The person to whom hardware is delivered will be responsible for the care, preservation, and protection of same until acceptance of the building.

1.11 KEYING - CONTRACTOR FURNISHED/CONTRACTOR INSTALLED

A. Keying: Cylinder locks shall be keyed in sets or subsets as scheduled. Cylinder locks shall be furnished with the manufacturer's standard construction key system. Keys for cylinder locks shall be stamped with change number, and the inscription "U.S. Property - Do Not Duplicate" keys shall be supplied as follows:

B. All locks except those designed to be keyed separately, are to be master keyed in one or more sets and keyed individually. Provide three (3) change keys per lock, three masterkeys for each masterkey group. All keying shall be set to base Grand Masterkey System, which is a component of the Facility Key System. All keying must be coordinated through the Base Civil Engineer Office. Confirm number of masterkey sets and keyed alike sets in

conformance with authority having jurisdiction.

C. All exterior locks shall be construction keyed during project construction by general contractor. Permanent keys for all locks are to be made and given to general manager prior to project completion and beneficial occupancy is accepted. Keys may by sent by registered mail or delivered by supplier and hand receipted to AAFES general manager ONLY. General Manager or representative shall witness change over from construction to permanent keying system and general contractor with general contractor being responsible for having work accomplished.

D. All cylinders for locks, furnished and installed by general contractor, shall be product of one manufacturer.

1.12 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.13 DELIVERY, STORAGE, AND PROTECTION

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.14 PROJECT CONDITIONS

A. Section 01039 - Progress Meetings.

B. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.

C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

D. Coordinate Owner's keying requirements during the course of the Work.

1.15 WARRANTY

A. Section 01700 - Project Closeout.

B. Provide ten (10) year manufacturer warranty for door closers and not less than one year warranty for all locks, exit devices, and electrical devices.

1.16 MAINTENANCE PRODUCTS

A. Section 01700 – Project Closeout.

B. Provide special wrenches and tools applicable to each different or special hardware component.

C. Provide maintenance tools and accessories supplied by hardware component manufacturer.

D. Provide maintenance manual for each type of hardware supplied for use by facility maintenance personnel.

1.17 EXTRA MATERIALS

A. Section 01700 - Project Closeout.

B. Provide three (3) extra key lock cylinders for each master keyed group.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hinges: Stanley, Hagar, McKinney, Lawrence, and Bommer.

B. Pivots: Stanley, Hagar, McKinney, Lawrence, Rixson and LCN.

C. Latch Sets: Best, Arrow, and Falcon (as approved by facility manager).

D. Push/Pulls: Rockwood, Baldwin, Ives, and Hagar.

E. Cylindrical Locks: Best, Arrow, and Falcon (as approved by facility manager).

F. Mortise Locks: Best, Arrow, and Falcon (as approved by facility manager).

G. Lock Cylinders and Padlocks: Best, Arrow, and Falcon (as approved by facility manager).

H. Electric Locks: Security Door Controls, Locknetics, Dynalock, and Von Duprin.

I. Exit Devices: Von Duprin, Monarch, Precision, Sargent, Yale, Corbin-Russwin and Best.

J. Closers: LCN.

K. Overhead Holders: Glynn-Johnson, Rixson, Door Controls International, Architectural Builders Hardware, Corbin-Russwin and Sargent.

L. Floor and Wall Door Stops: Glynn-Johnson, Ives., Rockwood, and Hagar.

M. Manual and Automatic Bolts: Glynn-Johnson, Ives, Rockwood, and Door Controls International.

N. Gasketing: National Guard, Pemko Zero, and Durable.

O. Sliding Door Hardware: Stanley, Grant, and Lawrence.

P. Bi-Folding Door Hardware: Stanley, Grant, and Lawrence.

Q. Protection Plates: Rockwood, Baldwin, Ives, and Hagar.

R. Substitutions: Not permitted.

2.2 FASTENERS

A. General

1. Furnish all hardware with all necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.
2. Furnish fastenings, where necessary, with expansion shields, toggle bolts, sex bolts, and other approved anchors according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer.

B. Design: All fastenings shall harmonize with the hardware as to material and finish.

2.3 FINISHES

A. Finishes: Identified in Schedule at end of section.

2.4 EXIT DEVICES

A. Exit Devices shall be modern type ANSI A156.3 grade 1, and shall meet performance standards established by Underwriters Laboratories for accident hazard and/or fire labeled situations as indicated.

2.5 HINGES

A. Unless otherwise specified, provide 5-knuckle, button tip, full mortise template type butts with non-rising loose pins and plain or ball bearings as follows:

1. Exterior Door Hinges: Stainless steel. Provide extra heavy ANSI A5111 type door hinges with non-removable pins.
2. Interior Door Hinges: Cold rolled steel. ANSI Type A8112, polished and plated to match specified finish. ANSI Type A8133 may be supplied where listed for doors expected to have low frequency operation.
3. Where required to clear trim or permit doors to swing 180 degrees, furnish hinges of sufficient throw.
4. All doors with door closers to have ball bearing hinges as indicated.
5. All doors wider than 3'-0" to have 4 ball bearing extra heavy hinges (.190") 5" x 4½". Doors wider than 4'-0" to have 4 ball bearing hinges 6" x 4½".
6. Supply three hinges for all doors to 7'-6" high and one additional hinge for each additional 2'-6" or fraction thereof.

2.6 LOCKS AND LATCHES

A. Mortise Type:

1. All locksets and latchsets shall be full Mortise Type 1000, Grade 1, in accordance with BHMA/ANSI A156.13.
2. Lockset Escutcheons shall be cold forged bronze .050" thick, approximately 7½" x 2¼", and shall be thru bolted with no visible screws on the entry side of the door.
3. Lever handles shall be approximately 5" long with 3" projection and with unattached end returning to approximately ½" from face of door. Outside levers shall be pinned to the spindle.

B. Cylindrical Type:

1. Where cylindrical locksets and latchsets are in use in existing adjacent work, supply extra heavy duty Type 4000, Grade 1 Cylindrical locks and latches in accordance with ANSI A156.2.
2. Cylindrical locks shall have lever handles approximately 5" long with unattached end returning to approximately ½" from the face of the door and shall have anti-rotation through bolts.
3. Cylindrical lock roses shall be approximately 3½" diameter .

C. General:

1. All locksets and cylinders shall have a minimum of seven pins.
2. All cylinders shall be provided with construction cores. No substitutions will be allowed. Construction cores shall be provided by the Contractor.

3. All locksets and cylinders shall have interchangeable cores.
4. Upon completion of construction, the General Contractor, in company with the Contracting Officer, shall remove construction cores and install operational cores. Construction cores and keys will become property of Contractor.
5. Hardware supplier shall be responsible for providing cylinders with cams of proper configuration and tail pieces as required. Also, the hardware supplier shall communicate with the supplier of electric key switches fabric doors, grilles, etc., to assure that cylinders will function properly where installed.
6. Electro magnetic and solenoid deadlocks shall be as manufactured by Von Duprin or Security Door Controls as indicated.

2.7 EXIT DEVICES

A. Exit Devices shall be modern type ANSI A-156.3 Grade 1, and shall meet performance standards established by Underwriters Laboratories for accident hazard and/or fire labeled situation as indicated.

2.8 SECURITY DEAD LOCKS

A. Auxiliary security dead locks shall be heavy duty type with pivoted saw-resistant dead bolt having 1.41" projection. Locks shall be supplied with strikes as indicated herein.

2.9 DOOR CLOSERS AND ELECTRO-MAGNETIC HOLD-OPEN CLOSERS

A. Furnish flat, rectangular rack and pinion type closers with covers. Size all closers in accordance with the manufacturer's recommendations and good standard practice. All surface mounted closers shall be the product of LCN. Provide all closers with adjustable back check, which at outswinging exterior doors become effective at 70 degrees, allowing door to swing 180 degrees, where conditions permit. Electromagnetic hold-open closers are to connect to the building fire detection system.

2.10 KICK PLATES, MOP PLATES, ARMOR PLATES

A. High pressure laminate kick plates and mop plates .125" x designated height x full width of door minus 1-1/2" on push side, and ½" less than door width on pull side of door. Provide mop plates and kick plates for all doors above hard surface floors.

2.11 DOOR STOPS AND HOLDERS

A. Place door stops at least 2/3 of the distance from hinge edge to lock edge of the door and in such a position that they permit maximum door swing but do not present hazard or obstruction. Wall mounted door bumpers will not be acceptable, except where doors will not contact floor mounted door stops. Provide door stops where noted. Where carpeting occurs, provide appropriate elevators as Glynn Johnson #FB14R. Install no door stops before finished floor covering is in place.

B. Overhead spring cushion type door stops shall be "HD" heavy duty type and shall be correlated with door closers to provide unobstructed operation of both door stop arms and

door closer arms.

2.12 EXIT DOOR SIGNS

A. Exit doors which are provided with dead locks for after hour security shall be provided with signs engraved with 1" letters to read. “This door to remain unlocked when the building is occupied”. In accordance with NFPA 101 Life Safety Code paragraph 5-2, 1.5, exception 2.

2.13 FINISHES

A. Finishes shall be US32D, satin stainless steel or US26D satin chromium, as indicated. The finish of all hardware shall match the finish of the locksets. Special care shall be taken to coordinate all the various manufactured items furnished on this work to ensure an acceptable uniform finish. Spray finished door closers and exit devices shall match other hardware.

2.14 PROPRIETARY PRODUCTS

A. References to specific proprietary products are sued to establish minimum standards of utility and quality. Unless otherwise approved, only the specified products will be approved. Design is based on the materials specified.

2.15 ADJUSTABLE SHELF STANDARD

A. Standards:

1. Double slotted shall be No. 85 with No. 185 steel shelf bracket in brushed or satin chrome finish as manufactured by Knape and Vogt Manufacturing Company.

B. Installation shall be in accordance with manufacturer’s printed instructions.

2.16 OTHER MATERIALS

A. All other materials, not specifically described, but required for a complete and proper finish hardware installation, shall be as selected by the Contractor subject to approval by the Contracting Officer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings. instructed by the manufacturer.

B. Verify that electric power is available to power operated devices and is of the correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions.

B. Use templates provided by hardware item manufacturer.

C. Mounting heights for hardware from finished floor to center line of hardware item:

1. Locksets: 40-5/16" (1023.938 mm).
2. Push: 45" (1143.0 mm).
3. Pulls: 42" (1066.8 mm)
4. Dead Locks: 48" (1219.2 mm).
5. Exit Devices: 40-5/16" (1023.038 mm).

D. Mounting heights for hardware from finished floor to center line of hardware item, refer to:

1. Section 08110
2. Section 08410
3. DHI WDMS.3.
4. DHI A115 Series.

3.3 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant will inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.4 ADJUSTING

A. Section 01700 - Contract Closeout: Adjusting installed work.

B. Adjust hardware for smooth operation.

3.5 PROTECTION OF FINISHED WORK

A. Section 01700 - Contract Closeout: Protecting installed work.

B. Do not permit adjacent work to damage hardware or finish.

3.6 DELIVERIES

A. Stockpile all items sufficiently in advance to ensure their availability and make all necessary deliveries in a timely manner to ensure orderly progress of the total work. Hardware supplier shall correlate hardware delivery requirements with the General Contractor immediately upon receipt of the Contractor’s purchase order.

3.7 INSPECTION OF INSTALLATION

A. Upon completion of the installation, and as a condition of its acceptance, deliver a report signed by the AHC stating that his inspection was made, that all adjustments recommended by him have been completed, and that all finish hardware furnished under this section has been installed and is in optimum working condition.

3.8 HARDWARE SCHEDULE

A. Furnish the following items in the amount indicated on the drawings or required for a complete and operable facility.

B. Hardware sets listed herein are intended to be complete and functional. However, it is the responsibility of the hardware supplier to furnish materials as required and in accordance with manufacturer’s recommendations for best operation and to notify the Contracting Officer of any recommended changes with no reduction in quality.

C. Products listed include quantity, manufacturer name, product description, manufacturer product number US finish, BHMA/ANSI finish, and BHMA/ANSI Product number where available.

3.9 HARDWARE SETS

Group 1

DOOR HINGES – Furnished by Manufacturer with aluminum storefront door

WEATHER STRIPPING – (1 ea) full set

ALUMINUM THRESHOLD – (1 ea) continuous with no offsets across door opening and not to exceed 1/2" in height at which the beveled slope shall not exceed 1:2 or follow the current ADA requirements which ever is more strict.

PANIC DEVICE – Push and Pull bar

CYLINDERS – (1 ea) keyed into the master system as designated. All cylinders shall be Best #1E74; as applicable; no substitutions will be acceptable.

CLOSER – LCN 4110

Group 2

DOOR HINGES - (1-1/2 pair) Stanley FBB179

WEATHER STRIPPING - (1 ea.) Full set.

PEEPHOLE - (1 ea) View from unlocked side of door.

STEEL THRESHOLD - Continuous with no offsets across door opening and not to exceed 1/2" in height at which the beveled slope shall not exceed 1:2 or follow the current ADA requirements, which ever is more strict.

PANIC RIM DEVICE - It shall be a concealed vertical rod, tamper proof, panic hardware connected to the internal alarm system. (Similar to Adams Rite Series 8600/8100)

OVERHEAD CLOSER - Surface mounted, parallel arm with manual hold open device, hand to match door.

RAIN DRIP - (1 ea.) Continuous across door opening.

DOOR SWEEP - (1 ea.) Nylon brush gasketing.

CYLINDER - (1 ea.) Keyed into the master as designated. All cylinders shall be Best #1E74; as applicable; no substitutions will be acceptable.

KICK PLATE - (1 ea.) Half-door, S/S, full width on interior side.

Group 3

DOOR HINGES - (1-1/2 pair) Stanley FBB179

LOCKSET - Stanley 73KC-7-N-15-D-STK-626

OVERHEAD CLOSER – LCN 4110

WALL STOP - Floor mounted

CYLINDER - (1 ea.) Keyed into the master as designated. All cylinders shall be Best #1E74; as applicable; no substitutions will be acceptable.

KICK PLATE - (1 ea.) Half-door, full width on push side.

Group 4

CYLINDER - (1 ea.) Keyed into the master as designated. All cylinders shall be Best #1E74; as applicable; no substitutions will be acceptable.

Group 5

DOOR HINGES - (1-1/2 pair) Stanley FBB179

LOCKSET - Stanley 73KC-7-N-15-D-STK-626

WALL STOP - Floor mounted

CYLINDER - (1 ea.) Keyed into the master as designated. All cylinders shall be Best #1E74; as applicable; no substitutions will be acceptable.

Group 6

DOOR HINGES - (1-1/2 pair) Stanley FBB179

LOCKSET - Stanley 73KC-7-N-15-D-STK-626

OVERHEAD CLOSER – LCN 4010

WALL STOP - Floor mounted

CYLINDER - (1 ea.) Keyed into the master as designated. All cylinders shall be Best #1E74; as applicable; no substitutions will be acceptable.

PUSH PLATE - (1 ea). 8”x16”

PULL - (1 ea).

Group 7

DOOR HINGES - (1-1/2 pair) Stanley FBB179

PUSHPLATE – (1 ea.)

PULL – (1 ea.)

LOCKSET - Stanley 83T-7K-STK-626-CS-ADA Dead Bolt w/removable Best keyed core w/ thumb dead bolt w/removable best keyed core w/ thumb turn on inside

CYLINDER - (1 ea.) Keyed into the master as designated. All cylinders shall be Best #1E74; as applicable; no substitutions will be acceptable.

OVERHEAD CLOSER – LCN 4110

PEEPHOLE - (1 ea) View from unlocked side of door.

KICK PLATE - (2 ea.) Half-door, full width on both sides.

FLUSH BOLT – (2 ea.) On 2' door only at top and bottom.

METAL TRIM OVERLAY – (1 ea.) On 4' door from top to bottom overlay on 2' door when closed.

Group 8

DOOR HINGES - (1-1/2 pair) Stanley FBB179

LOCKSET - Stanley 73KC-7-N-15-D-STK-626

CYLINDER - (1 ea.) Keyed into the master as designated. All cylinders shall be Best #1E74; as applicable; no substitutions will be acceptable.

WALL STOP - Floor mounted

COAT HOOK – Mounted at 54" above finish floor

Group 9

DOOR HINGES - (1-1/2 pair) Stanley FBB179.

WEATHER STRIPPING - (1 ea) full set.

ALUMINUM THRESHOLD - (1 ea) continuous with no offsets across door opening and not to exceed 1/2" in height at which the beveled slope shall not exceed 1:2 or follow the current ADA requirements which ever is more strict.

PANIC RIM DEVICE - It shall be a concealed vertical rod, tamper proof, panic hardware connected to the internal alarm system. (Similar to Adams Rite Series 8600/8100)

SINGLE CYLINDER DEADLOCK – (1 ea) keyed from inside only- no hole outside or use security cover. (Similar to Adams-Rite MS1850 x 1 ½ with MS4002 armored strike. Emergency Exiting override connected to Panic Rim Device.

CYLINDERS - (1 ea) keyed into the master system as designated. All cylinders shall be Best #1E74; as applicable; no substitutions will be acceptable.

DOOR SWEEP - (1 ea.) Nylon brush gasketing.

RAIN DRIP - (1 ea.)

Group 10

DOOR HINGES - (1-1/2 pair) Stanley FBB179

PUSH PLATE - (1 ea).

PULL - (1 ea).

OVERHEAD CLOSER - (1 ea) surface mounted, parallel arm with hold open manually activated, hand to match door.

CYLINDER - (1 ea.) Keyed to installation master system. All cylinders shall be Best #1E74; as applicable; no substitutions will be acceptable.

RAIN DRIP - (1 ea.) Continuous across the door opening.

DOOR SWEEP - (2 ea.) Nylon brush gasketing.

Group 11

DOOR HINGES - (1-1/2 pair) Stanley FBB179

LOCKSET - storeroom type function (ANSI-F86), outside handle fixed, entrance by key only, inside handle is always unlocked.

KICK PLATE - (1 ea.) half door, full width on inside.

Group 12

Self-closing, double action, high impact traffic, double doors. Spring bumpers to match the decorative laminate (light gray) of the door (both sides). Windows to be standard for the door manufacturer.

MISCELLANEOUS

3	Best	Masterkeys	for each master key set
3	Best	Construction Masterkeys	
2	Best	Control Keys	

END OF SECTION

SECTION 08800

GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass and glazing as shown on the drawings and as specified.

B. LEED Requirements:

1. Provide products having recycled content.
2. Provide of regional materials.
3. Provide materials having low VOC content.

1.2 PERFORMANCE REQUIREMENTS

A. Glass and glazing materials shall provide continuity of building enclosure vapor and air barrier.

1. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

B. Glass size is 1-5/16” clear with low e coating on inner panel to achieve 70% UV. Outboard exterior panel to be 1/4” laminated and 1/4” heat strengthened interlayer and shall withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with UBC Chapter 54, as measured in accordance with ANSI/ASTM E330.

C. Limit glass deflection to 1/200 or flexure limit of glass, with full recovery of glazing materials, whichever is less.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Conform to 1994 UBC Chapter 24, to local requirements and to State law.

B. Standards:

1. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
2. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

C. Perform Work in accordance with FGMA Glazing Manual, FGMA Sealant Manual, and Laminators Safety Glass Association - Standards Manual for Glazing Installation Methods.

1.4 SUBMITTALS

A. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit MR 5.1: For each regional material, including its source.

a. Include statement indicating cost and the fraction by weight that is considered regional.

3. Product Data for Credit EQ 4: Including printed statement of VOC content.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Glass Materials: Furnish products of one of the following Manufacturers as approved by YKK AP as the preferred approved manufacturer for the YHS 50 TU system.

1. PPG Industries
2. Pilkington

2.2 GLASS MATERIALS

A. Safety Glass: ASTM C1048, Kind FT fully tempered with horizontal tempering Condition A uncoated, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select; conforming to ANSI Z97.1; 1/4 inch thick laminated minimum.

2.3 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness tested for compatibility with glazing sealant, min. length 4 inches (100mm).

B. Spacers: Neoprene blocks of 40 to 50 Shore A durometer hardness, adhesive backed on one face only and tested for compatibility with specified glazing sealant.

C. Glazing Adhesive: Dow Corning 995 Structural Silicone Sealant; black.

D. Sealant: Non-skimming type, AAMA 803.3.

2.4 MARKINGS

A. Tempered glass shall have each light permanently etched with Manufacturer's name and his compliance with ANSI Z-97.1. Glass shall be free from all manufacturing markings, including tong marks.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine sub-surfaces to receive Work and report detrimental conditions in writing to the Architect. Commencement of Work will be construed as acceptance of sub-surfaces.

B. Examine framing or glazing channel surfaces, backing, removable stop design, and conditions under which glazing is to be performed.

C. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.2 GLAZING METHOD

A. General

1. The vertical glazed curtain wall shall include a dense silicone spacer and silicone sealants at the vertical joint on the exterior and fillet beads at the interior vertical mullion, and shall be captured horizontally by means of an exterior aluminum pressure plate and cover.
2. The horizontals are dry glazed using an interior sponge preset gasket and a dense neoprene preset gasket on the exterior.

B. Clean contact surfaces with solvent.

C. Place setting blocks at 1/4 points.

D. Apply bed of sealant along exterior face on concealed mullions ensuring full contact with glass

E. Rest glass on setting blocks and push against silicone spacers with pressure to ensure full contact. Allowable deviation in vertical joint space to be 1/32" over entire run.

F. Install removable stops, spacer strips inserted between glass and horizontal frames.

G. Fill gap between glass and vertical mullion with sealant to depth equal to bite of frame on glass but not more than 3/8 inch (10mm) flush w/ mullion face.

H. Apply cap bead of sealant along exterior void, to uniform and level line, flush with sight-line. Tool or wipe cap bead surface with solvent for smooth appearance.

3.3 ADJUSTING

A. Remove and replace glass which is broken, cracked, abraded or damaged in any other way during the construction, including natural causes, accidents and vandalism.

3.4 PROTECTION

A. Protect glass from breakage immediately upon installation, by attachment of crossed streamers to framing held away from glass.

B. Do not apply markers of any type to surfaces of glass.

END OF SECTION

SECTION 08835

MIRRORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass mirrors and installation.

B. LEED Requirements:

1. Provide products having recycled content.
2. Provide regional materials.
3. Provide materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 07900 - Joint Sealers: Sealant and back-up material.

B. Section 08800 - Glazing: Glass and glazing.

C. Section 10800 - Toilet and Bath Accessories: Mirrors.

1.3 REFERENCES

A. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

B. ASTM C920 - Elastomeric Joint Sealants.

C. ASTM C1036 - Flat Glass.

D. FGMA - Glazing Manual.

E. FGMA - Sealant Manual.

F. NAMM (National Association of Mirror Manufacturers) - Tips For the Professional on the Care and Handling of Mirrors.

1.4 PERFORMANCE REQUIREMENTS

A. Limit mirrored glass deflection to 1/200or flexure limit of glass with full recovery of glazing materials, whichever is less.

1.5 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Product Data on Mirror Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit MR 5.1: For each regional material, including its source.

a. Include statement indicating cost and the fraction by weight that is considered regional.

3. Product Data for Credit EQ 4: Including printed statement of VOC content.

1.6 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with FGMA Glazing Manual and FGMA Sealant Manual for glazing installation methods

.

B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with NAMM - Tips For the Professional on the Care and Handling of Mirrors.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Material and Equipment: Environmental conditions affecting products on site.

B. Do not install glazing when ambient temperature is less than 40 degrees F (8 degrees C).

C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.9 WARRANTY

A. Section 01700 - Contract Closeout.

B. Provide a five (5) year warranty to include coverage for reflective coating on mirrors and replacement of same.

1.10 EXTRA MATERIALS

A. Section 01700 - Contract Closeout.

PART 2 PRODUCTS

2.1 MIRROR MATERIALS

A. Manufacturers:

1. Guardian Industry. Designation GI.
2. Pilkington
3. Pittsburgh Plate Glass Company. Designation PPG.
4. Substitutions: Refer to Section 01600.

B. Mirror Glass (Type MR-A): Clear float tempered safety type with copper and silver coating, organic overcoating square and lapped edges, 1/4” thick.

2.2 GLAZING COMPOUNDS

A. Manufacturers:

1. Pecora Corporation.
2. Tremco.
3. Substitutions: Refer to Section 01600.

B. Acrylic Sealant (Type GC-C): ASTM C920, Type S, Grade NS, Class single component, solvent curing, non-bleeding; cured Shore A hardness of 15 to 25 clear color as selected.

C. Silicone Sealant (Type GC-F): ASTM C920, Type S, Grade NS, single component; chemical solvent curing; capable of water immersion without loss of properties; non-bleeding, non-staining, cured Shore A hardness of 15 to 25; clear color as selected.

2.3 GLAZING ACCESSORIES

A. Mirror Attachment Accessories: Stainless steel J-profile channels continuous top and bottom.

B. Mirror Adhesive: Chemically compatible with mirror coating and wall substrate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings for mirrored glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive mirrors.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealant in accordance with manufacturer's instructions.

3.3 INSTALLATION - GENERAL

A. Set mirrors plumb and level, free of optical distortion.

B. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

3.4 CLEANING

A. Section 01700 - Contract Closeout: Cleaning installed work.

B. Remove wet glazing materials from finish surfaces.

C. Remove labels after Work is complete.

D. Clean mirrors and adjacent surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Section 01700 - Contract Closeout: Protecting installed work.

B. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 09111

METAL STUD FRAMING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formed metal stud framing and misc. framing at interior locations.

B. Framing accessories.

C. LEED Requirements:

1. Provide products having recycled content.
2. Provide regional materials.

1.2 RELATED SECTIONS

A. Section 05400 - Cold-Formed Metal Framing: Structural load bearing metal stud framing.

B. Section 05500 - Metal Fabrications: Metal fabrications attached to stud framing.

C. Section 06114 - Wood Blocking and Curbing: Rough wood blocking within stud framing.

D. Section 07213 - Batt Insulation: Insulation within framing members.

E. Section 09260 - Gypsum Board Systems: Metal studs for partitioning.

1.3 REFERENCES

A. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM A525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

C. ASTM A591 - Steel Sheet, Cold-Rolled, Electrolytic Zinc-Coated.

D. GA 203 - Installation of Screw-Type Steel Framing Members to Receive Gypsum Board.

E. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.

1.4 SYSTEM DESCRIPTION

A. Metal stud framing system for interior partition walls.

B. Maximum Allowable Deflection: 1/360 span.

C. Design wall system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

D. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data describing standard framing member materials and finish, product criteria, load charts, limitations, and special conditions.

C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and fasteners.

D. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit MR 5.1: For each regional material, including its source.

a. Include statement indicating cost and the fraction by weight that is considered regional.

1.6 COORDINATION

A. Coordinate with the placement of components within the stud framing system, specified in Section 06112 Framing and Sheathing, 06114 Wood Blocking, 06410 Custom Casework, 08710 Door Hardware, Division 10, and Division 15.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. United States Gypsum Company.

B. Gold Bond, Division of National Gypsum Company.

2.2 STUD FRAMING MATERIALS

A. Studs: ASTM A525 ASTM A591, non-load bearing rolled steel, channel shaped, punched for utility access, as scheduled. as follows:

1. Depth: 1-5/8, 2-1/2, 3-5/8, 4, 6 inches Refer to Structural and Architectural Drawings for usage.
2. Thickness: Verify with structural drawings for gage to be used.

B. Runners: Of same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud. Ceiling Runners: With extended leg retainer.

C. Furring and Bracing Members: Of same material as studs; thickness to suit purpose.

D. Fasteners: GA 203. Self drilling, self tapping screws.

E. Sheet Metal Backing: 20 gage (0.9 mm thick) galvanized steel for reinforcement.

F. Anchorage Devices: Power actuated. Drilled expansion bolts. Screws with sleeves.

G. Touch-Up Primer for Galvanized Surfaces: SSPC - Paint 20 Type I Inorganic Type II Organic zinc rich

2.3 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.

B. Fit and assemble in largest practical sections for delivery to site, ready for installation.

2.4 FINISHES

A. Studs: Galvanize to G90 G60 coating class. Electro-galvanized.

B. Tracks and Headers: Galvanize to G90 G60 coating class. Electro-galvanized.

C. Accessories: Same finish as framing members. ASTM A123, hot dip galvanized to 1.25-oz/sq ft (380 gm/sq m).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that conditions are ready to receive work.

B. Verify that rough-in utilities are in proper location.

3.2 ERECTION

A. Align and secure top and bottom runners at 24 inches (600 mm) oc.

B. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

C. Install studs vertically at 12, 16, and 24 inches on center. Refer to Structural drawings.

D. Align stud web openings horizontally.

E. Secure studs to tracks using method recommended by stud manufacturer. Do not weld.

F. Stud splicing not permissible. Splice studs with 8 inch (200 mm) nested lap, secure each stud flange with flush head screw.

G. Fabricate corners using a minimum of three studs.

H. Double stud at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.

I. Brace stud framing system rigid.

J. Coordinate erection of studs with requirements of door frames, window frames, and install supports and attachments.

K. Coordinate installation of wood bucks, anchors, and wood blocking with electrical and mechanical work to be placed within or behind stud framing.

L. Blocking: Secure wood blocking to studs. Secure steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and

M. Extend stud framing past ceiling. Attach stud runner securely to brace off structural framing above in accordance with manufacturer's instructions.

O. Refer to Drawings for indication of partitions extending to finished ceiling only and for partitions extending through the ceiling to the structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.

P. Coordinate placement of insulation in stud spaces made inaccessible after stud framing erection.

3.3 ERECTION TOLERANCES

A. Maximum Variation of any Member from Plane: 1/8 inch

END OF SECTION

SECTION 09260

GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal stud wall framing.

B. Metal channel ceiling framing.

C. Acoustical insulation.

D. Gypsum board.

E. Gypsum sheathing.

F. Cementitious backer board.

G. Taped and sanded Batten joint treatment.

H. Texture finish.

I. LEED Requirements:

1. Provide Use of products having recycled content.
2. Provide regional materials.
3. Provide materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 05400 - Cold Formed Metal Framing.

B. Section 06114 - Wood Blocking and Curbing.

C. Section 07213 - Batt Insualation.

D. Section 09111 - Metal Stud Framing System.

E. Section 09900 - Painting: Surface finish.

1.3 REFERENCES

A. ASTM C36 - Gypsum Wallboard.

B. ASTM C79 - Gypsum Sheathing Board.

C. ASTM C442 - Gypsum Backing Board and Core Board.

D. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.

E. ASTM C514 - Nails for the Application of Gypsum Wallboard.

F. ASTM C557 - Adhesive for Fastening Gypsum Wallboard to Wood Framing.

G. ASTM C630 - Water Resistant Gypsum Backing Board.

H. ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.

I. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

J. ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.

K. ASTM C840 - Application and Finishing of Gypsum Board.

L. ASTM C931 - Exterior Gypsum Soffit Board.

M. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board.

N. ASTM E90 - Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

O. ASTM E119 - Fire Tests of Building Construction and Materials.

P. GA-201 - Gypsum Board for Walls and Ceilings.

Q. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.

R. GA-600 - Fire Resistance Design Manual.

1.4 SYSTEM DESCRIPTION

A. Acoustical Attenuation for Identified Interior Partitions: STC in accordance with ASTM E90.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate special details associated with fireproofing, acoustical seals, expansion.

C. Product Data: Provide data on metal framing, gypsum board, joint tape batten; decorative finish.

D. Samples: Submit two samples of predecorated gypsum board, 6x6 inch in size illustrating finish color and texture.

E. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit MR 5.1: For each regional material, including its source.

a. Include statement indicating cost and the fraction by weight that is considered regional.

3. Product Data for Credit EQ 4: Including printed statement of VOC content.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C840 and GA-600.

1.7 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum five years experience.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assemblies in conjunction with Section 05400 09111.

PART 2 PRODUCTS

2.1 MANUFACTURERS - GYPSUM BOARD SYSTEM

A. United States Gypsum Co.; USG

B. Other acceptable manufacturers offering equivalent products.

1. Georgia - Pacific Corp.
2. National Gypsum Co.

2.2 FRAMING MATERIALS

A. Fasteners: ASTM C514. ASTM C1002. GA-216.

B. Anchorage to Substrate: Tie wire, nails, screws and other metal supports, of type and size to suit application; to rigidly secure materials in place.

C. Adhesive: ASTM C557.

2.3 GYPSUM BOARD MATERIALS

A. Standard Gypsum Board: ASTM C36; 1/4, 1/2 , 5/8 inch thick, maximum permissible length; ends square cut, tapered tapered and beveled square round edges.

1. USG Fiberock Brand Abuse-Resistant Gypsum Interior Panels.

B. Fire Rated Gypsum Board: ASTM C36; fire resistive type, UL rated; 5/8 inch thick, maximum permissible length; ends square cut, tapered and beveled square round edges.

1. USG Fiberock Brand Abuse-Resistant Gypsum Interior Panels.

C. Moisture Resistant Gypsum Board: ASTM C630; 1/2, 5/8 inch thick, maximum permissible length; ends square cut, tapered tapered and beveled square round edges.

1. USG Fiberock Brand Tile Backerboard.

D. Exterior Gypsum Soffit Board: ASTM C931; standard fire rated type, 1/2 5/8 inch thick, maximum permissible length; ends square cut, tapered tapered and beveled square round edges.

E. Gypsum Sheathing Board: ASTM C79; moisture resistant and fire resistant type; 1/2, 5/8 inch thick, maximum permissible length; ends square cut, square book tongue and grooved edges; water repellent paper faces.

1. USG Fiberock Brand Aqua Tough Sheathing Panels.

F. Cementitious Backing Board: High density, glass fiber reinforced, 1/2 inch thick; 2 inch wide, coated glass fiber tape for joints and corners.

1. USG Durock Brand Cement Board.

2.4 MANUFACTURERS - PREDECORATED GYPSUM BOARD

A. Manufacturers:

1. United States Gypsum Co.; USG

B. Gypsum Board: ASTM C36; standard fire rated type; 3/8 1/2 5/8 inches thick, maximum permissible length; paper bound edges and ends square cut.

C. Batten Joints: Manufacturer's standard type.

2.5 ACCESSORIES

A. Acoustical Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced, 6” thick.

B. Acoustical Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

C. Corner Beads: Metal. Metal and paper combination.

D. Edge Trim: GA 201 and GA 216; Type LC L LK U exposed reveal bead.

E. Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive, and water.

F. Textured Finish Materials: Latex based texturing material, containing silver gold color metallic glitter, containing fine aggregate.

G. Fasteners: ASTM C1002, Type S12 W.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings. instructed by the manufacturer.

3.2 WALL FURRING INSTALLATION

A. Erect wall furring for direct attachment to concrete block.

B. Install thermal insulation in conjunction with Section 07212 and 07213 between Z-furring channels directly attached to concrete masonry in accordance with manufacturer's instructions.

C. Erect free-standing metal stud framing tight to spaced verify required inches from concrete, concrete masonry walls, attached by adjustable furring brackets in accordance with manufacturer's instructions.

3.4 FURRING FOR FIRE RATINGS

A. Install furring as required for fire resistance ratings indicated and to GA-600 requirements.

3.5 CEILING FRAMING INSTALLATION

A. Install in accordance with ASTM C754. and manufacturer's instructions.

B. Coordinate location of hangers with other work.

C. Install ceiling framing independent of walls, columns, and above ceiling work.

D. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches (600 mm) past each end of openings.

E. Laterally brace entire suspension system.

3.6 ACOUSTICAL ACCESSORIES INSTALLATION

A. Install resilient channels at maximum 24 inches (600 mm) on center. Locate joints over framing members.

B. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.

C. Install acoustical sealant at gypsum board perimeter at:

1. Metal Framing: One Two beads.
2. Base Layer.
3. Face Layer.
4. Calk all penetrations of partitions by conduit, pipe, duct work, rough-in boxes.

3.7 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with GA-201, GA-216 GA-600 and manufacturer's instructions.

B. Erect single layer standard gypsum board in most economical direction horizontal vertical, with ends and edges occurring over firm bearing.

C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.

D. Erect exterior gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing.

E. Use screws when fastening gypsum board to metal furring or framing.

F. Double Layer Applications: Use gypsum backing board for first layer, placed perpendicular parallel to framing or furring members. Use fire rated gypsum backing board for fire rated partitions.

G. Place second layer perpendicular parallel to first layer. Offset joints of second layer from joints of first layer.

H. Erect exterior gypsum soffit board perpendicular to supports, with staggered end joints over supports.

I. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

J. Place control joints consistent with lines of building spaces as indicated.

K. Place corner beads at external corners as indicated. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials as indicated.

L. Install backing board over metal studs plywood sheet gypsum board in accordance with manufacturer's instructions.

M. Apply gypsum board to curved walls in accordance with GA-216.

3.8 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch (0.8 mm).

C. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.

D. Tape joints and corners of cementitious backing board.

3.9 TEXTURE FINISH

A. Spray, Trowel, Roller, Brush, apply finish texture coating in accordance with manufacturer's instructions.

3.10 PREDECORATED GYPSUM BOARD FINISH

A. Erect predecorated gypsum board vertically, with exposed batten fastening system.

B. Erect in accordance with manufacturer's instructions.

3.11 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

SECTION 09306

FLOOR TILE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ceramic and Quarry Paver tile floor and base finish using the thinset mortar bed application method.

B. LEED Requirements:

1. Use of products having recycled content.
2. Use of regional materials.
3. Use materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 07900 - Joint Sealers: Mildew resistant sealant.

1.3 REFERENCES

A. ANSI A108.1 - Installation of Ceramic Tile with Portland Cement Mortar.

B. ANSI A108.3 - Quarry Tile and Paver Tile Installed With Portland Cement Mortar.

C. ANSI A108.4 - Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive.

D. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

E. ANSI A108.6 - Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy.

F. ANSI A108.8 - Installation of Ceramic Tile with Chemical Resistant Furan Mortar and Grout.

G. ANSI A108.9 - Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.

H. ANSI A108.10 - Installation of Grout in Tilework.

I. ANSI A118.1 - Dry-Set Portland Cement Mortar.

J. ANSI A118.3 - Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.

K. ANSI A118.4 - Latex-Portland Cement Mortar.

L. ANSI A118.5 - Chemical Resistant Furan Mortars and Grouts for Tile Installation.

M. ANSI A118.6 - Ceramic Tile Grouts.

N. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.

O. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile.

P. ANSI A137.1 - Standard Specifications for Ceramic Tile.

Q. TCA (Tile Council of America) - Handbook for Ceramic Tile Installation.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, and setting details.

C. Product Data: Provide instructions for using adhesives and grouts.

D. Samples: Mount tile and apply grout on two plywood panels, 12x12 inch in size illustrating pattern, color variations, and grout joint size variations.

1.5 MAINTENANCE DATA

A. Submit under provisions of Section 01300.

B. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI A137.1.

B. Conform to TCA Handbook, ANSI A108.1, ANSI A108.3, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years experience.

B. Installer: Company specializing in performing the work of this section with minimum five years experience approved by manufacturer.

1.8 PRE-INSTALLATION CONFERENCE

A. Convene one week prior to commencing work of this section, under provisions of Section 01039.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in an unventilated environment.

B. Maintain 50 degrees F (10 degrees C) during installation of mortar materials.

1.11 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Furnish quantity of full size units equal to 3 percent of amount installed of each size, color, and surface finish of tile specified.

PART 2 PRODUCTS

2.1 TILE MANUFACTURERS

A. Dal-Tile, Inc.
B. Graniti Fiandre

2.2 CERAMIC TILE MATERIALS

A. Ceramic Mosaic Floor Tile: TCA A137.1, conforming to the following:

1.	Moisture Absorption	0 to 0.5 0.5 to 3.0 over 3.0 percent
2.	Size	13 inch x13 inch
3.	Shape	square
4.	Edge	square
5.	Surface Finish	unpolished
6.	Color	Brune #MI-22

B. Ceramic Floor Tile: (Burger King Dining and Toilet room areas)

1.	Size:	12 inch X 12 inch
2.	Shape:	square
3.	Edge:	square
4.	Color:	Copper Red #TS003M12
5.	Grout Color:	43 Chocolate Truffle

2.3 QUARRY PAVER MATERIALS (Burger King Kitchen area)

A. Quarry Tile:

1.	Size	6 inch X 6 inch
2.	Shape	square
3.	Edge	square
4.	Surface Finish	abrasive, non slip
5.	Color	Commercial Red

2.4 ADHESIVE MATERIALS

A. Manufacturers:

1. Dal-Tile, Inc.

B. Organic Adhesive: ANSI A136.1, Type I II, thin set bond type.

2.5 MORTAR MATERIALS

A. Manufacturers:

1. Dal-Tile, Inc.

B. Mortar Materials: ANSI A118.1 Dry Set, ANSI A118.4 Latex Modified, Portland cement, sand, latex additive, and water.

2.6 GROUT MATERIALS

A. Manufacturers:

1. Dal -Tile, Inc.

B. Grout: ANSI A118.6, tile grout, color as selected by Architect or specified on the drawings.

2.7 ACCESSORIES

A. Membrane: No. 15 (6.9 kg) asphalt saturated felt. 4 mil (0.1 mm) thick polyethylene film. Reinforced asphalt paper.

B. Thresholds: Extruded aluminum with integral edge strip, bullnosed edge.

C. Tile Floor Edging:

2.8 MORTAR MIX AND GROUT MIX

A. Mix and proportion cementitious materials for site made slurry coat, mortar bed and bond coat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.2 PREPARATION

A. Protect surrounding work from damage or disfiguration.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Apply sealer conditioner to substrate surfaces in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION - THINSET METHOD

A. Install adhesive tile, thresholds, and grout in accordance with manufacturer's instructions and TCA Handbook.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Place thresholds edge strips at exposed tile edges. locations indicated.

D. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base and wall joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep expansion control joints free of adhesive or grout. Apply sealant to joints.

H. Allow tile to set for a minimum of 48 hours prior to grouting.

I. Grout tile joints.

J. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 CLEANING

A. Clean work under provisions of 01700.

B. Clean tile and grout surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Section 01500.

B. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09307

WALL TILE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ceramic Mosaic tile wall and base finish using the thinset mortar bed application method.

B. Cementitious backing board.

C. LEED Requirements:

1. Provide products having recycled content.
2. Provide regional materials.
3. Provide materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 0960- Gypsum Board Systems: Wall substrate surface.

B. Section 09220 - Portland Cement Plaster: Base coat for tile finish.

C. Section 07900 - Joint Sealers: Mildew resistant sealant.

D. Section 09306 - Floor Tile.

1.3 REFERENCES

A. ANSI A108.1 - Installation of Ceramic Tile with Portland Cement Mortar.

B. ANSI A108.3 - Quarry Tile and Paver Tile Installed With Portland Cement Mortar.

C. ANSI A108.4 - Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive.

D. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

E. ANSI A108.6 - Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy.

F. ANSI A108.8 - Installation of Ceramic Tile with Chemical Resistant Furan Mortar and Grout.

G. ANSI A108.9 - Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.

H. ANSI A108.10 - Installation of Grout in Tilework.

I. ANSI A118.1 - Dry-Set Portland Cement Mortar.

J. ANSI A118.3 - Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.

K. ANSI A118.4 - Latex-Portland Cement Mortar.

L. ANSI A118.5 - Chemical Resistant Furan Mortars and Grouts for Tile Installation.

M. ANSI A118.6 - Ceramic Tile Grouts.

N. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.

O. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile.

P. ANSI A137.1 - Standard Specifications for Ceramic Tile.

Q. TCA (Tile Council of America) - Handbook for Ceramic Tile Installation.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, and setting details.

C. Product Data: Provide instructions for using adhesives and grouts.

D. Samples: Mount tile and apply grout on two plywood panels, 24 x 24inch in size illustrating pattern, color variations, and grout joint size variations.

E. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit MR 5.1: For each regional material, including its source.

a. Include statement indicating cost and the fraction by weight that is considered regional.

3. Product Data for Credit EQ 4: Including printed statement of VOC content.

1.5 MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI A137.1.

B. Conform to TCA Handbook, ANSI A108.1, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three five years experience.

B. Installer: Company specializing in performing the work of this section with minimum five years experience.

1.8 PRE-INSTALLATION CONFERENCE

A. Convene one week prior to commencing work of this Section, under provisions of Section 01039.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in an unventilated environment.

B. Maintain 50 degrees F (10 degrees C) during installation of mortar materials.

1.11 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Furnish quantity of full-sized units equal to 3 percent of amount installed of each size, color, and surface finish of tile specified.

PART 2 PRODUCTS

2.1 TILE MANUFACTURERS

A. Dal-Tile Corp.

B. Substitutions: Under provisions of Section 01600.

2.2 CERAMIC TILE MATERIALS

A. Wall Tile: ANSI A137.1, conforming to the following:

1.	Moisture Absorption	0 to 0.5
2.	Size	13” x 13” x 3/8”

3.	Shape	square
4.	Edge	square
5.	Surface Finish	unglazed
6.	Color	Brune #M122

B. Wall Tile: ANSI A137.1, conforming to the following:

1.	Moisture Absorption	0 to 0.5
2.	Size	6” x 6’ x 3/8”
3.	Shape	square diagonal
4.	Edge	square
5.	Surface Finish	unglazed
6.	Color	Cream SC 40

C. Wall Tile: ANSI A137.1, conforming to the following:

1.	Moisture Absorption	0 to 0.5
2.	Size	3” x 3” x 3/8”
3.	Shape	square
4.	Edge	square
5.	Surface Finish	unglazed
6.	Color	Veranda Leather P506

D. Wall Tile: ANSI A137.1, conforming to the following (QSR-1)

1.	Moisture Absorption	0 to 0.5
2	Size	12” x 12”
3.	Shape	square
4.	Edge	square
5.	Surface Finish	glazed
6.	Color	Aspen Lodge-Golden Ridge AL61
7.	Accent Tile:	Daltile Aspen Lodge-Golden Ridge AL61

2.3 BASE MATERIALS

A. Base: Match floor tile for moisture absorption, surface finish, and color: (Burger King kitchen)

1.	Length	tile length 6 inch
2.	Height	5 inch
3.	Top Edge	bull nosed
4.	Internal Corner	coved
5.	External Corner	square
6.	Color	Red Blaze Q40

2.4 ADHESIVE MATERIALS

A. Manufacturers:

1. Dal-Tile Corp.
2. Laticrete International Inc.

B. Organic Adhesive: ANSI A136.1, Type I II, thinset bond type.

2.5 MORTAR MATERIALS

A. Manufacturers:

1. Dal-Tile Corp..
2. Laticrete International Inc.

B. Mortar Materials: ANSI A118.1 Dry Set, ANSI A118.4 Latex Modified Portland cement, sand, latex additive and water.

2.6 GROUT MATERIALS

A. Manufacturers:

1. Dal-Tile Corp.
2. Laticrete International Inc.

B. Grout: Silicone sealant, moisture and bacteria resistant type, as specified in Section 07900 color as selected.

2.7 ACCESSORIES

A. Membrane: No. 15 (6.9 kg) asphalt saturated felt. 4 mil (0.1 mm) thick polyethylene film. Reinforced asphalt paper.

B. Reinforcing Mesh: 2 x 2 size weave of 16/16 wire size; welded fabric, galvanized.

C. Backing Board: High density, cementitious, glass fiber reinforced, 1/2 inch (13 mm) thick; 2 inch (50 mm) wide coated glass fiber tape for joints and corners.

2.8 MORTAR MIX AND GROUT MIX

A. Mix and proportion cementitious materials for site made slurry coat, mortar bed and bond coat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.2 PREPARATION

A. Protect surrounding work from damage or disfiguration.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Apply sealer conditioner to substrate surfaces in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION - THINSET METHOD

A. Install adhesive tile and grout in accordance with manufacturer's instructions and TCA Handbook Method Number.

B. Install backing board over metal studs over gypsum board in accordance with board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

C. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

D. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base and wall joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

F. Form internal angles square coved and external angles bullnosed square.

G. Install ceramic accessories rigidly in prepared openings.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep expansion control joints free of adhesive or grout. Apply sealant to joints.

J. Allow tile to set for a minimum of 48 hours prior to grouting.

K. Grout tile joints.

L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - MORTAR BED METHOD

A. Install mortar bed, tile, and grout in accordance with manufacturer's instructions and TCA Handbook Method.

B. Install membrane; lap and seal watertight, edges and ends.

C. Install metal lath in accordance with TCA Handbook.

D. Apply mortar bed over surfaces to a thickness of 5/8 inch thick.

E. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

F. Form internal angles square coved and external angles bullnosed square.

G. Cut and fit tile tight to penetrations through tile. Ensure finish trim will cover cut tile edges. Form corners and bases neatly. Align floor, base and wall joints.

H. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar or excess grout.

I. Install ceramic accessories rigidly in prepared openings.

J. Sound tile after setting. Replace hollow sounding units.

K. Keep expansion control joints free of mortar or grout. Apply sealant to joints.

L. Allow tile to set for a minimum of 48 hours prior to grouting.

M. Grout tile joints.

N. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.5 CLEANING

A. Clean work under provisions of 01700.

B. Clean tile and grout surfaces.

END OF SECTION

SECTION 09511

SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system and perimeter trim.

B. Acoustical tile.

C. Non-fire rated Fire rated assembly.

D. Supplementary acoustical insulation over system units.

E. Large suspended open metal grid over Snack Ave. & Class Six areas.

F. LEED Requirements:

1. Provide products having recycled content.
2. Provide materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 07213 - Batt Insulation.

B. Section 15501 - Wet Automatic Fire Sprinkler.

C. Section 16500 - Lighting

1.3 REFERENCES

A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

C. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

D. ASTM E1264 - Classification of Acoustical Ceiling Products.

E. Ceilings and Interior Systems Contractors Association (CISCA) - Acoustical Ceilings: Use and Practice.

F. UL - Fire Resistance Directory and Building Material Directory.

1.4 SYSTEM DESCRIPTION

A. Installed System: Conform to UL Design for ceiling and floor ceiling and roof assembly.

B. Suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system.

C. Product Data: Provide data on metal grid system components, acoustical units.

D. Samples: Submit two architectural size samples 12x12 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, edge trim.

F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

G. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit EQ 4: Including printed statement of VOC content.

1.6 QUALIFICATIONS

A. Grid Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years experience.

B. Acoustical Unit Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assembly and combustibility requirements for materials.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.9 SEQUENCING

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust-generating activities have terminated, and overhead work is completed, tested, and approved.

B. Install acoustical units after interior wet work is dry.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Provide 1 carton for every 100 sq. ft. of total acoustical unit area of extra tile/panels for installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS - SUSPENSION SYSTEM

A. Armstrong World Industries, Inc.

B. Hunter-Douglas, Inc.

C. USG Interiors, Inc.

2.2 SUSPENSION SYSTEM MATERIALS

A. Fire Rated Grid: ASTM C635, light intermediate heavy duty, listed by UL for use in a 1 hour assembly, two directional concealed exposed T exposed T/one direction; components die cut and interlocking.

B. Grid Materials: Commercial quality cold rolled steel with galvanized coating. Cold rolled aluminum. Extruded aluminum.

C. Exposed Grid Surface Width: 15/16.

D. Grid Finish: White Anodized color as selected.

E. Accessories: Stabilizer bars clips splices edge moldings hold down clips and required for suspended grid system.

F. Support Channels and Hangers: Galvanized Primed steel; size and type to suit application , seismic requirements, and ceiling system flatness requirement specified.

2.3 MANUFACTURERS - ACOUSTICAL UNITS

A. Armstrong World Industries, Inc.

B. The Celotex Corporation

C. USG Interiors, Inc.

2.4 ACOUSTICAL UNIT MATERIALS

A. Acoustical Tile: ASTM E1264

1. Size: 24” x 24” inches
2. Thickness: 5/8 inches
3. Armstrong Hi-Lr Ultima RH 90

2.5 ACCESSORIES

A. Acoustical Batt Insulation: Specified in Section 07213, unfaced; 2 inch thick.

B. Gypsum Board: UL fire rated type; 5/8 inch thick, ends and edges square, paper faced.

C. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - LAY-IN GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636 manufacturer's instructions and as supplemented in this section.

B. Install fire rated system in accordance with UL Design requirements.

C. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

D. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

E. Locate system on room axis according to reflected plan.

F. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

G. Supply hangers or inserts for installation to Section with instructions for their correct placement.

H. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

I. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

J. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

K. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.

L. Do not eccentrically load system, or produce rotation of runners.

M. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

N. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch (25 mm) movement. Maintain visual closure.

O. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with UL assembly requirements.

3.2 INSTALLATION - CONCEALED GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636 and manufacturer's instructions and as supplemented in this section.

B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Locate system on room axis according to reflected plan.

E. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

F. Supply hangers or inserts for installation to Section with instructions for their correct placement.

G. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

H. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

I. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

J. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.

K. Do not eccentrically load system, or produce rotation of runners.

L. Install concealed edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide concealed edge moldings at junctions with other interruptions.

M. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units one way with pattern parallel to longest/shortest room axis in basket weave pattern. Fit border trim neatly against abutting surfaces.

D. Install units after above ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp and dents.

F. Cut tile panels to fit irregular grid and perimeter edge trim. Field rabbett tile panel edge. Double cut and field paint exposed edges of tegular units.

G. Where bullnose concrete block corners round obstructions occur, provide preformed closers to match edge molding.

H. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions as indicated.

I. Install hold-down clips to retain panels tight to grid system within 20 ft of an exterior door.

3.4 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09720

WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Vinyl wall covering.

B. Related Sections include the following:

1. Division 9, Section “Gypsum Board” for gypsum board assemblies.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.

B. LEED Submittals:

1. Certificates for **Credit MR 6** and **Credit MR 7**: Chain-of-custody certificates indicating that wood-veneer wall coverings comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
3. Product Data for Credit IEQ 4.2: For paints and coatings, documentation including printed statement of VOC content.
4. Laboratory Test Reports for Credit IEQ 4: For **wall covering systems, adhesives and paints and coatings**, documentation indicating that products 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."

C. Shop Drawings: Show location and extent of each wall-covering type. Indicate seams and termination points.

D. Samples for Verification: Full width by 36-inch- (1000-mm-) long section of wall covering from dye lot to be used for each type of wall covering indicated for each color, texture, and pattern required.

E. Schedule: For wall coverings. Use same designations indicated on Drawings.

F. Maintenance Data: For wall coverings to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide wall coverings and adhesives with the following fire-test-response characteristics as determined by testing identical products applied with identical adhesives to substrates per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Surface-Burning Characteristics: As follows, per ASTM E 84:

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.
c. Fire Rating: Class A.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate appearance and aesthetic effects and set quality standards for installation.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not install wall coverings 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.

B. Lighting: Do not install wall covering until a lighting level of not less than 15 fc (160 lux) is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Rolls of Wall-Covering Material: Full-size units equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Basis of this Specification, including color, is indicated in the Finishes Legend at the end of the Finish Schedule. Subject to compliance with the requirements and properties of the product listed, including acceptable color and texture, products of other manufacturers will be considered if submitted prior to Bid in accordance with the stipulations in the Instructions to Bidders.

2.2 WALL-COVERING PRODUCTS

A. General: Provide rolls of each type of wall covering from the same run number or dye lot.

B. Location: See Finishes Legend and Finish Schedule for location of vinyl wall covering.

2.3 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining adhesive, for use with specific wall covering and substrate application, as recommended in writing by wall-covering manufacturer.

B. Metal Primer: Interior ferrous metal primer complying with Division 9 Section "Painting (Professional Line Products)."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, dirt, and dust.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

1. Moisture Content: Maximum of 5 percent on new plaster, concrete and concrete masonry units when tested with an electronic moisture meter.
2. Metals: If not factory primed, clean and apply metal primer.
3. Gypsum Board: Prime with primer recommended by wall-covering manufacturer.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finishes with fine sandpaper.

E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION

A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.

C. Install strips in same order as cut from roll.

D. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.

E. Match pattern 72 inches (1830 mm) above the finish floor.

F. Install seams vertical and plumb at least 6 inches (150 mm) from outside corners and 6 inches (150 mm) from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.

G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

H. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by wall-covering manufacturer.

C. Replace strips that cannot be cleaned.

D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

SECTION 09900

PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and field application of paints and coatings.

B. LEED Requirements:

1. Provide materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 15190 - Mechanical Identification.

B. Section 16102 - Labeling.

1.3 REFERENCES

A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

B. ASTM D2016 - Test Method for Moisture Content of Wood.

C. USGBC Version 2.2 LEED NC. – Low VOC content

1.4 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on all finishing products.

C. Samples: Submit samples for initial color selection in the form of manufacturer □s color charts.

D. Samples: Submit 12x12 inch stained wood samples of type and quality of wood specified for use on project.

E. Manufacturer's Instructions: Indicate special surface preparation procedures, substrate conditions requiring special attention.

F. LEED Submittals:

1. Product Data for Credit EQ 4.2: For field applications that are inside the weatherproofing system, use paints and coatings that comply with the VOC content limits calculated according to 40 CFR 59, Subpart D.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section

with minimum five years experience.

B. Applicator: Company specializing in performing the work of this section with minimum five years experience

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating requirements for finishes.

B. Conform to applicable requirements for low VOC content per the USGBC version 2.2 LEED NC.

1.8 FIELD SAMPLES

A. Provide field sample of paint under provisions of Section 01400.

B. Provide field sample: Request review for Contracting Officer of first finished room for color, texture, and workmanship.

C. Use first acceptable room as project standard.

D. Accepted sample may remain as part of the Work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.10 ENVIRONMENTAL REQUIREMENTS

A. USGBC Version 2.2 LEED NC requirements for architectural paints, coatings and primers applied to the interior walls and ceilings that do not exceed the VOC content limits established in the Green Standard GS-11, Paints, First Edition.

B. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish and Finishes: 65 degrees F (18 degrees C) for interior or exterior, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

G. All paint usages and paint related MSDSs must be provided to the DPW Environmental Division's Air Quality Manager.

1.11 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Provide 1 gallon (4 L) of each color, type, and surface texture to Owner.

C. Label each container with color, type, texture, room locations, and in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers – Paint (Lead Free and low VOC)

1. ICI Paint Company
2. PPG Industries Pittsburg Paints
3. The Sherwin - Williams Company

2.2 MATERIALS

A. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

C. Patching Materials: Latex filler.

D. Fastener Head Cover Materials: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Plaster and Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
3. Interior Wood: 15 percent, measured in accordance with ASTM D2016.
4. Exterior Wood: 15 percent, measured in accordance with ASTM D2016.
5. Concrete Floors: 8 percent.

3.2 PREPARATION

A. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

B. Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit loose surface defects.

C. Seal with shellac and seal marks which may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

F. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply compatible sealer or primer.

G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

H. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

I. Copper Surfaces Scheduled for a Paint Finish: Remove contamination by steam, high pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.

J. Copper Surfaces Scheduled for a Natural Oxidized Finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.

K. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

L. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

M. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

N. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

O. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand; power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

P. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

Q. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

R. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

S. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied.

T. Exterior Wood Scheduled to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied.

U. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

V. Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish.

D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

E. Sand wood and metal lightly between coats to achieve required finish.

F. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

G. Allow applied coat to dry before next coat is applied.

H. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Prime concealed surfaces of interior and exterior woodwork with primer paint.

J. Prime concealed surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

3.4 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Section 15190 and Section 16195 for schedule of color coding and identification banding of equipment, duct work, piping, and conduit.

B. Paint shop primed equipment.

C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

D. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, and except where items are prefinished.

E. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

F. Paint exposed conduit and electrical equipment occurring in finished areas.

G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

H. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. color schedule. Color band and identify with flow arrows names and numbering.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400.

3.6 CLEANING

A. Clean work under provisions of 01700.

B. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.7 SCHEDULE - EXTERIOR SURFACES

A. Wood - Painted (Opaque):

1. One coat of latex alkyd primer sealer.
2. Two coats of alkyd latex enamel, gloss. semi-gloss.

B. Wood - Transparent:

1. Two coats of stain.

C. Pavement Markings:

1. Two coats of paint, white.

D. Concrete, Concrete Block

1. One coat of primer sealer latex. alkyd.
2. Two coats of latex alkyd

E. Gypsum Board Cement Plaster Soffits

1. One coat of primer sealer latex. alkyd.
2. Two coats of latex alkyd flat

F. Steel - Unprimed:

1. One coat of latex alkyd primer.
2. Two coats of alkyd latex enamel, gloss. semi-gloss.

G. Steel - Shop Primed:

1. Touch-up with zinc chromate zinc rich primer.
2. Two coats of alkyd latex enamel, gloss. semi-gloss.

H. Steel - Galvanized:

1. One coat galvanize primer.
2. Two coats of alkyd latex enamel, gloss. semi-gloss.

I. Aluminum - Mill Finish:

1. One coat etching primer.
2. Two coats of alkyd enamel, gloss

J. Copper:

1. One coat etching primer.
2. Two coats of alkyd enamel, gloss.

3.8 SCHEDULE - INTERIOR SURFACES

A. Wood - Painted:

1. One coat of latex alkyd prime sealer.
2. Two coats of alkyd latex enamel, gloss. semi-gloss. eggshell. flat.

B. Wood - Intumescent Coating:

1. One coat of prime sealer.
2. Two coats of intumescent coating.

C. Wood - Transparent:

1. Filler coat (for open grained wood only).
2. One coat Two coats of stain.
3. One coat sealer.
4. Two coats of varnish gloss. satin. flat.

D. Cabinet Interior:

1. One coat of latex alkyd prime sealer.
2. One coat of alkyd latex enamel, semi-gloss. flat.

E. Concrete, Concrete Block

1. One coat of primer sealer latex. alkyd.
2. Two coats of latex alkyd flat. semi-gloss.

G. Steel - Unprimed:

1. One coat of alkyd latex primer.
2. Two coats of alkyd latex enamel, gloss. semi-gloss.

H. Steel - Primed:

1. Touch-up with alkyd latex primer..
2. Two coats of alkyd latex enamel, gloss. semi-gloss.

I. Steel - Galvanized:

1. One coat galvanize primer.
2. Two coats of alkyd latex enamel, gloss. semi-gloss.

J. Aluminum - Mill Finish:

1. One coat etching primer.
2. Two coats of alkyd enamel, gloss.

K. Concrete Floors:

1. One coat of alkali resistant catalyzed epoxy primer.
2. Two coats of alkyd floor enamel catalyzed epoxy enamel, gloss.

L. Gypsum Board:

1. One coat of alkyd primer sealer.
2. Two coats of alkyd latex latex acrylic enamel, eggshell flat.

M. Wall Surfaces Under Vinyl Wall Covering:

1. Two coats of alkyd primer sealer.

N. Fire Retardant Finish

1. One coat of fire retardant primer.
2. Two coats of fire retardant finish, gloss.
3. Flame and smoke rating of 25/5.

O. Insulated Coverings - Canvas and Cotton:

1. One coat of alkyd primer sealer.
2. Two coats of alkyd enamel, gloss. semi-gloss. eggshell. flat.

END OF SECTION

SECTION 09985

FRP WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-finished wall panels.

B. LEED Requirements:

1. Provide products having recycled content.
2. Provide materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 09260- Gypsum Board Systems

1.3 SUBMITTALS

A. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit EQ 4: Including printed statement of VOC content.

PART 2 PRODUCTS

2.1 MATERIALS

A. Panels and Accessories: Kemply as manufactured by Dyrotech Industries, Joliet, IL. Provide the following

1. Fiberglass reinforced plastic, 0.09 inches (2.25mm) thick with embossed finish laminated to one side of a 1/2 inch (12mm) thick APA, CD Exposure 1 grade plywood. Colors textures and patterns as selected.
2. Moldings between panels to be 2 piece batten type with snap-on trim.
3. Moldings at panels edges to be 1 piece "J" - mold style to match.
4. Fasteners to be Manufacturer's standard nylon drive pins.

B. Adhesive: Manufacturer's recommended type for use with selected materials, waterproof, mildew resistant non-staining type.

C. Caulking: Latex type as approved by Adhesive and Wall Paneling Manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Examine substrate and conditions under which the material is to be installed.
2. Verify that surfaces, when tested with moisture meter, have proper moisture content.
3. Verify that nails and screws are recessed, with joints and depressions taped, finish and sealed.
4. Start of Work indicates acceptance of responsibility for performance and any required remedial Work.

3.2 INSTALLATION

A. Install panels in accordance with Manufacturer's printed instructions using full sheet mastic coverage method plus nylon fasteners.

B. Remove plumbing escutcheons, switch-plates, wall plates, and surface-mounted fixtures, and cut wall paneling evenly to fit. Replace items after completion of Work.

C. Where applicable, install paneling before installation of plumbing, casings, bases, cabinets and other items to be applied over paneling.

D. Apply all moldings securely in place and fit panels into moldings to form a complete installation.

END OF SECTION

SECTION 10165

TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Plastic Laminate head rail braced toilet compartments.

B. Urinal screens; wall mounted.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Framing and plates within walls for partition panel support.

B. Section 06100 - Rough Carpentry: Wood blocking for fasteners.

C. Section 10800 - Washroom Accessories.

1.3 REFERENCES

A. ANSI A117.1 - Safety Standards for the Handicapped.

B. ASTM A167 - Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

C. ASTM A424 - Steel Sheet for Porcelain Enameling.

D. ASTM A526 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.

E. FS RR-P-1352 - Partitions, Toilet, Complete.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of supports, door swings.

C. Product Data: Provide data on panel construction, hardware, and accessories.

D. Samples: Submit two samples of partition panels, approximately 3 x 3 inches in size illustrating panel finish, color, and sheen.

1.5 REGULATORY REQUIREMENTS

A. Conform to ANSI A117.1 and ADA code for access for the handicapped.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.7 COORDINATION

A. Coordinate the work with placement of support framing and anchors in wall and ceiling.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Global Steel Products.

B. Mills Company.

C. Sanymetal.

D. Weis.

E. Approved equal.

2.2 MATERIALS

A. Steel Sheet: ASTM A526, with G90 galvanized, bonderized coating.

2.3 ACCESSORIES

A. Pilaster Shoe: Formed chromed steel with satin finish, 3 inch high, with adjustable screw jack.

B. Head Rails: Hollow aluminum tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.

C. Attachments, Screws, and Bolts: Stainless steel; tamper proof type, heavy duty extruded aluminum brackets.

D. Hardware: Chrome plated non-ferrous cast metal:

1. Pivot hinges, gravity type, adjustable for door close positioning.
2. Nylon bearings.
3. Thumb turn door latch with exterior emergency access feature.
4. Door strike and keeper with rubber bumper.
5. Coat hook with rubber bumper.
6. Door pull for outswinging doors.

2.4 FABRICATION

A. Fabricate partitions in accordance with FS RR-P-1352.

B. Fabricate components of steel sheet as follows:

1. Panel Faces: 20 gage
2. Pilaster Faces: 18 gage
3. Reinforcement: 12 gage.
4. Door Faces: 22 gage.

C. Doors and Panels:

1. Thickness: 1 inch
2. Door Width: 24 inch
3. Door Width for Handicapped Use: 36 inch, out-swinging.
4. Height: 58 inch

D. Pilasters: 1-1/4 inch thick, of sizes required to suit cubicle width and spacing.

E. Door, Panel, and Pilaster Construction: Sheet steel face, pressure bonded to sound deadening core, form and close edges, miter and weld corners, grind smooth.

F. Internal Reinforcement: Provide in areas of attached hardware and fittings. Mark locations of reinforcement for partition mounted washroom accessories.

G. Urinal Screens:

1. Thickness: 1 inch
2. Size: 18 inches wide x 42 inches high.
3. Face Material: 20 gage galvanized, bonderized steel.
4. Finish: Same as toilet partitions.
5. Color: As indicated on the finish schedule in the drawings.
6. Mounting: Wall mounted with top and bottom brackets. Top bracket shall be 8 inch "wing" type.

2.5 FINISHING

A. Clean, degrease, and neutralize panels.

B. Follow immediately with a phosphatizing treatment, prime coat and two finish coats baked enamel.

C. Color: color as indicated on the finish schedule in the drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify correct spacing of and between plumbing fixtures.

B. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attached panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets with tamper proof through bolts and nuts.

E. Anchor urinal screen panels to walls with two panel brackets.

F. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.

G. Support pilasters from built-in framing using two adjustable hanging studs providing vertical leveling. Conceal ceiling fastenings with pilaster shoe.

H. Equip each door with two hinges, one door latch, one coat hook and bumper; outswinging door with pull.

I. Install door strike and keeper with door bumper on each pilaster in alignment with door latch.

J. Field touch-up of scratches or damaged enamel finish will not be permitted.

K. Replace damaged or scratched materials with new materials.

3.3 ERECTION TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10260

WALL AND CORNER GUARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Corner guards.

B. LEED Requirements:

1. Provide products having recycled content.
2. Provide materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Concealed in wall anchors for attachment of work of this section.

B. Section 06114 - Wood Blocking and Curbing: Support blocking for wall and corner guard anchors.

C. Section 09260 - Gypsum Board Systems.

D. Division 9 - Finishes.

1.3 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People.

1.4 PERFORMANCE REQUIREMENTS

A. Corner Guards: Resist lateral impact force of 100 lbs at any point without damage or permanent set.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Samples: Submit two sections of bumper rail corner guard; 24 inch long, illustrating component design, configuration, color and finish.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

E. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit EQ 4: Including printed statement of VOC content.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI A117.1 requirements for the physically handicapped.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on Drawings.

1.8 COORDINATION

A. Coordinate the work with wall or partition sections for installation of concealed blocking or anchor devices.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Balco, Inc.

B. Construction Specialties, Inc.

C. Pawling Corporation

2.2 COMPONENTS

A. Corner Guard - Flush Mounted:

1. Material: High impact vinyl
2. Projection From Wall to Outside of Guard:
3. Length: One piece 4’-0” in length

B. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

2.3 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

2.4 FINISHES

A. Corner Guard: PVC, Clear.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough-in for components are correctly sized and located.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to wall framing members only.

B. Position corner guard 6 inches above finished floor to 24 inches high.

3.3 ERECTION TOLERANCES - HORIZONTAL RAILS

A. Maximum Variation From Required Height: 1/4 inch

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch

END OF SECTION

SECTION 10441

PLASTIC SIGNS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Engraved plastic signs. Individual plastic character signs.

B. LEED Requirements:

1. Provide products having recycled content.
2. Provide materials having low VOC content.

1.2 RELATED SECTIONS

A. Section 01017 - AAFES Furnished and Installed Equipment.

B. Section 15190 - Mechanical Identification.

C. Section 16105 – Labeling.

1.3 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate sign styles, lettering font, foreground and background colors, locations, overall dimensions of each sign.

C. Samples: Submit two (2) sample signs, 12x12 inch in size illustrating type, style, letter font, and colors specified; method of attachment.

D. Manufacturer's Installation Instructions: Include installation template and attachment devices.

E. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit EQ 4: Including printed statement of VOC content.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five (5) years experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code and ANSI A117.1 for requirements for the physically handicapped.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package signs, labeled in name groups.

B. Store adhesive attachment tape at ambient room temperatures.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. LSI Sign Systems, Inc.
2. Fast Signs, Inc.

2.2 ENGRAVED SIGNS

A. Engraved Signs: Laminated colored plastic; lettering engraved through face to expose core color:

1. Face Color: Color as selected.
2. Core Color:
3. Total Thickness: 1/8 inch
4. Height:
5. Edges: Radiused.
6. Character Font: Helvetica or match existing.

2.3 RAISED LETTER SIGNS

A. Base Material: Solid color acrylic plastic:

1. Total Thickness: 1/8 inch.
2. Height:
3. Edges: Radiused.
4. Character Font: Helvetica or match existing.

B. Raised Character Size and Style: Acrylic plastic, character adhered to base material:

1. Character Color: Black or match existing.
2. Character Thickness: 1/8 inch.
3. Height: match existing
4. Edges: match existing
5. Character Font: match existing
6. Character Case: match existing

2.4 INDIVIDUAL GRAPHICS

A. Material: Solid color acrylic plastic:

1. Thickness: 1/8 inch.
2. Height: match existing
3. Edges: match existing

B. Character Style:

1. Character Color: match existing
2. Character Font: match existing
3. Character Case: match existing

C. Graphic Style: Handicapped type.

2.5 ACCESSORIES

A. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs after surfaces are finished, in locations as shown and indicated.

C. Position sign 12 inches from strike side of door; on door surface, level.

D. Locate sign on wall surface, level.

END OF SECTION

SECTION 10522

FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.

B. Cabinets.

C. Accessories.

1.2 RELATED SECTIONS

A. Section 06114 - Wood Blocking and Curbing: Wood blocking in wall.

1.3 REFERENCES

A. NFPA 10 - Portable Fire Extinguishers.

B. UL 8 - Foam Fire Extinguishers.

C. UL 154 - Carbon Dioxide Fire Extinguishers.

D. UL 299 - Dry Chemical Fire Extinguishers.

E. UL 1093 - Halogenated Agent Fire Extinguishers.

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Shop Drawings: Indicate cabinet physical dimensions, and wall location.

C. Product Data: Provide extinguisher operational features, color and finish, anchorage details.

1.5 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.

B. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01700 - Contract Closeout: Procedures for submittals.

B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.7 QUALITY ASSURANCE

A. Provide units UL listed with UL listing mark for type, rating, and classification of extinguisher.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code NFPA 10 for requirements for extinguishers.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. J.L. Industries
   2. Larsen's Manufacturing Co.

2.2 EXTINGUISHERS

A. Dry Chemical Type: UL 299, Cast steel tank, with pressure gage; Class B:C, Size 10.
]
B. Extinguisher Finish: Steel painted enamel; color Red.

2.3 CABINETS

A. Metal: Formed sheet steel, primed and painted white; 18 gage thick base metal.

B. Configuration: Semi-Recessed type, sized to accommodate accessories

C. Trim Type: Returned to wall surface.

D. Door: 18gage thick, reinforced for flatness and rigidity; half glass and pull handle access.

E. Door Glazing: Glass, clear, 1/8 inch tempered.

F. Pre-drill for anchors.

G. Hinge doors for 180 degree opening with continuous piano hinge. Provide roller type catch.

H. Weld, fill, and grind components smooth.

I. Glaze doors with resilient channel gasket glazing.

J. Finishing Cabinet Exterior Trim and Door: baked enamel, color as selected.

K. Finishing Cabinet Interior: painted white enamel.

2.4 ACCESSORIES

A. Extinguisher Brackets: Formed steel, mill finish.

B. Graphic Identification: FE lettering ; color: Red

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify wall location for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level on wall openings, 48 inches max. from finished floor to centerline of handle.

C. Secure rigidly in place.

D. Place extinguishers in cabinets on wall.

END OF SECTION

SECTION 10553

VIDEO DEPOSITORY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Clear anodized aluminum video depository.

1.2 RELATED SECTIONS

A. Section 04100 – Mortar and Grout

B. Section 04200 - Brick Masonry.

C. Section 07620 – Sheet Metal Flashing and Trim

D. Section 07900 – Joint Sealers

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data relating to size, construction details, material specifications and installation instructions.

1.4 QUALITY ASSURANCE

A. Installers Qualifications: Company specializing in performing the work of this section approved by the manufacturer.

1.5 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on drawings.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Kingsley Companies 813 Towne Center Drive, Pomona, CA 91767, Phone 1-800-376-7209 www.kingsley.com

1. Product: Kingsley Standard Video Depository Model 10-8900.
2. Exterior Door and Frame Finish: Clear anodized aluminum finish.
3. Standard Identification on Exterior Frame: “Video Depository”. Letters engraved and black filled.
4. Depository Housing: Heavy gauge paint grip steel, electric arc welded at the seams and ground smooth, thoroughly cleaned and prime painted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared opening is ready to receive unit.

3.2 INSTALLATION

A. Install in accordance with Manufacturer's instructions.

B. Hopper Pull handle to be installed at 48" max. above the finish floor or grade.

C. Installation shall be in compliance with ADA guidelines.

3.3 ADJUST AND CLEAN

A. Adjust accessories for proper operation.

B. After completion of installation, clean and polish all exposed surfaces.

END OF SECTION

SECTION 10800

TOILET ROOM ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Toilet room accessories.

B. Grab bars.

C. Attachment hardware.

1.2 RELATED SECTIONS

A. Section 06114 – Wood Blocking and Curbing; In wall framing and plates] for support of accessories.

B. Section 08800 - Glazing: Wall mirrors.

C. Section 09307 - Wall Tile: Ceramic accessories.

1.3 REFERENCES

A. ANSI A117.1 - Safety Standards for the Handicapped.

B. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

D. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

E. ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.

F. ASTM B456 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

C. Samples: Submit one sample of each component, illustrating color and finish.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.5 REGULATORY REQUIREMENTS

A. Conform to ANSI A117.1 code for access for the handicapped.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as [indicated [on product data].] [instructed by the manufacturer.]

1.7 COORDINATION

A. Coordinate the work with the placement of [internal wall reinforcement] [and] [reinforcement of toilet partitions] to receive anchor attachments.

1.8 DELIVERY, STORAGE AND PROTECTION

A. Store in original protective packaging.

B. Maintain protective covers on all units until installation is complete. Remove protective covers at final clean up of installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bobrick Washroom Equipment, Inc.

B. Other acceptable manufacturers offering equivalent products.
   1. Bobrick.
   2. Bradley Corporation

C. Substitutions: Under provisions of Section 01600.

2.2 MATERIALS

A. Sheet Steel: ASTM A366.

B. Stainless Steel Sheet: ASTM A167, Type 304.

C. Tubing: ASTM A269, stainless steel.

D. Adhesive: Two component epoxy type,waterproof.

E. Fasteners, Screws, and Bolts: Same material as unit, galvanized, where concealed, tamper-proof type.

F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

G. Primer:

2.3 FABRICATION

A. Weld and grind joints of fabricated components, smooth.

B. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.

C. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges. Form bar with 1½ inches clear of wall surface. Knurl grip surfaces.

D. Shop assemble components and package complete with anchors and fittings.

E. Provide steel anchor plates, adapters, and anchor components for installation.

F. Locked dispensing units.

2.4 KEYING

A. Supply one key for each accessory to Owner.

B. Key alike all accessories.

2.5 FINISHES

A. Galvanizing: ASTM A123 to 1.25 oz/sq yd (380 g/sq m). Galvanize ferrous metal and fastening devices.

B. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

C. Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats electrostatic baked enamel.

D. Chrome/Nickel Plating: ASTM B456, Type, satin finish.

E. Stainless Steel: No. 4 satin luster finish.

F. Back paint components where contact is made with building finishes to prevent electrolysis.

2.6 WASHROOM ACCESSORY SCHEDULE

Reference drawing A4.10 for accessory schedule with model numbers and quantities.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive work and dimensions are as instructed by the manufacturer.

B. Verify exact location of accessories for installation.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions and ANSI A117.1.

B. Install plumb and level, securely and rigidly anchored to substrate.

END OF SECTION

M.E.P. SPECIFICATIONS

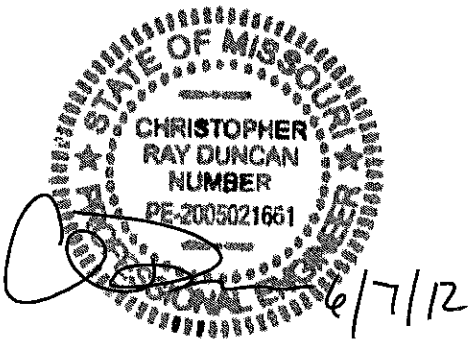
82nd Airborne Mini-Mall Expansion
Fort Bragg, North Carolina

ENGINEER

LaRose & Schober Engineering, Inc.
3015 South Fort Avenue, Suite D
Springfield, Missouri 65807
Phone: 417.881.1586
Fax: 417.881.8390

DISCLAIMER

It is hereby stated, pursuant to Missouri Revised Statutes Section 327.411, that the specifications intended to be authenticated by LaRose & Schober Engineering, Inc. and the undersigned's seal are limited to the specification sections listed in the following Table of Contents and we hereby disclaim any responsibility for all other specification sections relating to or intended to be used for any part of this project.



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DIVISION 15 - MECHANICAL

SECTION 15010 – BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. The work to be performed under this Division shall include all labor, materials, equipment, transportation, construction plant, and facilities necessary to provide a complete and operable system. The Contractor shall examine all Drawings and all Sections of the Specifications and shall be responsible for ascertaining to what extent other Drawings and Sections affect the work herein specified.

1.03 CODES, REGULATIONS, AND STANDARDS

A. All work must be performed in accordance with the requirements of local, county, state and national codes and regulations including the requirements of the current edition of the following:

1. International Building Code (IBC).

2. International Fuel Gas Code (IFGC).

3. International Mechanical Code (IMC).

4. International Energy Conservation Code (IECC).

5. International Plumbing Code (IPC).

6. National Electrical Code (NEC).

7. Occupational Safety and Health Administration (OSHA) Act of 1970.

8. National Fire Protection Association (NFPA) 13, 14, 17/17A, 72, 72E, 54, 96, 101

9. Unified Facilities Criteria (UFC) 3-600-01 Latest edition

10. For work not specifically listed above, use codes and standards of the NFPA.

B. All equipment, apparatus and systems shall be rated, tested, fabricated and/or installed in accordance with the applicable industry standard mentioned. The following list will serve to clarify abbreviations that appear in other sections of this specification:

1.	AABC	Associated Air Balance Council.
2.	ADC	Air Diffusion Council.
3.	AGA	American Gas Association.
4.	AMCA	Air Moving and Conditioning Association.
5.	ANSI	American National Standards Institute.
6.	ARI	Air Conditioning and Refrigeration Institute.
7.	ASE	Association of Safety Engineers.
8.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers.
9.	ASME	American Society of Mechanical Engineers.
10.	ASSE	American Society of Sanitary Engineering.
11.	ASTM	American Society for Testing and Materials.
12.	AWWA	American Water Works Association.
13.	EPA	Environmental Protection Agency.
14.	FM	Factory Mutual.
15.	FS	Federal Specifications.
16.	IBR	Institute of Boiler and Radiator Manufacturers.
17.	IEEE	Institute of Electrical and Electronics Engineers.
18.	MCAA	Mechanical Contractors’ Association of America.
19.	NEBB	National Environmental Balancing Bureau.

20.	NEMA	National Electrical Manufacturers Association.
21.	NFPA	National Fire Protection Association.
22.	NSC	National Safety Council.
23.	NSF	National Sanitation Foundation.
24.	SBI	Steel Boiler Institute Industry.
25.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association.
26.	UL	Underwriters' Laboratories.
27.	USCFCCCHR	University of Southern California Foundation for Cross Connection Control and Hydraulic Research.

1.04 SUBMITTALS

A. As soon as possible and within thirty (30) days after the award of the contract and before beginning the fabrication of any material or the installation of any equipment, a complete schedule of the materials and equipment proposed for installation shall be submitted to the Engineer for approval. This schedule shall include manufacturers' names, catalog data, diagrams, drawings and other descriptive data as required or requested by the Contracting Officer.

B. All items of materials and equipment used for the project shall be submitted.

C. Submittals shall be assembled in an orderly manner and shall include a title page with space for the Engineer's approval stamp and remarks. It shall also contain a concise listing of all items being submitted. Submit five (5) copies as follows: Architect (for records); Engineer (for records); Owner (for records); and two (2) copies for Contractor's use.

D. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Engineer with written certification that the material/product contains no asbestos. This certificate is mandatory before approval will be issued. Submittals furnished without the asbestos-free certification will be returned to the Contractor with no action taken until such certification is provided.

1.05 SUBSTITUTION OF EQUIPMENT

A. All proposed substitutions for specified products on this project require approval in advance of bidding. Approval will not be granted after award of contract. See Substitution Request Form in the bidding documents at the beginning of these specifications for the appropriate approval form. If no form is found, submit by mail, or hand-carried on contractor's or

supplier's letterhead. **DO NOT FAX.** Substitutions must be submitted for review at least five (5) working days prior to the bid date to be considered. Request must be made to the Contracting Officer.

B. It is incumbent on the Contractor to submit technical data that will fully establish the equality of the proposed substitute equipment with that listed and evidence to substantiate the availability of the required repair and maintenance service. Each request for substitution shall be accompanied by the following information for each piece of equipment:

1. Statement indicating that this substituted equipment will not increase the contract cost nor extend the completion date.

2. Manufacturer's name and model number.

3. Catalog cut sheets, diagrams and other data published by the manufacturer with the particular model identified and the pertinent design data for that model highlighted or underlined for easy reference.

4. Each request for substitution shall also include the following information relating to service maintenance and repair:

a. Name, address and telephone number of nearest factory authorized technical representative.

b. Name, address and telephone number of firm(s) qualified to perform preventive maintenance, minor or major repairs in the locale of the project.

c. Name, address and telephone number of firm(s) from whom spare parts and major components are available.

d. Building name and address, and the name, address and telephone number of its owner's representative where equipment of the same manufacturer as requested for substitution has been installed and in operation for two or more years. Two or more such installations shall be listed and the location should be in the vicinity of the proposed project.

C. In the event of Engineer's approval of a substitution of equipment, the requesting entity will be notified by telephonic message or FAX by the Engineer (or authorized representative), and/or by the issuance of an amendment to the contract documents incorporating the equipment by name and model number.

1.06 CONTRACT DRAWINGS

A. The layout shown on the Contract Drawings is necessarily diagrammatic but shall be followed as closely as actual construction and as other work will allow. The dimensions of work as shown on the Contract Drawings are not as-built dimensions. No measurements

shall be scaled from the drawings and used as definite dimensions for laying out or fitting work in place.

B. The layout of manufactured equipment as shown on the drawings shall be checked and the exact location shall be determined from the dimensions of equipment shop drawings approved by the Engineer.

1.07 DEFINITIONS

A. FURNISH: The term furnish means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation and similar operations.

B. INSTALL: The term install describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.

C. PROVIDE: The term provides means to furnish and install, complete and ready for intended use.

1.08 MAINTENANCE MANUAL AND OPERATING INSTRUCTIONS

A. Upon completion of the work, Contractors shall provide the Engineer with two copies of maintenance manuals for all equipment furnished and installed under his work.

B. Manuals shall be in substantial 3-ring binders with project name and number inscribed on face and hinged back. Manuals shall include roster of all training session attendees. The manuals shall, however, first be approved by the Engineer. The manuals shall include, but not be limited to manufacturer's lubricating and operating instructions and parts list and serial numbers for all operating machinery, including drive information, and motor horsepower, amperage, and voltage readings on all phases, valve chart, sequence of operation, index following the order listed in the specifications, warranties in the name of the Installation, and a list of manufacturers, service firms and subcontractors names and telephone numbers.

C. Training attendance rosters for each training session shall be included in manuals. Roster will identify training subject, date, attendees name, job title, and telephone number.

D. All switches, controls, and safety devices shall be clearly and permanently marked with embossed or printed plates as to purpose and as to operation and shall be tested in the presence of the Owner designated representative to ensure that he understands their function and purpose.

E. Upon completion of the work, Contractors shall put the systems into service. Contractors shall be entirely responsible for the equipment during all testing operations including the lubricating and turning on and off of such apparatus.

1.09 PROJECT RECORD AND CLOSEOUT DOCUMENTS

A. See Division 1 for red lining of all documents during construction to reflect “as-built” conditions.

B. In addition to the requirements specified in Division 1, indicate the following installed conditions:

1. Ductwork mains and branches, size and location, for both exterior and interior; locations of dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.

2. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Refer to Section 15190 - “MECHANICAL IDENTIFICATION.” Indicate actual inverts and horizontal locations of underground piping.

3. Equipment locations (exposed and concealed), dimensioned from prominent building lines.

4. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

5. Contract Modifications, actual equipment and materials installed.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

1.11 GUARANTEES AND WARRANTIES

A. Submit to the Contracting Officer two copies of all warranties and guarantees specified in the General Conditions, Supplementary Conditions, the individual sections of the specifications, or as provided by the various subcontractors and material suppliers. All such documents shall show the name and location of the project and the name of the purchaser.

B. The Contractor shall provide to the Contracting Officer a non-prorated guarantee of all materials and workmanship for a period of not less than one year from the date of the Owner’s final certificate.

C. The Contractor shall be responsible for enforcing all special or extended guarantees required in individual sections of the specifications that might be provided by various subcontractors or material suppliers.

D. Acceptance of the work under this Division shall be subject to the conditions that all installed systems, equipment, apparatus, and appliances included in the work shall operate and perform as designed, and as selected with respect to efficiency, capacity and quietness and shall operate and perform without producing objectionable noise within occupied areas of the building.

E. Acceptance of the work shall also be subject to the conditions that any time within one year after date of final payment, any defective part of the work resulting from the supply of faulty workmanship or material shall be immediately amended, repaired or replaced as a part of the contract work without cost to the Owner.

F. This guarantee shall be extended to include the capacity and integrated performance of the component parts of the various systems in strict accordance with the true intent and purpose of the specification. The contractor shall conduct such tests as are herein specified or as may be required by the Engineer to demonstrate the capacity and performance ability of the various systems to maintain specified conditions.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.02 MECHANICAL INSTALLATIONS

A. Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate mechanical systems, equipment, and materials installation with other building components.

2. Verify all dimensions by field measurements.

3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.

4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.

6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.

7. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.

9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

11. Install access panel or doors where equipment, fire dampers or balancing dampers are concealed behind finished surfaces.

12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.03 DEFECTIVE WORK AND MATERIAL

A. All materials or work found to be defective or not in strict conformity with the drawings or different from requirements of the drawings and specifications or defaced or injured through negligence of Contractor or his employees, or through action of fire or weather will be rejected and shall be immediately removed from premises by Contractor and satisfactory materials and work substituted without delay.

B. All defective work or imperfect work shall be corrected immediately on notice from Engineer. No previous inspection or certificate on account shall be held to relieve Contractor from his obligation to furnish sound materials and to perform good and satisfactory work.

3.04 COOPERATION AND COORDINATION

A. Contractor shall confer with other contractors at the site before installing his work to avoid interferences so that maximum head room and clearances may be maintained. In event that interferences develop between work of various contractors, Engineer's decision will be final and no additional compensation will be allowed for changes required.

B. Particular attention shall be paid to situations where recessed equipment, pipes and lights occur, or where the work of several trades occurs together above suspended ceilings, in pipe shafts or in areas where space is limited.

C. All fixtures, equipment, devices, switches, outlets, pumps, etc., shall be positioned to avoid all interferences with and to assure proper coordination with work of all other trades, cases, partitions, wall, floor and ceiling patterns, architectural features, etc. All recessed devices, fixtures, etc., shall be coordinated with all wall, floor and ceiling patterns. Engineer will reconcile conflicts and adjustments where such adjustments are warranted.

3.05 CUTTING AND PATCHING

A. Perform cutting and patching in accordance with Division 1. In addition to the requirements specified in Division 1, the following requirements apply:

1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:

1. Uncover work to provide for installation of ill-timed work.

2. Remove and replace defective work.

3. Remove and replace work not conforming to requirements of the Contract Documents.

4. Remove samples of installed work as specified for testing.

C. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

D. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

1. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

a. Refer to Division 1 for definition of "Experienced Installer."

3.06 PROTECTION OF EQUIPMENT AND SYSTEMS

A. Contractor shall keep all his respective pipe openings closed by means of plugs or caps to prevent entrance of foreign matter during construction and cover all fixtures, equipment, and apparatus as required to protect them against dirt, water, chemical or mechanical damage both before and after installation. Any such fixtures, equipment or apparatus damaged prior to final acceptance of the work shall be restored to its original condition or replaced by Contractor at no cost to Owner.

END OF SECTION 15010

DIVISION 15 - MECHANICAL

SECTION 15013 - CLEANING, TESTING AND ADJUSTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. This section of the specifications includes the cleaning and the testing and the adjusting of all various plumbing and hydronic systems and equipment for mechanical strength, leakage and performance.

B. The Contractor shall provide for testing and balancing of the HVAC air distribution systems per Section 15990 - “TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS”.

C. Upon completion of the work, the Contractor shall make such tests as are hereinafter specified or as may be required by the Engineer.

D. Certificates, where such are required, shall be executed and turned over to the Engineer.

1.03 GENERAL REQUIREMENTS

A. The Contractor shall provide all apparatus, temporary piping, connections or any other requirements necessary and shall take all due precautions to prevent damage to the building and its contents as may be incurred during tests. The Contractor shall repair or make good at his own expense any damage to the building and/or its contents resulting from tests.

B. Elements of the various systems, equipment, etc, which might be damaged during testing shall be removed (or otherwise protected) for the period of the test and replaced thereafter.

C. Any leaks, defects, or deficiencies discovered as a result of the tests shall be immediately repaired or made good, and tests shall be repeated until test requirements are fully complied

with. Defective materials shall be replaced. Caulking, puttying or painting to correct leaks in pipe or pipe joints will not be permitted.

1.04 PERFORMANCE TESTS

A. Operating tests to determine performance shall be conducted of each completed system and its associated equipment.

B. Where major items of Owner-furnished equipment are included in a system, it is the Contractor's responsibility to have a factory representative available when required.

C. The Contractor shall be responsible for notifying the Owner in writing of the test date sufficiently in advance to allow the timely request for the representative. In the event that testing cannot proceed immediately upon the arrival of the factory representative, and if the delay incurred is due to incomplete work or improper preparation of the work by the Contractor, the Contractor shall bear all costs of the factory representative for the period of the delay.

D. Performance tests shall be conducted in a manner that will demonstrate satisfactorily the ability of the systems and equipment to perform as specified under design conditions.

1.05 MECHANICAL STRENGTH AND LEAKAGE TESTS

A. All tests hereinafter specified shall be conducted before backfilling, insulating, or other form of concealment is completed.

B. It is desirable that each system be tested in its entirety but the various systems may be tested in sections as may be required to expedite the work of other trades.

1.06 CLEANING EQUIPMENT AND SYSTEM

A. All equipment, piping systems and duct systems shall be thoroughly cleaned internally and externally before being placed in service.

B. The Contractor is charged with the responsibility for maintaining all systems and equipment clean and free of foreign matter during the processes of assembly and erection.

C. Pipe strainers and air filters shall be cleaned and serviced immediately prior to final inspection.

D. When flushing systems, all control, thermal and other elements subject to blocking by foreign matter shall be removed.

E. When piping systems are flushed with fluids other than that normally contained, the Contractor shall take adequate precautions to insure that the normal contents of the piping will not be contaminated when placed in service.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 15013

DIVISION 15 - MECHANICAL

SECTION 15050 – MATERIALS AND METHODS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. Provide all material as specified in this Section.

1.03 RELATED WORK

A. Division 1 - General Conditions.

B. Division 7 - Through Penetration Firestop Systems

C. Section 15010 - “BASIC MECHANICAL REQUIREMENTS”.

D. Section 15067 - “TESTING PIPING SYSTEMS”.

E. Section 15100 - “VALVES”.

F. Section 15400 - “PLUMBING”.

1.04 SUBMITTALS

A. Submit shop drawings in accordance with Section 15010 - “BASIC MECHANICAL REQUIREMENTS” for the following devices:

1. Pipe hangers and supports.

2. Valves.

3. Strainers.

4. Pressure gauges.

5. Thermometers.

B. Submit certificates of compliance for valves specified under this section.

1.05 QUALITY ASSURANCE

A. Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. Code ratings, labels or other data which are die-stamped or otherwise affixed to the surface of the equipment shall be in easily visible location.

1.06 PRODUCT DELIVERY STORAGE AND HANDLING

A. Follow manufacturer's directions in delivery, storage, protection and handling of all equipment and materials.

B. Deliver and store equipment and materials to the site in original containers, suitably sheltered from the elements and mechanical injury, but readily accessible for inspection until installed.

C. Items subject to moisture damage shall be stored in dry, heated spaces.

D. Ascertain, from examination of architectural drawings, whether any special temporary access openings in the building(s) will be required for admission of apparatus furnished under this Division.

E. Heavy machinery, equipment and heavy parts thereof shall be brought into building or onto premise by a machinery moving concern acceptable to Engineer.

F. Machinery movers shall not rig, tie to, or rest weight upon any building member of any part of building premises or make use of any stairway until specific permission is obtained from Engineer.

G. Permission to rig to or in any way make use of any part of building premises shall not relieve Installer of responsibility for any damage resulting from, or because of said rigging or use.

1.07 PROTECTION

A. Keep pipe openings closed by means of plugs or caps to prevent entrance of foreign matter, and cover all fixtures, equipment and apparatus as required to protect them against dirt, water, chemical or mechanical damage both before and after installation.

B. Fixtures, equipment or apparatus damaged prior to final acceptance of work shall be restored to original condition or replaced by Installer.

C. Equipment shall be inherently safe and moving parts shall be covered with guards which meet OSHA requirements.

D. Provide protective guards for devices such as or similar to thermostats, valves, and switches which are so located as to be readily subject to tampering, accidental damage, or vandalism.

E. Safety railings.

PART 2 - PRODUCTS

2.01 VALVES

A. Refer to Section 15100 - “VALVES”.

2.02 HANGERS, SUPPORTS, AND INSERTS

A. Hangers and supports shall conform to the recommendations of Standard Practice SP.58 of the Manufacturers’ Standardization Society of the Valve and Fitting Industry.

B. All hangers for insulated piping shall be oversized to allow the insulation to run through the hanger uninterrupted. Insulation shall be protected from crushing by sheet metal shields.

C. Where several pipes occur at the same elevation, trapeze type hangers may be used. Trapeze hangers shall be made of 2" x 2" structural steel angles with legs down. All copper tubing supports shall be copper plated or insulated from dissimilar materials.

D. Hanger rods shall conform to the following:

Pipe Size	Rod Diameter
Up to 2"	3/8"
2½" to 5"	1/2”
6" to 10"	5/8"

Trapeze hanger rods shall be of sufficient size to carry weight of trapeze channel, piping and contents, insulation supports and an additional 200 lb. load.

E. Wire or perforated strap iron hangers, expansion anchors, and power actuated fasteners will not be permitted.

2.03 SLEEVES

A. Provide pipe sleeves for all penetrations of piping through walls.

B. Floor sleeves (for floors above grade) shall be standard weight galvanized steel pipe or PVC pipe with bottom set flush with surface below and top extending 1" above finished floor (3" in mechanical equipment rooms). Seal around pipe and pipe sleeve with fire resistant waterproofing caulking materials. See division 7 for caulking specifications.

C. Wall sleeves for exterior foundation walls shall be cast iron fabricated sleeves flush with wall inside and outside. Caulk with oakum and lead wool or otherwise adequately waterproof opening between pipe and sleeve.

D. Wall sleeves for masonry walls shall be standard weight galvanized steel pipe flush with all surfaces.

E. Wall sleeves for interior partitions and ceilings shall be 20 gauge galvanized steel with lock joints.

F. Sleeves for piping that is to be insulated shall be large enough to allow insulation to pass through the sleeve. Refer to Section 15250 - “PIPE INSULATION” for specific thicknesses of insulation.

G. Pack the space between the interior surface of all sleeves and pipes or pipe insulation with fire resistant sound and waterproofing caulking materials. See division 7 for caulking specifications.

2.04 ESCUTCHEONS

A. Provide set-screw chrome plated escutcheons (not friction-dependent) on all exposed pipe or pipe insulation passing through or into finished walls, partitions, ceiling and floors. Escutcheons at insulated pipes shall be large enough to encircle insulation without penetrating vapor barrier or jacket.

2.05 INDUSTRIAL TYPE THERMOMETERS

A. Industrial type thermometers shall be the adjustable angle type with 9" case and a minimum stem length of 6" insertion in piping.

B. Casing shall be cast aluminum with double strength glass, white face with dark graduations.

C. Element shall be a red reading organic liquid filled tube and brass stem.

D. Provide separable brass sockets for all thermometers in piping systems. Provide extension sockets when installed in insulated piping.

2.06 PRESSURE GAUGES

A. Ranges of gauges shall be two times indicated operating pressure or 5 PSIG above relief valve setting. Verify ranges on shop drawings.

B. Gauges shall be 4½" dial gauges encased in an aluminum die-cast housing with a threaded access cover and glass crystal. The gauge body shall be water and dust tight with back flange .

C. Movements shall be rotary geared stainless steel with Grade “A” phosphor bronze Bourdon tube rated from 30" vacuum to 1000 PSIG maximum. Accuracy shall be within 1% of the scale range.

2.07 MOTORS

A. For each item of equipment requiring electric drive, provide a motor having starting and running characteristics consistent with torque and speed requirements of the driven machinery.

B. Motors shall be of ample size to operate continuously at their proper load and speed without causing noise, vibration or temperature rise in excess of their rating.

C. Motors shall be of sufficient size as to be non-overloading throughout entire capacity range of the driven equipment.

D. Motors ½ HP and smaller shall be designed for 120 volts, single phase, 60 hertz operation, and shall have the following: capacitor start and run, 40°C continuous temperature rise, open-drip-proof, permanently lubricated sealed bearings.

E. Motors ¾ HP and larger shall be suitable for voltage as specified under Division 16; 3 phase, 60 hertz operation, shall be squirrel cage type NEMA design B, low current in-rush and normal starting torque, quiet operating, 40°C. continuous rise and shall be equipped with permanently lubricated sealed bearings, unless otherwise specified.

F. Efficiency: All motors as available shall be “Energy Efficient”, provide motors with higher efficiency than “average standard industry motors”, in accordance with IEEE Standard 112, test method B.

2.08 STARTERS

A. Where possible, motor starters shall be integral to the equipment being supplied and of the same manufacturer as specified under Division 16.

B. Unless otherwise noted, separately mounted motor starters will be provided under Division 16.

C. Starter heater coil sizes shall be determined by motor nameplate.

D. Motor starter control circuits and devices shall be 24 volt, 60 hertz unless indicated otherwise on the plans.

E. Contactors shall be similar to starters.

F. Automatically started equipment shall have starter with hand-off-auto switch. Manually operated electrical equipment shall have start-stop buttons, unless otherwise indicated on drawings.

G. Coordinate with work under Division 16 to ensure proper motor starting and circuit protection is provided in compliance with code requirements.

H. Assume responsibility for compliance with code requirements where groups of motors require circuit protection per NEC. Article 430.

I. Provide auxiliary contacts where required for interlocking, intermittent starting, pilot control, remote control, motor shut-down and safety features.

2.09 AUXILIARY DEVICES

A. Each trade providing equipment requiring automatic control or remote control shall provide all proper pilot devices to perform the particular duty specified for the driven equipment. In no case shall safety devices be bypassed.

B. Coordinate automatic control work and the work of Division 16.

2.10 CONDUIT AND WIRING

A. Wiring systems provided under Division 15 shall be as specified in Division 16.

B. All electrical terminals shall be labeled.

C. Provide wiring diagrams inside each cabinet.

D. Conduit shall comply with all requirements of Division 16.

E. Final connections to equipment shall be flexible.

2.11 BELT AND COUPLING GUARDS

A. Guards shall be provided for all belt-driven units and at chains, gears, couplings, keys, projecting set screws, and other rotating or moving parts. Belt guards shall be made to enclose both pulleys and belts on exposed sides, and shall be constructed of galvanized steel top, bottom, and sides with expanded metal front. Entire assembly shall be rigidly supported with all necessary supplementary steel, and shall be provided for greasing, oiling, adjusting, checking of equipment, etc. Provide coupling guards on direct connected units. Guards shall be readily accessible and designed for easy removal for service and shall comply with U.L. Safety Requirements.

2.12 ACCEPTABLE MANUFACTURERS

A. Hangers, Supports, and Inserts (insulated or non-insulated piping)

1. Elcen - 12X.
2. Grinnell - #65.

B. Industrial Type Thermometers

1. Palmer Instruments, Inc.
2. Trerice Co.
3. Weksler Instruments Corp.

C. Gauges

1. Ashcroft.
2. Marsh.
3. Marshalltown.

PART 3 - EXECUTION

3.01 EXCAVATION AND BACKFILLING

A. The Contractor shall do all excavation and backfilling and rock excavation required for installation of all of the work requiring excavation, and shall provide all necessary sheeting and bracing required to properly protect his workmen and facilitate the work.

B. Pipe trenches shall be excavated to lines and grades as shown on drawings or as approved by the Engineer. Over-excavated or unfirm ground shall be brought up to the proper level with sand, or with pit run gravel, thoroughly compacted in place. Width of trench shall be such as to readily permit making of joints.

C. Backfill for a depth of 6" above the top of the pipe shall be sand or crushed rock, free from rocks or other foreign materials, and shall be placed and hand tamped uniformly so as to avoid damaging or disturbing the alignment of the pipe. Completely backfill top of trench with selected backfill.

D. All excess excavated material resulting from this work shall be deposited by the Contractor in an approved location.

E. The Contractor shall establish and maintain all elevations and lines required for the installation of sewers and water lines.

F. Sheet and brace trenches and remove water as necessary to fully protect workmen and permit proper installation of the work. Comply with local regulations or, in the absence thereof, with the provisions of the “Manual of Accident Prevention on Construction,” of the Associated General Contractors of America, Inc. Under no circumstances lay pipe or install appurtenances in water; keep the trench free from water until pipe joints have been completed.

3.02 JOINTING OF PIPING

A. Threads shall be full and clean cut, and ends of pipe shall be reamed. When screwed joints are assembled, the male thread shall be thoroughly coated with appropriate thread compound to serve as a joint sealer and as a prime coat of paint for the exposed threads (Teflon tape

may be used at Contractor's option). Care shall be taken to keep all other foreign matter from entering the interior of the piping. Each section of pipe and all fittings shall be carefully inspected for dirt, grease, or other foreign matter on the inside and where necessary they shall be properly cleaned before assembly.

B. Soldered or brazed joints made with fittings having pre-inserted rings of solder or brazing alloy shall have the tube and fittings cleaned bright and fluxed. The joint shall be heated sufficiently to make a tight connection. Tubes and fittings without such rings, shall be cleaned bright, fluxed and heated until the solder is drawn into the joint by capillarity and the connection is tight. Flux shall be water soluble binder flux. In potable water systems, the use of solder and flux exceeding 0.2 percent lead content is prohibited.

3.03 EXPANSION AND CONTRACTION

A. Provisions shall be made for expansion and contraction in all piping. Piping shall be installed in a manner such that joints will not develop leaks. All expansion shall be taken up by swing-connections, and the Contractor shall be responsible for the installation of these connections whether or not they are shown on the Drawings with specific means for relieving expansion and contraction. Slip-type expansion joints shall not be used. Particular care must be exercised at branches on underground piping to allow free movement at branch connection to main.

3.04 INSTALLATION OF PIPING

A. Piping shall be installed on long continuous lengths, with a minimum number of joints. Joints, where necessary shall be carefully made to insure against leakage.

B. All piping shall be firmly supported using hangers, brackets and braces to prevent sagging and/or lateral movement. All hangers, brackets, and other supports shall be securely fastened to the construction as may be required and in a manner acceptable to the Engineer. All piping shall be installed to maintain maximum head room. Nothing shall be suspended from the roof deck.

C. Arrangement of all piping shall be as shown on plans. It is especially necessary that all mains be installed with view to accessibility in case of repair and location of pipe lines and spacing between same shall be so made that there will be no conflict between pipe lines by the several trades.

D. Contractor shall give careful consideration to clearances and locations of lines and type of fittings used to obtain these clearances. Provide maximum headroom in all cases. Piping shall be installed parallel to building walls and at a height so as not to obstruct any portion of a window, light fixture, doorway, pipe tunnel or passageway. Ascertain from the drawings heights of all suspended ceilings, size of all pipe shafts in which piping is to be concealed, and location and size of structural members in and adjacent to all pipe shafts.

E. Where interferences develop in the field, Contractor shall offset or reroute piping as required to clear such interferences. In all cases consult architectural drawings for exact location of pipe spaces, ceiling heights, or other architectural details before installing piping.

F. Under no circumstances shall the size of piping shown on the drawings be changed without written approval of the Engineer.

G. Provide eccentric reducers where required for proper drainage or venting of horizontal pipe lines. Reducing fittings shall be used for all changes of pipe size and bushings shall not, under any circumstances, be used.

H. Unions or flanges are to be installed on the equipment side of all valves in pipe connections from mains to equipment, to enable equipment to be drained and disconnected without necessitating the draining of mains.

I. Valves must be arranged for easy access and be within easy reach and the piping shall be arranged to accomplish this.

3.05 WELDING

A. When welding is to be performed, precautionary measures must be taken to prevent fire. Provide water barrels and fire buckets or 2½ gal., water pump extinguisher, in close proximity to welding work. All piping shall be shop-fabricated to the greatest extent practicable.

B. Welded joints shall be made by the oxy-acetylene or electric process in accordance with Code for Pressure Piping ANSI B31.l.

C. Filler metal for the oxy-acetylene welding process shall conform to the American Society for Testing and Materials Specification for Iron and Steel Gas-Welding Rods, ASTM Designation A251-46T, Classification GA60. Filler metals for the metallic arc welding process shall conform to the American Society for Testing and Materials Specification for Mild Steel Arc-Welding Electrodes, ASTM Designation A233-58T. Classification of electrodes shall be one of the following: E6010, E6015, E7016, E7018.

D. Welds shall be of the single vee butt type for which the pipe shall be mill leveled to 45° to within 1/16" of the inside wall surface.

E. The abutting ends of the joints shall be separated before welding to permit complete fusion to the bottom without overlapping, tacked in two or more points to maintain alignment, and welded. All welding shall be continuous around the pipe.

F. Welds shall be of sound weld metal, thoroughly fused into the ends of the pipe and to the bottom of the vee, and shall be built up in excess of the pipe wall to give a reinforcement of one-quarter (¼) the pipe wall thickness and in such a manner that one weld metal will present a gradual increase in thickness from the surface of the pipe to the center of the weld. The minimum width of the weld shall be 2½ times the pipe wall thickness.

G. The fillet welds for flanges of fittings shall be fused into the pipe and plate for a minimum distance of 1½ times the pipe wall thickness and shall be built up to present a minimum throat thickness of depth of weld of 1¼ times the pipe wall thickness.

H. Welding ells shall be used at all turns in welded pipe lines; no mitered ells will be approved.

I. Where welded mains are 3" in size or larger and branches are 2" in size and smaller, branch connections shall be made up with “Thread-O-Lets” as manufactured by Bonney Forge, Tube Turns or Tube Line, Inc. Welding tees or Weld-O-Lets shall be used for all other branch connection, unless specifically agreed otherwise with the Engineer for a specific case.

J. Welded piping shall be subject to a hydrostatic test of not less than 100 psi, or of 1½ times the working pressure whichever is the greater at which pressure all welded joints shall be hammered with a three pound hammer, the blows being struck with a sufficient force to jar the pipe and joint, but not so hard as to injure the piping. All welds must pass this test without showing leaks or any defects.

K. Welding shall be done with high quality modern welding equipment by competent operators, and in a thorough, first class, workmanlike manner. Preparation, fabrication welding and installation shall be in accordance with ANSI B31.3 - 1962.

L. The Contractor shall be required to furnish proof of the competency of each welding operator, and shall at the request of the Engineer, have all or any of such welding operators pass a standard qualification test such as A.S.M.E., A.W.S. or Hartford Insurance Company procedure and tests.

3.06 HANGERS, SUPPORTS AND INSERTS

A. Provide all hangers, supports, bracing, inserts, beams, anchors, guides, sleeves and miscellaneous steel for the proper support, alignment, expansion and contraction of piping and equipment.

B. Hanger supports shall be securely fastened to structural members by approved beam clamps and clips, concrete inserts, anchors, or other appropriate methods agreed upon with the Engineer.

C. Maximum spacing of hangers and supports for steel and copper piping shall be as follows:

Pipe Size	Spacing
½" thru 1¼"	Not over 8'-0"
l½" thru 3"	Not over 10'-0"
4" and 6"	Not over 12'-0"

D. Cast iron or bell and spigot piping shall be supported at every joint.

E. Additional hangers and supports shall be provided to minimize undesirable stress on valve bodies, other fittings and equipment.

F. Provide all supplemental angles, channels and plates of adequate sizes where bracing or supports are required for piping between structural members.

3.07 OPENINGS IN CONSTRUCTION

A. All cutting or provision of openings that may be necessary for the installation of this work shall be done by the Contractor, and all patching and repairing shall be done by workmen competent in the trade required. The Contractor shall be responsible for arranging the work so that minimum cutting will be required.

3.08 CONCRETE EQUIPMENT PADS

A. The Contractor shall supply all concrete pads and machine bases required for his equipment unless specifically shown to be furnished otherwise.

B. Concrete supplied for machine bases shall be as specified under Division 3. Pads for pumps and fans shall be doweled to slab floors with one (1) ¼ in. steel rod per sq. ft. of pad. Dowels shall project a minimum of 2" into the slab and 2" into the pad. All other pads shall be of 4" high, 2" high, or other dimensions as indicated. Pads shall have chamfered edges and equipment anchors.

3.09 VALVES

A. Install ball valves with the stem above body in accessible position.

B. The necessary valves shall be installed within the systems to provide required shut-off and flow control service and to allow isolation for inspection, maintenance and repair of each piece of equipment, fixture and branch service loop.

C. Each valve shall be installed so that it is easily accessible for operation, visual inspection and preventative maintenance.

3.10 MOTORS

A. Unattached electric motors (motors furnished loose with equipment) shall be set by the Contractor. Motors shall be leveled and aligned on bases and foundation pads in strict accordance with the manufacturer’s instructions and their recommended tolerances before any electrical connections are made. After all connections have been made and just prior to placing each motor in operation, levels and alignment shall be re-checked. All necessary adjustments shall be made to assure that the thrust is balanced, that shaft rotates freely when turned by hand. All final connections to motor shall be made under Division 16.

3.11 THERMOMETERS AND GAUGES

A. Thermometers and Gauges: Install thermometers and gauges in piping systems and duct systems as shown. Thermometers and gauges for each major equipment item shall be readily readable from one position while standing on floor or through the ceiling access panel. Gauges shall not be installed until systems are cleaned.

3.12 CLEANING THE PIPING SYSTEMS

A. Before pipe covering is applied and final tests are made, flush the water piping systems thoroughly to remove grit, sand, oil, etc., for as long a time as is required to thoroughly clean the apparatus and piping. Make the required temporary connections for this purpose.

B. Care must be taken not to get dirt, grease, etc., upon the floors or walls. Any damage done shall be promptly repaired.

C. After the period of these operations, any defects or damages that may have developed in the equipment and apparatus as a result of the cleaning process or the operation of the system shall be made good, and the apparatus put in first class working order.

END OF SECTION 15050

DIVISION 15 - MECHANICAL

SECTION 15067 - TESTING PIPING SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. Provide pressure tests on soil, waste, storm drain and vent piping systems.

B. Provide pressure tests on domestic cold and hot water piping systems.

C. Provide pressure tests on natural gas and/or LP piping systems.

1.03 RELATED WORK

A. Division 1 - General Conditions.

B. Section 15050 - “MATERIALS AND METHODS”.

C. Section 15250 - “PIPE INSULATION”.

D. Section 15400 - “PLUMBING”.

1.04 SUBMITTALS

A. Submit three (3) copies of all testing reports to the Contracting Officer.

1.05 QUALITY ASSURANCE

A. Notify Contracting Officer three days prior to the tests, who will in turn notify other interested parties.

B. All tests shall be performed and all piping defects shall be corrected prior to insulating, inaccessible concealing or backfilling. Leaks shall be repaired, all repaired piping shall be

retested. All defective pipe, materials and workmanship shall be removed and replaced and tests shall be repeated until systems are proven entirely tight.

C. The tests shall not be performed until after cleaning the piping systems.

PART 2 - PRODUCTS

2.01 TESTING MATERIALS

A. All materials, pumps, compressors and equipment required for testing shall be provided by the Contractor installing the piping system.

B. Where water is used in hydrostatic testing, only potable water shall be used.

PART 3 - EXECUTION

3.01 TESTING OF PIPING SYSTEM - GENERAL

A. Devices or equipment, or parts thereof, gauges thermometers, etc., which may be damaged by test pressures shall be removed or protected during tests.

B. Fabricated piping shall not be connected to equipment until testing has been completed. Before applying test pressure, provide restraining devices as required to prevent distortion of piping system during testing.

C. Welding and screwed joints and other potential leak sources of the systems to be hydrostatically tested shall be painted with a powdered blue chalk and water mixture and allow to dry before testing begins.

D. All joints in the piping systems shall be inspected during the test period. All defective joints shall be removed, repaired and replaced.

E. Where air is used for pressure testing, the air pressure shall be gradually applied. All leak sources shall be checked for leaks by applying a coating of soap suds to the source.

F. After tests have been completed and piping systems proven tight, piping and equipment shall be tested for complete drainage through unions, caps, plugs, faucets or hose valves at low points. If piping and equipment do not drain properly, piping and equipment shall be re-graded and drain points added until system can be completely drained. Systems shall be left dry in freezing weather.

3.02 SOIL, WASTE, STORM DRAIN AND VENT PIPING SYSTEM

A. Stacks and underfloor sewers of all kinds shall be tested by capping outlets 5'-0" outside building wall, capping all connections, providing a 10'-0" high tight pipe extension and filling with water to top of extension. Water shall remain in each system for at least 2 hours

without dropping more than 1". Leaks shall be repaired and tests repeated until system is proven watertight. System may be tested in sections, but every joint between sections must be tested.

3.03 DOMESTIC COLD AND HOT WATER PIPING SYSTEMS

A. Domestic cold and hot water piping systems shall be hydrostatically tested to a pressure of 100 psig registered at ground floor level. Testing shall be considered complete when systems hold the test pressure for a minimum period of one hour without variation in pressure except that which is due to changes in temperature. Testing shall be performed with potable water.

3.04 GAS PIPING SYSTEMS

A. Gas and LP piping shall be tested with an inert gas and in accordance with the International Fuel Gas Code.

END OF SECTION 15067

DIVISION 15 - MECHANICAL

SECTION 15100 - VALVES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. This Section includes general duty valves common to most mechanical piping systems.

1. Special purpose valves are specified in individual piping system specifications.

1.03 RELATED WORK

A. Section 15010 - “BASIC MECHANICAL REQUIREMENTS”.

B. Section 15050 - “MATERIALS AND METHODS”.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 15010 - “BASIC MECHANICAL REQUIREMENTS”:

1. Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Comply with the requirements specified in Division 1.

B. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Preparation For Transport: Prepare valves for shipping as follows:

1. Ensure valves are dry and internally protected against rust and corrosion.

2. Protect valve ends against damage to threads, flange faces, and weld-end preps.

B. Storage: Use the following precautions during storage:

1. Do not remove valve end protectors unless necessary for inspection; then reinstall for storage.

2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature.

PART 2 - PRODUCTS

2.01 VALVE FEATURES - GENERAL

A. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.

B. Isolation Valves: Valves 2” and smaller shall be ball valves. Valves 2½" and larger shall be butterfly valves. Isolation valves shall be the same size as upstream pipe

C. Circuit Balancing Valves: Valves shall be globe valves. Circuit balancing valves shall be one pipe size smaller than the upstream pipe, unless otherwise indicated.

D. Operators: Provide the following special operator features:

1. Hand wheels, fastened to valve stem, for valves other than quarter turn.

2. Lever handles, on quarter-turn valves 6" and smaller, except for plug valves.

3. Motorized valve operators shall be provided by the same manufacturer as the corresponding valve.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

F. End Connections: As indicated in the valve specifications.

1. Threads: Comply with ANSI B1.20.1.

2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.

3. Solder-Joint: Comply with ANSI B16.18.

a. Caution: Where soldered end connections are used, use solder having a melting point below 840°F. for globe, and check valves; below 421°F. for ball valves.

2.02 GATE VALVES

A. **Gate valves are not allowed**.

2.03 BALL VALVES

A. Ball Valves: 150 psi rating, saturated steam pressure, 400 psi WOG pressure; two-piece construction; with bronze body conforming to ASTM B 62, standard (or regular) port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, and vinyl-covered steel handle. Provide solder ends for condenser water, chilled water, and domestic hot and cold water service.

2.04 BUTTERFLY VALVES

A. Butterfly Valves: 200 psi rating, MSS SP-67, Lug-style; cast-iron body conforming to ASTM A 126, Class B. Provide valves with field replaceable EPDM sleeve, nickel-plated ductile iron disc (except aluminum bronze disc for valves installed in condenser water piping), stainless steel stem, and EPDM O-ring stem seals. Provide lever operators with locks for sizes 2 through 6 inches and gear operators with position indicator for sizes 8 through 24 inches.

2.05 CHECK VALVES

A. Swing Check Valves: MSS SP-80; Class 125, cast-bronze body and cap conforming to ASTM B 62; with horizontal swing, Y-pattern, and bronze disc; and having threaded or solder ends. Provide Class 150 valves meeting the above specifications, with threaded end connections, where system pressure requires or where Class 125 valves are not available.

B. Wafer Check Valves: Class 250, cast-iron body; with replaceable bronze seat, and non-slam design lapped and balanced twin bronze flappers and stainless steel trim and torsion spring. Provide valves designed to open and close at approximately one foot differential pressure.

2.06 GLOBE VALVES

A. Globe Valves (2" and smaller): Type 2, Class 150, bronze.

B. Globe Valves (2½" and larger): Type 1, Class 250, cast iron.

2.07 ACCEPTABLE MANUFACTURERS

A. Valves:

1. Bell and Gossett.
2. Crane
3. Grinnell.
4. Keystone.
5. Nibco.
6. Stockham.
7. Victaulic.
8. Watts.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine valve interior through the end ports for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks used to prevent disc movement during shipping and handling.

B. Prior to valve installation, examine the piping for cleanliness, freedom from foreign materials, and proper alignment.

C. Replace defective valves with new valves.

3.02 VALVE ENDS SELECTION

A. Select valves with the following ends or types of pipe/tube connections:

1. Copper Tube Size, 2" and Smaller: Solder ends.

2. Steel Pipe Sizes, 2" and Smaller: threaded or grooved end.

3. Steel Pipe Sizes 2½" and Larger: grooved end or flanged.

3.03 VALVE INSTALLATIONS

A. Refer to piping system specification sections for specific valve applications and arrangements.

1. Locate valves for easy access and provide separate support where necessary.

2. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

3. Install valves in horizontal piping with stem at or above the center of the pipe.

4. Install valves in a position to allow full stem movement.

B. Installation of Check Valves: Install for proper direction of flow as follows:

1. Swing Check Valves: Horizontal position with hinge pin level.

2. Wafer Check Valves: Horizontal or vertical position, between flanges.

3.04 SOLDER CONNECTIONS

A. Cut tube square and to exact lengths.

B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket in same manner.

C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

D. Open globe valves to full open position.

E. Remove the cap and disc holder of swing check valves having composition discs.

F. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of the flux.

G. Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.05 THREADED CONNECTIONS

A. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

B. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.06 FLANGED CONNECTIONS

A. Align flange surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

B. For dead-end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

3.07 FIELD QUALITY CONTROL

A. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

3.08 ADJUSTING AND CLEANING

A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.

END OF SECTION 15100

DIVISION 15 - MECHANICAL

SECTION 15190 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. Provide identification of all systems and equipment installed under Division 15.

1.03 RELATED WORK

A. Division 1 - General Conditions.

B. Section 15010 - “BASIC MECHANICAL REQUIREMENTS”.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer’s technical product data and installation instructions for each identification material and device required in accordance with Section 15010 - “BASIC MECHANICAL REQUIREMENTS.”

B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

1.05 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service.

B. Codes and Standards:

1. ANSI Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

PART 2 - PRODUCTS

2.01 PLASTIC PIPE MARKERS

A. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1.

B. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1.

C. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360° around pipe at each location, fastened by one of the following methods:

1. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.

2. Adhesive lap joint in pipe marker overlap.

2.02 UNDERGROUND-TYPE PLASTIC LINE MARKERS

A. General: Manufacturer's standard permanent, bright-colored, continuous-printed detectable tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide tape with printing which most accurately indicates type of service of buried pipe.

1. Provide multi-ply tape consisting of solid aluminum foil core between 2-layers of plastic tape.

2.03 ACCEPTABLE MANUFACTURERS

A. Allen Systems, Inc.
B. Brady (W.H.) Co.; Signmark Div.
C. Industrial Safety Supply Co., Inc.
D. Seton Name Plate Corp.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.02 PIPING SYSTEM IDENTIFICATION

A. General: Install pipe markers on each piping system, and include arrows to show normal direction of flow.

B. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.

1. Near each valve and control device.

2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.

3. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.

4. At access doors, manholes and similar access points which permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.

7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.03 UNDERGROUND PIPING IDENTIFICATION

A. General: During back-filling/top-soiling of underground gas piping, install continuous underground-type detectable type line marker, located directly over buried line at 6" to 8" below finished grade.

END OF SECTION 15190

DIVISION 15 - MECHANICAL

SECTION 15250 - PIPE INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. Provide all materials, equipment, apparatus, services, methods, tools, labor, transportation, etc., required to complete the insulation of the mechanical systems shown on the drawings and specified.

B. Piping requiring insulation:

1. Horizontal roof drain piping (not including overflow drain piping) above grade, vertical roof drain piping leaders to roof drains and roof drain bodies.

2. HVAC piping (hot water, chilled water, condensate, refrigerant suction)

3. Domestic water piping (hot water, cold water)

C. Painting and identification shall be provided under Division 9 or by the Contractor providing the items to be insulated. Factory sizing on outer jacketing of insulation shall be provided under this section suitable for specified finish coat of paint or identification.

1.03 SUBMITTALS

A. Submit shop drawing in accordance with Section 15010 - “BASIC MECHANICAL REQUIREMENTS” for all insulation as follows:

1. Schedule listing each type of insulation, insulation thickness, density, “K” factor, type of jacket, etc., and the service or type of work that the insulation is to apply.

1.04 CODES AND STANDARDS

A. Where applicable, the Fire Hazard Classification of the materials herein specified shall be listed and inspected by Underwriters' Laboratories, Inc. The flame spread rating, fuel contributed and smoke developed as shown in the listing shall be determined by ASTM E84 "Method of Tests for Surface Burning Characteristics of Building Materials". Each product shall bear the label of Underwriters' Laboratories. All products used on this project shall be classified as "non-combustible" in International Building Code or NFPA National Fire Code.

1.05 DEFINITION

A. The term "piping" as used in this section of the specifications shall include pipe, fittings, valves, specialties, strainers, flanges, unions, run-outs, final connections, etc.

1.06 PROTECTION

A. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Any such insulation or covering damaged prior to final acceptance of the work shall be satisfactorily repaired or replaced.

B. Provide sturdy metal guards on all duct and pipe (whether insulated or not) subject to damage from normal maintenance operations and personnel.

PART 2 - PRODUCTS

2.01 PIPING AND EQUIPMENT INSULATION

A. "Fiberglass": Minimum 3½ pounds per cubic foot density, fiberglass factory molded or spun pipe insulation with a "K" factor of 0.24 at 75°F. mean temperature and a factory applied fire retardant self sealing vapor barrier "ASJ" jacket. At the Contractor's option, closed-cell elastomeric insulation in tubular form equal to Armacell "AP Armaflex" may be used in lieu of fiberglass insulation. Self-sealing pipe insulation such as Armacell "AP Armaflex SS" is not allowed.

Note: All pipe insulation to be installed in plenums shall be rated for plenum installation. Insulation shall have a flame-spread index of less than 25 and a smoke-developed index of less than 50 as tested by ASTM E 84-03.

B. "Foamglass": Insulation equal to *Pittsburgh Corning Foamglass*. The insulation shall be jacketed with *Pittsburgh Corning Pittwrap SS* jacketing or equal.

2.02 ADHESIVES, LAGGING, AND SEALERS

A. Adhesives, lagging and sealers shall be as recommended by the insulation manufacturers. Where applicable, they shall include an anti-vermin and fungicidal agent and shall be non-toxic and non-flammable.

2.03 PVC PRE-MOLDED FITTING AND VALVE COVERS

A. Pre-molded fitting and valve covers shall be factory made of one piece polyvinyl chloride. Covers shall overlap the adjoining pipe insulation.

2.04 ALUMINUM JACKET

A. .016" thk. aluminum jacket, with moisture barrier, shall be field applied over all exterior piping, fittings, and valves.

B. Provide pre-molded .016" thk. aluminum jacket covers at all valves and fittings.

C. Joints shall be sealed with preformed 2" butt strap with sealant over the seam and secured with ½" aluminum band and wing seal.

2.05 ACCEPTABLE MANUFACTURERS

A. Fiberglass Insulation

1. Certain-Teed
2. Knauf Fiberglass.
3. Manville Corp.
4. Owens-Corning Fiberglass Corp.

B. Flexible Foamed Plastic Insulation

1. Armacell.
2. Halstead Industrial Products.

C. Adhesives, Lagging, and Sealers

1. Benjamin Foster.
2. Insul-Coustic.
3. Chicago Mastic Co.

D. PVC Pre-molded Fitting and Valve Covers

1. Insul-Coustic Corp.
2. Zeston, Inc.
3. Certain-Teed/Saint Gobain Corp.

PART 3 - EXECUTION

3.01 PREPARATION/GENERAL REQUIREMENTS

A. <u>Insulation work shall be performed by competent workmen regularly employed by insulating contractors.</u>

B. Install insulation in full accordance with the manufacturer’s recommendations, including provisions for cementing joints and insulating fittings.

C. Clean thoroughly to remove rust, plaster, and dirt before insulation is applied. Insulation shall be applied on clean dry surfaces only. Piping shall have been tested and approved before covering.

D. Exposed insulated ducts and piping shall be provided with a finish of an adequate surface for a final coat of paint. Pre-sized jackets, aluminum, vinyl and other pre-finished jackets are acceptable as installed, however, canvas and similar material shall be filled and sealed or dipped if necessary to provide a good surface for painting.

E. At Contractor's option, canvas jacket may be replaced by glass cloth. Vapor barriers on cold surfaces and piping must be continuous through sleeves, hangers, supports, etc. Stapling of vapor barrier jackets will not be permitted.

F. Insulation is not required on vertical down spouts (within the building) except at vertical piping leaders to roof drains.

G. Provide saddles, shields, metal protectors and other appurtenances necessary to prevent crushing of insulation at hangers, rollers, supports and anchors. Provide rigid insulation blocks at saddles.

3.02 PIPING INSULATION

A. Insulate all above-ground piping systems, except gas piping and sprinkler piping, with piping insulation of specified thicknesses.

	Type of System or Pipe	Insulation Thickness
1.	Domestic cold water piping, domestic hot water piping, tempered water piping, condensate piping, roof drain piping, ground-source heat pump system piping, HVAC hot water piping, and HVAC hot water equipment: *fiberglass*	½"
2.	HVAC chilled water piping and HVAC chilled water equipment: *fiberglass*	1"
3.	Exterior HVAC chilled water pipe above grade: *fiberglass with a .016" thick aluminum jacket*	1"
4.	Exterior HVAC chilled water pipe below grade, *foamglass*	2"
5.	Hot water storage tanks: *fiberglass*	1½"

B. Installation of insulation shall be as follows:

1. Insulate all hydronic lines with the materials specified above. Install insulation neatly and securely.

2. Insulate headers and lines in the mechanical room. Also insulate the air separator, pump bodies, and any other surface which may produce condensate during system operation.

3. Pipe: Butt all joints firmly together. Cover joints with 3" butt strips. Smoothly secure all jacket laps and joints strips with adhesive. Self-sealing laps shall be applied according to manufacturers recommendations. Ends of pipe insulation shall be sealed off with a vapor barrier coating at all fittings and valves and at intervals of 21' on continuous runs.

4. Fittings and Valves: Insulate with molded fiberglass fittings, foamed plastic insulation, segments of pipe covering or firmly compressed foil faced fiberglass blankets. Vapor seal by applying a layer of open weave glass cloth embedded between two coats of vapor barrier mastic.

5. Insulation of hoses at heat pump connections shall be done using Armacell “AP Armaflex” tubular insulation. Install foam tape as necessary to prevent condensation at joints in insulation.

END OF SECTION 15250

DIVISION 15 - MECHANICAL

SECTION 15300 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. The wet-pipe sprinkler systems for buildings and structures.

B. Products specified in this Section with installation not in Contract include sprinkler cabinets with spare sprinklers and sprinkler wrenches. Deliver to the Owner's maintenance personnel.

1.03 RELATED WORK

A. Section 02667 - for water supply piping from water source to inside of building.

B. Section 15010 - "BASIC MECHANICAL REQUIREMENTS".

C. Section 16721 - "FIRE ALARM SYSTEM" for alarm devices not specified in this Section.

1.04 SUBMITTALS

A. Submit product data for fire protection system components in accordance with Section 15010 - "BASIC MECHANICAL REQUIREMENTS." Include the following:

1. Backflow preventers.

2. Valves.

3. Specialty valves, accessories, and devices.

4. Alarm devices. Include electrical data.

5. Fire hose and cabinet.

6. Fire department connections. Include type of fire department connection; number, size, type, and arrangement of inlets; size and direction of outlet; and finish.

7. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other data.

B. Sprinkler system drawings identified as "working plans," prepared according to NFPA 13 and where applicable, NFPA 14. Submit required number of sets to authority having jurisdiction for review, comment, and approval. Include system hydraulic calculations. Plans and calculations shall be sealed by a registered professional engineer.

C. Test reports and certificates as described in NFPA 13. Include "Contractor's Material & Test Certificate for Aboveground Piping" and "Contractor's Material & Test Certificate for Underground Piping."

D. Maintenance data for each type of fire protection specialty specified, for inclusion in Operating and Maintenance Manual specified in Division 1.

E. Two (2) copies of NFPA 25 "Standard for Inspection, Testing and Maintenance of Water Based Fire Protection Systems." Deliver to Owner's maintenance personnel.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in the UL Fire Protection Equipment Directory and that conform to other requirements indicated.

B. Listing and Labeling: For equipment, specialties, and accessories that are listed and labeled, refer to the NEC Article 100 for the definition of "Listed" and "Labeled".

C. Comply with requirements of authority having jurisdiction for submittals, approvals, materials, hose threads, installation, inspections, and testing.

D. Designer: Submit shop drawings and design calculations prepared by a licensed engineer in compliance with the requirements of UFC 3-600-01. When prepared by a licensed engineer, the drawings and calculations shall be sealed by the engineer. The shop drawings and calculations shall be reviewed by the Contracting Officer prior to the sprinkler system installation.

E. Installer's Qualifications: Firms qualified to install and alter fire protection piping, equipment, specialties, and accessories, and repair and service equipment. A qualified firm is one that is experienced (minimum of 5 previous projects similar in size and scope to this Project) in such work, familiar with precautions required, and in compliance with the requirements of the authority having jurisdiction. Submit evidence of qualifications to the Engineer upon request. Refer to Division 1 for definition of "Installer."

F. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:

1. NFPA 13 “Standard for the Installation of Sprinkler Systems.”

2. NFPA 14 “Standard for the Installation of Standpipe, Private Hydrant and Hose Systems.”

3. NFPA 26 “Recommended Practice for the Supervision of Valves Controlling Water Supplies for Fire Protection.”

4. NFPA 70 “National Electrical Code.”

5. Unified Facilities Criteria “UFC 3-600-01”

1.06 DEFINITIONS

A. Pipe sizes used in this Section are nominal pipe size (NPS) specified in inches. Tube sizes are standard tube size specified in inches.

B. Working plans as used in this Section refer to documents (including drawings and calculations) prepared pursuant to requirements in NFPA 13 for obtaining approval of authority having jurisdiction.

C. Other definitions for fire protection systems are included in the referenced NFPA standards.

1.07 SYSTEM DESCRIPTION

A. Wet-Pipe Sprinkler System: A sprinkler system employing automatic sprinklers attached to a piping system containing water and connected to water supply so that water discharges immediately from sprinklers opened by heat from a fire.

B. Sprinkler System Protection Limits: All spaces within areas indicated on the plans including closets, toilet and locker room areas, each landing of each stair, and special applications areas.

C. Water Supply: The supply portion of the sprinkler system that provides the flow (gpm) and pressure (psi) required by the water based fire protection system. The water supply system consists of the piping up to and including the valve that isolates the sprinkler system from the water source.

1.08 SYSTEM PERFORMANCE REQUIREMENTS

A. Design and obtain approval from authority having jurisdiction for fire protection systems specified.

B. Minimum Pipe Sizes: Not smaller than sizes indicated for connection to water supply piping and system riser.

C. Water Supply: Conduct tests on water supply as required to obtain hydraulic data needed to prepare design for hydraulically calculated systems.

D. Hydraulically design sprinkler systems according to:

1. Sprinkler System Occupancy Hazard Classifications as indicated on the drawings.

2. Minimum Density Requirements for Automatic Sprinkler System Hydraulic Design required by NFPA 13.

E. Components and Installation: Piping systems with the following minimum working pressure ratings or as required by NFPA 13.

1. Sprinkler Systems: 175 psig (1200 kPa).

PART 2 - PRODUCTS

2.01 PIPES AND TUBES

A. Refer to Part 3 Article "Sprinkler and Standpipe System Piping Applications" and for identification of systems where pipe and fitting materials specified below are used.

B. Ductile-Iron Pipe: AWWA C115, ductile-iron barrel with iron-alloy threaded flanges, 250-psig (1725 kPa) minimum working pressure rating, and AWWA C104 cement-mortar lining.

1. Option: Pipe may be AWWA pattern, cut-grooved for grooved-coupling joints.

C. Steel Pipe: ASTM A 53, Schedule 40 in sizes 6" (150 mm) and smaller and Schedule 30 in sizes 8" (200 mm) and larger, black and galvanized, plain and threaded ends, for welded, threaded, cut-groove, and rolled-groove joints.

D. Steel Pipe: ASTM A 135, Schedule 10 through 5" (125 mm) sizes and NFPA 13 specified wall thickness for 6" (150 mm) through 10" (250 mm) sizes, with plain ends, black and galvanized, for rolled-groove and welded joints.

E. Steel Pipe: ASTM A 135, threadable light wall, black and galvanized, for threaded joints.

F. Steel Pipe: ASTM A 795, black and galvanized, for joints listed and for use with fittings for plain-end steel pipe.

1. Type: Lightweight pipe, Schedule 10, for rolled- groove and welding joints.

2.02 PIPE AND TUBE FITTINGS

A. Ductile-Iron and Gray-Iron Flanged Fittings: AWWA C110, 250-psig (1725 kPa) minimum pressure rating, with AWWA C104 cement-mortar lining.

B. Malleable-Iron Threaded Fittings: ASME B16.3, Class 300, standard pattern, with threads according to ASME B1.20.1.

C. Grooved-End Fittings for Ductile-Iron Pipe: ASTM A 536 ductile-iron or ASTM A 47 malleable-iron, AWWA pipe-size, designed to accept AWWA C606 grooved couplings. Include cement lining or Food and Drug Administration (FDA)-approved interior coating.

D. Steel Fittings: ASTM A 234/A 234M, seamless or welded; ASME B16.9, buttwelding; or ASME B16.11, socket-welding type for welded joints.

E. Steel Flanges and Flanged Fittings: ASME B16.5.

F. Grooved-End Fittings for Steel Pipe: UL-listed and FM-approved, ASTM A 536, Grade 65-45-12 ductile iron or ASTM A 47 Grade 32510 malleable iron, with grooves or shoulders designed to accept grooved couplings.

2.03 JOINING MATERIALS

A. Refer to Section 15050 - "MATERIALS AND METHODS" for joining materials not included in this Section.

B. Flanged Joints for Ductile-Iron Pipe and Ductile-Iron or Cast-Iron Fittings: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.

C. Couplings for Grooved-End Steel Pipe and Grooved-End Ferrous Fittings: UL 213, AWWA C606, ASTM A 536 ductile-iron or ASTM A 47 malleable-iron housing, with enamel finish. Include synthetic-rubber gasket with central-cavity, pressure-responsive design; ASTM A 183 carbon-steel bolts and nuts; and locking pin, toggle, or lugs to secure grooved pipe and fittings.

D. Couplings for Grooved-End Ductile-Iron Pipe and Fittings: UL 213, AWWA C606, ASTM A 536 ductile-iron housing, with enamel finish. Include synthetic-rubber gasket with central-cavity, pressure-responsive design, and ASTM A 183 carbon-steel bolts and nuts to secure grooved pipe and fittings.

2.04 FIRE PROTECTION SERVICE VALVES

A. General: UL-listed and FM-approved, with 175-psig (1200 kPa) non-shock minimum working pressure rating.

1. Option: Valves for use with grooved piping may be grooved type.

B. Gate Valves, 2" (50 mm) and Smaller: UL 262, cast-bronze, threaded ends, solid wedge, outside screw and yoke, rising stem.

C. Gate Valves, 2½" (65 mm) and Larger: UL 262, iron body, bronze mounted, taper wedge, outside screw and yoke, rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.

D. Gate Valves, 2½" (65 mm) and Larger for Use with Indicator Posts: UL 262, iron body, bronze mounted, solid wedge disc, non-rising stem with operating nut and flanged ends.

E. Indicator Posts: UL 789, cast-iron body, with windows for target plates that indicate valve position, extension rod and coupling, locking device, and red enamel finish.

1. Operation: Cast Hand Wheel.

F. Swing Check Valves, 2½" (65 mm) and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze disc ring and flanged ends.

G. Ball Drip Valves: UL 1726, automatic drain valve, ¾" (20 mm) size, spring-loaded, ball check device with threaded ends.

2.05 BACKFLOW PREVENTERS

A. General: ASSE standard backflow preventers, of size indicated for maximum flow rate indicated and maximum pressure loss indicated.

1. Working Pressure: 150 psig (1035 kPa) minimum except where indicated otherwise.

2. Bronze, cast-iron, steel, or stainless-steel body with flanged ends.

3. Interior Lining: FDA-approved epoxy coating, for backflow preventers having cast-iron or steel body.

4. Interior Components: Corrosion-resistant materials.

B. Reduced Pressure Backflow Prevention Assemblies: consisting of shutoff valves on inlet and outlet and strainer on inlet. Include test cocks with 2 positive-seating check valves for continuous pressure application. Assembly shall meet the requirements of the local authority

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.

2.06 SPRINKLERS

A. Automatic Sprinklers: With heat-responsive element conforming to:

1. UL 199, for applications except residential.

2. UL 1767, for early-suppression, fast-response applications.

B. Sprinkler types and categories are as indicated and as required by application. Furnish automatic sprinklers with nominal ½" (12.7 mm) orifice for "Ordinary" temperature classification rating except where otherwise indicated and required by application.

C. Sprinkler types, features, and options include:

1. Flush (concealed) ceiling sprinklers, including escutcheon.

2. Pendent, dry-type sprinklers.

3. Upright sprinklers.

D. Sprinkler Finishes: Chrome-plated and bronze.

E. Sprinkler Escutcheons: Materials, types, and finishes for following sprinkler mounting applications. Escutcheons for concealed sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, 1-piece, flat.

F. Sprinkler Cabinets: Finished steel cabinet and hinged cover, with space for minimum of 6 spare sprinklers plus sprinkler wrench, suitable for wall mounting. Include number of sprinklers required by NFPA 13 and 1 wrench for sprinklers. Include separate cabinet with sprinklers and wrench for each style sprinkler on Project.

2.07 SPECIALTY SPRINKLER FITTINGS

A. Specialty Fittings: UL-listed and FM-approved, made of steel, ductile iron, or other materials compatible with system materials and applications where used.

B. Locking-Lug Fittings: UL 213, ductile-iron body with locking-lug ends, for use with plain-end steel pipe.

C. Mechanical-"T" Fittings: UL 213, ductile-iron housing with pressure-responsive gasket, bolts, and threaded or locking-lug outlet.

D. Mechanical-Cross Fittings: UL 213, ductile-iron housing with pressure-responsive gaskets, bolts, and threaded or locking-lug outlets.

E. Drop-Nipple Fittings: UL 1474, with threaded inlet, threaded outlet, and seals; adjustable.

F. Sprinkler Alarm Test Fittings: Ductile-iron housing with 1½" (40 mm) inlet and outlet, integral test valves, combination orifice and sight glass, and threaded or locking-lug ends.

2.08 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connections: UL 405, cast-brass body; NH-standard thread inlets according to NFPA 1963 and matching local fire department threads; and threaded NPS outlet. Include

lugged cap, gasket, and chain; lugged swivel connection and drop clappers for each hose connection inlet; and round wall escutcheon plate with marking “AUTO SPKR.”

2.09 HOSE AND VALVE CABINETS

A. Surface mounted hose cabinet: Potter-Roemer #1054 fire hose cabinet, with #2510 hose rack assembly and 100’ polyflex hose and fog nozzle (or approved equal).

B. Recessed hose cabinet: Potter-Roemer #1004 fire hose cabinet, with #2510 hose rack assembly and 100’ polyflex hose and fog nozzle (or approved equal).

C. Surface mounted valve cabinet: Potter-Roemer #1835 valve cabinet.

D. Recessed valve cabinet: Potter-Roemer #1830 valve cabinet.

E. All cabinets shall be provided with a bright red finish. See plan for cabinet configuration (recessed or surface mounted).

2.10 ALARM DEVICES

A. Alarm Devices: Types and sizes that will match piping and equipment connections.

B. Electric Alarm Bells: UL Listed, 6" round and designed for horizontal or vertical installation. Polarized, mount to 4" square outlet box, high-efficiency motor driven striker, red finish; on outdoor installations provide a weatherproof back box. Provide bells with voltage as required (See Fire Protection Drawings).

C. Supervisory Switches: UL 753, for valves, electrical-supervision type, SPDT (single-pole, double-throw), normally closed contacts, designed to signal controlled valve in other than full open position (See Fire Protection Drawings).

2.11 PRESSURE GAUGES

A. Pressure Gauges: UL 393, 3½" to 4½" (90 to 115 mm) diameter dial with dial range of 0-250 psig (0-1600 kPa).

2.12 ACCEPTABLE MANUFACTURERS

A. Backflow Preventers:

1. Ames Co., Inc.
2. Cla-Val Co.
3. Conbraco Industries, Inc.
4. Febco.
5. Hersey Products, Inc., Grinnell Corp.
6. Watts Regulator Co.
7. Wilkins Regulator Div., Zurn Industries, Inc.

B. Fire Department Connections:

1. Badger-Powhatan, Figgie International Co.
2. Croker Div., Fire-End and Croker Corp.
3. Elkhart Brass Mfg. Co., Inc.
4. Firematic Sprinkler Devices, Inc.
5. Gem Sprinkler Co. Div., Grinnell Corp.
6. Guardian Fire Equipment, Inc.
7. Potter-Roemer Div., Smith Industries, Inc.
8. Reliable Automatic Sprinkler Co., Inc.
9. Sierra Fire Equipment Co.

C. Fire Protection Service Gate and Check Valves:

1. Gem Sprinkler Co. Div., Grinnell Corp.
2. Kennedy Valve Div., McWane, Inc.
3. Nibco, Inc.
4. Stockham Valves and Fittings, Inc.
5. Victaulic Company of America.

D. Grooved Couplings for AWWA Ductile-Iron Piping:

1. Gustin-Bacon Div., Tyler Pipe Subsid., Tyler Corp.
2. Victaulic Company of America.

E. Grooved Couplings for Steel Piping:

1. Grinnell Supply Sales Co., Grinnell Corp.
2. Gustin-Bacon Div., Tyler Pipe Subsid., Tyler Corp.
3. Sprink-Line by Sprink, Inc.
4. Stockham Valves and Fittings, Inc.
5. Victaulic Company of America.

F. Indicator Posts and Valves:

1. Clow Valve Co. Div., McWane, Inc.
2. Gem Sprinkler Co. Div., Grinnell Corp.
3. Kennedy Valve Div., McWane, Inc.
4. Nibco, Inc.
5. Stockham Valves and Fittings, Inc.
6. Waterous Co.

G. Specialty Valves and Electric Alarm Bells:

1. ASCOA Fire Systems, Figgie International Co.
2. Central Sprinkler Corp.
3. Firematic Sprinkler Devices, Inc.
4. Gem Sprinkler Co. Div., Grinnell Corp.

5. Globe Fire Sprinkler Corp.
6. Reliable Automatic Sprinkler Co., Inc.
7. Star Sprinkler Corp.
8. Viking Corp.

H. Sprinklers:

1. ASCOA Fire Systems, Figgie International Co.
2. Central Sprinkler Corp.
3. Firematic Sprinkler Devices, Inc.
4. Gem Sprinkler Co. Div., Grinnell Corp.
5. Globe Fire Sprinkler Corp.
6. Reliable Automatic Sprinkler Co., Inc.
7. Star Sprinkler Corp.
8. Viking Corp.

I. Water Flow Indicators and Supervisory Switches:

1. Gamewell Co.
2. Gem Sprinkler Co. Div., Grinnell Corp.
3. Potter Electric Signal Co.
4. Reliable Automatic Sprinkler Co., Inc.
5. System Sensor Div., Pittway Corp.
6. Victaulic Company of America.
7. Watts Regulator Co.

PART 3 - EXECUTION

3.01 SPRINKLER AND STANDPIPE SYSTEM PIPING APPLICATIONS

A. Refer to Part 2 of this Section for detailed specifications on pipe and fittings products listed below. Use pipe, tube, fittings, and joining methods according to the following applications. Piping may be joined with flanges instead of indicated joints. Use grooved-end fittings with grooved couplings that are made by the same manufacturer and that comply with listing when used together for grooved- coupling joints.

B. Pipe Between Fire Department Connections and Check Valves: Use galvanized-steel pipe instead of black-steel pipe when steel pipe is specified for applications below. Do not use welded joints.

C. Sizes 2" (50 mm) and Smaller: ASTM A 53, A 135, or A 795; threadable light wall pipe, Schedule 40 steel pipe with cut-groove ends, grooved-end steel pipe fittings, and grooved-coupling joints; or with threaded joints and fittings.

D. Sizes 2½" (65 mm) to 6" (150 mm: ASTM A 135 or A 795, Schedule 10 steel pipe with rolled- groove ends, grooved-end steel pipe fittings, and grooved-coupling joints.

3.02 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use gate, ball, or butterfly valves.

2. Throttling Duty: Use globe, ball, or butterfly valves.

3.03 JOINT CONSTRUCTION

A. Refer to Section 15050 - “MATERIALS AND METHODS” for basic piping joint construction.

B. Grooved-End Pipe and Grooved-End Fitting Joints: Use grooved-end fittings and grooved couplings that are made by the same manufacturer and that are listed for use together. Groove pipe and assemble joints with grooved coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer’s written instructions.

1. Groove Type: Cut.

2. Groove Type: Rolled.

C. Locking-Lug Joints: Follow manufacturer’s written instructions.

D. Dissimilar Materials Piping Joints: Make joints using adapters compatible with both piping materials.

3.04 SERVICE ENTRANCE PIPING

A. Connect fire protection piping to water service piping of size and in location indicated for service entrance to building. Water service piping is specified in Section 02667.

B. Install shutoff valve, backflow preventer, pressure gauge, drain, and other accessories indicated at connection to water supply piping.

3.05 PIPING INSTALLATIONS

A. Refer to Section 15050 - “MATERIALS AND METHODS” for basic piping installation.

B. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping. Install piping as indicated, as far as practical. All piping shall be installed as high as possible.

1. Deviations from approved “working plans” for sprinkler piping require written approval from authority with jurisdiction. File written approval with the Engineer prior to deviating from approved “working plans.”

C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes 2" (50 mm) and smaller. Unions are not required on flanged devices or in piping installations using grooved couplings.

E. Install flanges or flange adapters on valves, apparatus, and equipment having 2½" (65 mm) and larger connections.

F. Install “Inspector’s Test Connections” in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.

G. Install sprinkler piping with drains for complete system drainage.

H. Install ball drip valves to drain piping between fire department connections and check valves, and where indicated. Drain to floor drain or outside building.

I. Install alarm devices in piping systems.

J. Hangers and Supports: Comply with NFPA 13.

1. Install hanger and support spacing and locations for steel piping joined with grooved mechanical couplings according to manufacturer’s written instructions for rigid systems.

K. Install pressure gages on riser or feed main. Include pressure gauges with connection not less than ¼" (7 mm) and with soft metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they will not be subject to freezing.

3.06 SPECIALTY SPRINKLER FITTING INSTALLATIONS

A. Install specialty sprinkler fittings according to manufacturer’s written instructions.

3.07 VALVE INSTALLATIONS

A. Refer to Section 15100 - “VALVES” for installation of general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13, manufacturer’s written instructions, and the authority having jurisdiction.

B. Gate Valves: Install fire-protection service valves supervised-open, located to control sources of water supply except from fire department connections. Where there is more than 1 control valve, provide permanently marked identification signs indicating portion of system controlled by each valve.

C. Alarm Check Valves: Install valves in vertical position for proper direction of flow, including bypass check valve and retard chamber drain line connection.

3.08 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Comply with plumbing code and authority having jurisdiction. Do not install bypass around backflow preventer.

3.09 SPRINKLER APPLICATIONS

A. Rooms without Ceilings: Upright sprinklers.

B. Rooms with Suspended Ceilings: Flush (concealed) sprinklers.

C. Wall Mounting: Sidewall sprinklers.

D. Spaces Subject to Freezing: Upright or pendent dry-type.

E. Special Applications: Use extended-coverage, flow- control, and quick-response sprinklers where indicated.

F. Sprinkler Finishes: Use sprinklers with following finishes:

1. Upright and Sidewall Sprinklers: Chrome-plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view.

3.10 SPRINKLER INSTALLATIONS

A. Install sprinklers in suspended ceilings in center of acoustical panels and tiles where spacing permits.

B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers supplied from heated space.

3.11 FIRE DEPARTMENT CONNECTION INSTALLATIONS

A. Install fire department connections of types and features indicated in locations indicated.

B. Install ball drip valves at each check valve for fire department connection to mains and where indicated. Drain to floor drain or outside building.

3.12 CONNECTIONS

A. Connect water supplies to standpipe and sprinkler systems. Include backflow preventers.

B. Electrical Connections: Power wiring is specified in Division 16.

C. Connect alarm devices to fire alarm system.

3.13 FIELD QUALITY CONTROL

A. Perform field acceptance tests of each fire protection system.

1. Flush, test, and inspect sprinkler piping systems according to NFPA 13 Chapter "System Acceptance."

B. Replace piping system components that do not pass test procedures specified, then retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.

C. Report test results promptly and in writing to authority having jurisdiction when required.

3.14 CLEANING

A. Clean dirt and debris from sprinklers. Replace sprinklers having paint other than factory finish with new sprinklers. Cleaning and reuse of painted sprinklers is prohibited.

3.15 COMMISSIONING

A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturer, proceed as follows:

1. Verify that specialty valves, trim, fittings, controls, and accessories have been installed correctly and operate correctly.

2. Verify that specified tests of piping are complete.

3. Check that damaged sprinklers and sprinklers with paint or coating not specified have been replaced with new, correct type of sprinklers.

4. Check that sprinklers are correct type, have correct finish and temperature ratings, and have guards where required for applications.

5. Check that potable water supplies have correct type of backflow preventer.

6. Check that hose valves and fire department connections have threads compatible with local fire department equipment and have correct pressure rating.

7. Fill wet-pipe sprinkler systems with water.

8. Adjust operating controls and pressure settings.

B. Coordinate with fire alarm system tests. Operate systems as required.

3.16 DEMONSTRATION

A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.

END OF SECTION 15300

DIVISION 15 – MECHANICAL

SECTION 15400 - PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. All piping, fittings, meters, valves, hangers and other accessories specified or shown on the drawings for a complete plumbing system.

B. Sanitary waste, vent piping, and storm water drainage system, including all necessary excavating and backfilling to 5'-0" outside building foundation, unless stated otherwise.

C. All rough-in and final connections to the AAFES furnished equipment unless noted otherwise on the drawings.

1.03 SUBMITTALS

A. Submit certificates of compliance for pipe, fittings and valves specified under this section.

B. Submit shop drawings in accordance with Section 15010 - “BASIC MECHANICAL REQUIREMENTS” for the following equipment:

1. Floor drains.

2. Cleanouts.

3. Roof drains.

4. Hose bibbs.

5. Thermostatic tempering valves.

6. Water heaters.

C. Provide all identification, operating instructions, parts lists, wiring and control diagrams for all equipment installed under this section.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with current edition of following:

1. Pipe and fittings shall conform to applicable ANSI, AWWA, ASTM, and USASI standards referenced for those products.

B. No plumbing fixture, special equipment, device or piping shall be installed which will provide cross connection or interconnection between distributing supply for drinking water or domestic water and polluted supply or waste so as to make possible backflow or back-siphonage of sewage or polluted water into potable water supply system.

C. Where possibility of back-siphonage exists, water supplied to fixture shall be introduced through a suitable vacuum breaker installed at code minimum distance above fixture.

D. 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 DOMESTIC COLD AND HOT WATER PIPING SYSTEMS

A. All piping and fittings shall be manufactured in the United States. Each length of pipe and each fitting shall be marked with the manufacturer's name or trademark and the specification code to which it conforms.

B. Install water hammer arrestors where indicated on the drawings. Air chambers are not acceptable.

C. All supply connections to plumbing fixtures and equipment shall be galvanized or copper piping up to face of wall and chromium plated brass piping and fittings for exposed connections. Supply piping shall have screwed connections on both ends for piping through wall. Each fixture shall have a shut off valve at the fixture.

D. Each water connection to a plumbing fixture or item of equipment having a submerged inlet or hose end attached shall be provided with a vacuum breaker to prevent back-siphoning of contaminated water into the drinking supply. Vacuum breaker shall be approved by local and state health authorities.

2.02 PIPE AND TUBE MATERIALS

A. See Part 3 Article "Pipe and Fittings Applications" for the application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems:

1. Hard Copper Tube: ASTM B 88, Types K, and L, water tube, drawn temper.

2. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

3. "DWV" Copper Tube: ASTM B75, Type DWV.

4. Hub and Spigot, Cast-Iron Soil Pipe: ASTM A 74, Service Class.

5. Hubless, Cast-Iron Soil Pipe: CISPI 301.

6. Poly (Vinyl Chloride) (PVC) Plastic, DWV Pipe: ASTM D 2665, Schedule 40; plain ends.

7. Schedule 40 Black Steel: A53 ERW, Grade B.

8. Schedule 10 Black Steel: A135 ERW or A795 ERW, Grade B.

2.03 PIPE AND TUBE FITTINGS

A. Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.

B. Copper Tube, Grooved-End Mechanical Fittings: ASTM B 75, copper tube and ASTM B 584 bronze castings.

C. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends.

1. Threaded Ends: Threads conforming to ASME B1.20.1.

D. Mechanically Formed Outlets: Manufacturer's standard written procedure for forming tee-branch outlet from pipe and tube.

E. Malleable-Iron Unions: ASME B16.39, Class 150 hexagonal stock, with ball-and-socket joint, metal-to-metal bronze seating surfaces, and female threaded ends having threads conforming to ASME B1.20.1.

F. Malleable-Iron Threaded Fittings: ASME B16.39, Class 150, standard pattern, with threads conforming to ASME B1.20.1.

G. Hub and Spigot, Cast-Iron Soil Pipe Fittings: ASTM A 74, Service Class.

H. Hubless, Cast-Iron Soil Pipe Fittings: CISPI 301.

I. Poly (Vinyl Chloride) (PVC) Plastic, DWV Pipe Fittings: ASTM D 2665, made to ASTM D 3311; socket-type; drain, waste, and vent pipe patterns.

J. Poly (Vinyl Chloride) (PVC) Plastic, Schedule 40, Socket-Type Pipe Fittings: ASTM D 2466.

2.04 JOINING MATERIALS

A. Solder, brazing, and welding filler metals are specified in Part 3 of this Section.

B. Cast-Iron Soil Pipe and Fittings: ASTM C 564 neoprene rubber gaskets and lubricant.

C. Ductile-Iron Pipe and Ductile-Iron or Cast-Iron Fittings: The following materials apply:

1. Push-On Joints: AWWA C111 rubber gaskets and lubricant.

2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-t\strength steel bolts and nuts, and rubber gaskets.

3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.

D. Gasket-Type Couplings for Plain-End, Nonpressure System Pipe: Rubber or elastomeric compression gasket, made to match pipe inside diameter or hub and adjoining pipe outside diameter.

1. Gaskets: ASTM C 564, rubber for cast-iron soil pipe and ASTM F 477, elastomeric seal for plastic pipe. Gaskets for dissimilar or other pipe materials shall be compatible with pipe materials being joined.

E. Couplings for Grooved-End Copper Tube and Grooved-End Copper Fittings: ASTM A 536 ductile-iron or ASTM A 47 malleable-iron housing having copper-colored enamel finish, with synthetic-rubber gasket having central-cavity, pressure-responsive design and suitable for hot water, with ASTM A 183 carbon-steel bolts and nuts.

F. Schedule 40 Black Steel Pipe and Fittings - 2" and Smaller: Screwed joints with malleable-iron threaded fittings.

G. Schedule 40 Black Steel Pipe and Fittings - 2½" and Larger: Welded joints with standard weight welding fittings.

H. Couplings for Schedule 10 Black Steel Pipe 2" and Larger: ASTM A 536 ductile-iron or ASTM A 47 malleable-iron housing having orange-colored enamel finish, with synthetic-rubber gasket having central-cavity, pressure-responsive design and suitable for hot water, with ASTM A 183 carbon-steel bolts and nuts.

2.05 PIPE SPECIALTIES

A. Unions in copper pipe 2" and smaller shall be brass solder joint unions constructed for 150 psi working pressure.

B. Unions in steel pipe 2" and smaller shall be screwed, malleable-iron, brass to steel type (F.S. WW-U-531c Class 1) for 150 psi working pressure.

C. Unions 2½" in size and larger shall be companion flanges. (ANSI B16.1). Flanged unions shall be over welding nipples welded into pipelines.

D. Flanges shall be forged steel flanges (ANSI B16.5) constructed for 150 psig working pressure. Bolts for flanged joints shall be made of bolt steel and shall have clean cut threads with upset square heads and semi-flush hexagonal cold pressed nuts (F.S. WW-F406b).

E. Flange connections shall be made up with high pressure special type graphite 1/16" sheet packing (ANSI B16.21); or rubber, for temperature up to 200EF (F.S. HH-G-156 class A).

F. Dielectric unions suitable for dielectric service shall be provided at pipe connections between steel or cast-iron piping and copper tubing.

2.06 GAS PIPING

A. See Section 15488 - “NATURAL GAS PIPING” for gas piping materials.

2.07 FLOOR DRAINS

A. Unless noted otherwise, floor drains shall conform to the following:

1. Floor drains shall be 2" cast iron with a 5" satin nickel bronze vandal proof adjustable strainer. Jay R. Smith Model #2010-A-PB, unless otherwise noted.

2. Floor drains in shower or dry-off areas shall have polished chrome tops (suffix-CP).

3. Floor drains in slab-on-grade-floors shall not be flashed, shall have black iron bodies with nickel bronze covers and strainers, and must be located to properly serve associated equipment and be accessible for cleaning as approved by the Engineer. Floor drains in floors above grade shall be flashed.

4. Floor drains shall have covers and strainers securely fastened by countersunk, tamper-proof, brass machine screws.

5. All floor drains shall have a 5" minimum strainer size. On floor drains larger than 2", strainer size shall be at least 3" larger than the drain size unless specifically shown otherwise on the drawings.

6. Sanitary Floor Drains (Floor Sinks) shall be Jay R. Smith Model #3004 with a stainless steel grate. Coordinate grate type (cutouts) with drain usage.

7. Floor drains connected to trap primers shall be furnished with a ½” trap primer connection (Jay R. Smith Model #P050).

B. All floor drains shall be by the same manufacturer.

C. Furnish and install a deep seal “P” trap at each floor drain.

2.08 CLEANOUTS

A. All cleanouts shall be by the same manufacturer.

1. Exposed piping or piping above ceiling: Cast iron body ferrule with brass raised head, straight threaded coating plug having tapered shoulder.

2. Concrete floors: Cast iron floor cleanout, adjustable threaded housing, round satin bronze scoriated top, bronze tapered plug, vandal proof. Jay R. Smith, Model No. 4429-Y.

3. Tile floors: Cast iron floor cleanout, adjustable threaded housing, satin bronze top, recessed for tile bronze taper plug, vandal proof. Jay R. Smith, Model No. 4429-Y.

4. Walls: Pipe plug cleanout behind a stainless steel square access cover equal to a Jay R. Smith, Model No. 4730.

5. Carpeted floors: Cast iron floor cleanout, adjustable threaded housing, bronze taper plug satin bronze top with carpet marker. Jay R. Smith, Model No. 4020.

6. Outdoor: Coordinate placement of concrete pads with the general contractor, cast iron cleanout, adjustable threaded housing, round top, bronze tapered plug, vandal proof. Jay R. Smith Model No. 4250.

2.09 TRAPS

A. Trap all fixtures having waste connections with a water seal placed as close to fixture as possible. Provide all required traps including traps not furnished in combination with fixture and equipment.

B. Traps for lavatories or sinks shall be chrome plated 17 gauge brass unless noted otherwise on drawings.

C. Traps for laboratory table sinks or other sinks which may contain acids or other chemicals shall be heavy duty polyethylene.

2.10 ROOF DRAINS

A. All roof drains shall be by the same manufacturer.

1. Roof drains shall be as follows: cast-iron body, non-ferrous mushroom dome, flashing collar, gravel stop, caulked or threaded outlet, under-deck clamp, bearing pan sump receiver. Provide extension flange where required for insulation. Jay R. Smith. Model # 1010-C-R. See drawings for sizes.

B. Unless noted otherwise, roof drains shall conform to the following:

1. Roof drains shall have cast-iron bodies, non-ferrous mushroom domes with brass bolts, flashing rings and flashing. Size of roof drain shall be as indicated on the drawings.

2. Roof drains shall be provided with integral expansion joints unless connecting down spouts have sufficient offsets to provide required flexibility.

3. Roof drains shall be compatible to the type of roof and insulation in which they are to be installed. Provide bearing pan and/or extension flange where required.

2.11 HOSE BIBBS

A. Unless noted otherwise, hose bibbs shall be ¾" size, chrome plated, with removable T handle key, wall clamp and vacuum breaker. Woodford Model No. 65.

2.12 THERMOSTATIC TEMPERING VALVES

A. Water tempering valves (where shown on drawings) shall be rated for use for mixing water for showers or hand washing. They shall control the water temperature within ±2EF. of set point at any flow from zero to their maximum rating.

2.13 WATER HEATERS

A. Water heating equipment is specified on the HVAC drawing.

B. Refer to the Plumbing drawings for the storage tank requirements.

2.14 ACCEPTABLE MANUFACTURERS

A. Water Hammer Arrestors

1. Sioux Chief.

B. Unions (in copper pipe 2" and smaller)

1. Anaconda.
2. Chase Brass.
3. Mueller.

C. Flanged Unions

1. Cranelap.
2. Grinnell.
3. Van Stone.

D. Flange Connections

1. Cranite.
2. Garlock.

E. Cleanouts, Floor Drains, and Roof Drains

1. Jay R. Smith.
2. Josam.
3. Wade.
4. Watts.
5. Zurn.

F. Hose Bibbs

1. Chicago Faucet.
2. Woodford.

PART 3 - EXECUTION

3.01 PIPE AND FITTINGS APPLICATIONS

A. Use pipe, tube, fittings, and joining methods for piping systems according to the following applications:

1. Domestic Water Distribution Piping Below Ground: Use the following:

a. All interior domestic water piping shall be type “K” hard drawn copper tubing (SIL-FOS 2, FOS-FLO 7 or other silver brazing material). This is required for the water service line from the shut-off valve in the building to a point 5 feet outside the building.

b. All copper piping shall be installed with wrought copper fittings. Field-fabricated “T-Drill” taps are acceptable on piping 1" and larger, if silver-brazed (above-ground piping only).

c. Soft temper copper tubing may be used for small pipe in concealed spaces only to permit bends for roughing in.

d. Do not use tin-lead solder on domestic water piping. Use only approved lead-free solder or brazing material.

2. Domestic Water Distribution Piping Above Ground: Use the following:

a. Hard copper tube, Type L; wrought-copper or cast-copper-alloy pressure fittings; copper unions; bronze flanges; and solder joints with Alloy Sn95 solder.

b. Fittings Option: Mechanically formed outlets, brazing filler alloy, and brazed joints.

c. Fittings Option: Grooved fittings for copper piping.

3. All Exterior Domestic Water Piping: Including the building water service from the point of connection to the utility service to a point 5 feet outside the building, use the following:

a. ¾" - 1¼", schedule 40 PVC pipe with solvent-cemented joints.

b. 1½" - 3", SDR-21 PVC pipe (ASTM D2241) with rubber gasketed joints. Provide concrete blocking at all fittings.

c. 4" and larger, SDR-18 PC pipe (AWWA C-900) with rubber gasketed joints. Provide concrete blocking at all fittings.

4. Soil, Waste, and Vent Piping Below Ground: Use either of the following:

a. Hub-and-spigot cast-iron soil pipe, hub-and spigot cast-iron soil pipe fittings, neoprene rubber gaskets, and compression joints.

b. Poly (vinyl chloride) (PVC) plastic DWV pipe; PVC socket-type drain, waste, and vent pipe pattern fittings; and solvent-cemented joints.

5. Soil, Waste and Vent Piping Above Ground (not in plenum): Use either of the following:

a. Hubless cast-iron soil pipe; hubless cast-iron soil pipe fittings; stainless-steel, cast-iron, or FM-type heavy-duty couplings for hubless cast-iron soil pipe and fittings; and hubless joints.

b. Poly (vinyl chloride) (PVC) plastic DWV pipe; PVC socket-type drain, waste, and vent pipe pattern fittings; and solvent-cemented joints.

6. Soil, Waste and Vent Piping Above Ground (in plenum): Use either of the following:

a. Hubless cast-iron soil pipe; hubless cast-iron soil pipe fittings; stainless-steel, cast-iron, or FM-type heavy-duty couplings for hubless cast-iron soil pipe and fittings; and hubless joints.

b. Copper tubing, type DWV.

7. Storm Drainage Piping Below Ground: Use the following:

a. Poly (vinyl chloride) (PVC) plastic DWV pipe; PVC socket-type drain, waste, and vent pipe pattern fittings; and solvent-cemented joints.

8. Storm Drainage Piping Above Ground (not in plenum): Use the following:

a. Poly (vinyl chloride) (PVC) plastic DWV pipe; PVC socket-type drain, waste, and vent pipe pattern fittings; and solvent-cemented joints; or hubless cast-iron soil pipe.

b. Hubless cast-iron soil pipe; hubless cast-iron soil pipe fittings; stainless-steel, cast-iron, or FM-type heavy-duty couplings for hubless cast-iron soil pipe and fittings; and hubless joints.

c. Copper tubing, type L, M or DWV.

9. Storm Drainage Piping Above Ground (in plenum): Use either of the following:

a. Hubless cast-iron soil pipe; hubless cast-iron soil pipe fittings; stainless-steel, cast-iron, or FM-type heavy-duty couplings for hubless cast-iron soil pipe and fittings; and hubless joints.

b. Copper tubing, type L, M or DWV.

10. Compressed Air Piping Above Ground: Use the following:

a. 2" and Smaller: Schedule 40 black steel pipe; malleable-iron threaded fittings; screwed joints.

b. 2½" and Larger: Schedule 40 black steel pipe; standard weight fittings; welded joints.

c. Alternate: 2" and Larger: Schedule 10 black steel grooved-end pipe; gasketed couplings for grooved-end pipe.

3.02 JOINTING OF PIPING

A. Threads shall be full and clean cut, and ends of pipe shall be reamed. When screwed joints are assembled, the male thread shall be thoroughly coated with appropriate thread compound to serve as a joint sealer and as a prime coat of paint for the exposed threads. (Teflon tape may be used at Contractor's option.) Care shall be taken to keep all other foreign matter from entering the interior of the piping. Each section of pipe and all fittings shall be carefully inspected for dirt, grease, or other foreign matter on the inside and where necessary they shall be properly cleaned before assembly.

B. Soldered or brazed joints made with fittings having pre-inserted rings of solder or brazing alloy shall have the tube and fittings cleaned bright and fluxed. The joint shall be heated sufficiently to make a tight connection. Tubes and fittings without such rings, shall be cleaned bright, fluxed and heated until the solder is drawn into the joint by capillary action and the connection is tight. Flux shall be water soluble binder flux. In potable water systems, the use of solder containing lead is prohibited.

3.03 EXPANSION AND CONTRACTION

A. Provisions shall be made for expansion and contraction in all piping. Piping shall be installed in a manner such that joints will not develop leaks. All expansion shall be taken up by swing-connections, and the Contractor shall be responsible for the installation of these connections whether or not they are shown on the drawings with specific means for relieving expansion and contraction. Slip-type expansion joints shall not be used. Particular care must be exercised at branches on underground piping to allow free movement at branch connection to main.

3.04 INSTALLATION OF PIPING

A. Piping shall be installed on long continuous lengths, with a minimum number of joints. Joints, where necessary shall be carefully made to insure against leakage.

B. All piping shall be firmly supported using hangers, brackets and braces to prevent sagging and/or lateral movement. All hangers, brackets, and other supports shall be securely fastened to the construction as may be required and in a manner acceptable to the Engineer. All piping shall be installed to maintain maximum head room. Nothing shall be suspended from the roof deck. Piping installed on the structure (joists, etc.) shall be secured to the structure using pipe clamps, straps, etc.

C. Arrangement of all piping shall be as shown on plans. It is especially necessary that all mains be installed with view to accessibility in case of repair and location of pipe lines and spacing between same shall be so made that there will be no conflict between pipe lines by the several trades.

D. Contractor shall give careful consideration to clearances and locations of lines and type of fittings used to obtain these clearances. Provide maximum headroom in all cases. Piping shall be installed parallel to building walls and at a height so as not to obstruct any portion of a window, light fixture, doorway, pipe tunnel or passageway. Ascertain from the drawings heights of all suspended ceilings, size of all pipe shafts in which piping is to be concealed, and location and size of structural members in and adjacent to all pipe shafts.

E. Where interferences develop in the field, Contractor shall offset or reroute piping as required to clear such interferences. In all cases consult architectural drawings for exact location of pipe spaces, ceiling heights, or other architectural details before installing piping.

F. Under no circumstances shall the size of piping shown on the drawings be changed without written approval of the Engineer.

G. Provide eccentric reducers where required for proper drainage or venting of horizontal pipe lines. Reducing fittings shall be used for all changes of pipe size and bushings shall not, under any circumstances, be used.

H. Unions or flanges are to be installed on the equipment side of all valves in pipe connections from mains to equipment, to enable equipment to be drained and disconnected without necessitating the draining of mains.

I. Valves must be arranged for easy access. The piping shall be arranged to accomplish this.

3.05 COLD AND HOT WATER PIPING SYSTEM

A. Above grade water piping:

1. Piping shall be run true, parallel with walls, centered in hangers and sleeves, securely supported by hangers or supports independently of connections and sleeves, anchored as required to control movement. Pipe and fittings arranged as called for and as required to permit free, unrestrained, noiseless expansion and contraction and freedom from strain on equipment.

2. All screwed piping shall be carefully cut, reamed, threaded and worked into place with springing, using a small amount of prepared lubricant on the outside threads. Branch connections shall have three elbow spring pieces to allow for movement due to expansion.

3. Valves and unions or flanges shall be suitably located to isolate each unit, branch circuit or section of piping to facilitate maintenance and/or removal of all equipment and apparatus.

4. All piping shall be installed so as to be free to expand without injury to equipment or building.

5. Plumbing water mains must pitch down to drain completely through fixtures or equipment below; provide accessible unions, brass plugs or hose valves at low points.

6. Plumbing water mains must pitch to vent completely through fixtures or equipment above.

7. All risers or down-feed drops shall be firmly supported and blocking done as necessary to prevent hammer due to vibration.

8. Provide pipe escutcheons in accordance with Section 15050 - “MATERIALS AND METHODS”.

3.06 DISINFECTION OF DOMESTIC WATER SYSTEMS WITHIN THE BUILDING

A. General:

1. Before being placed in service and after testing is completed, all potable water piping shall be chlorinated as specified herein, in accordance with AWWA Standard C601-54 and as required by the local Health Department codes.

2. Chlorine may be applied by the use of chlorine gas-water mixture, direct chlorine-gas feed or a mixture of calcium hypochlorite and water. If calcium hypochlorite is used, it shall be equivalent to commercial products such as Perchloron, HTH or Maxochlor. The powder shall be mixed with water to form a paste thinned to a slurry and pumped or injected into the lines.

3. If direct chlorine-gas feed is used, it shall be fed with either a solution-feed chlorinator or by a pressure-feed chlorinator.

4. The lines and fixtures shall be flushed thoroughly after chlorination to remove all foreign matter.

5. Injection shall start only when all fixtures are connected and ready for operation.

6. A service cock or riser (¾" to at least 1¼") shall be provided by the Contractor and located at the point of connection to water service. The disinfecting agent shall be injected into and through the system from this cock or riser only.

7. Chlorine, either gas or liquid, or calcium hypochlorite (liquid or powered) shall be used as a disinfecting agent as approved in federal and AWWA procedures.

8. The disinfecting agent shall be injected by a proportioning pump or device through the service cock or riser slowly and continuously at an even rate.

9. All outlets shall be fully opened and closed at least four times during injection and the residual checked with orthotolidine solution.

10. When the chlorine residual concentration indicated not less than 50 parts per million at all outlets, all fixtures and water supply valves shall be closed.

11. The residual shall then be retained for a period of not less than eight hours.

12. After retention, the residual upon checking at most outlets, shall not be less than ten parts per million. If less, the disinfection must be repeated as described above.

13. If satisfactory, all fixtures shall be flushed until residual or orthotolidine tests are not greater than the water supply.

14. Contractor shall furnish Engineer or his authorized representative with sterilization report indicating potable water to be safe from contamination.

3.07 FLUSHING WATER PIPING

A. After the piping has been chlorinated, each run of pipe shall be thoroughly flushed out so as to remove all foreign matter from the lines. Flushing will ordinarily be done by opening drain valves along the lines.

B. Sufficient flushing water shall be introduced into the mains to produce a velocity of not less than 4 ft. per second, and this flow rate shall be continued until the discharge is clean and clear and does not show evidences of silt or foreign matter when a sample is visually inspected.

3.08 SOIL, WASTE, VENT AND STORM DRAIN PIPING SYSTEM

A. Size of soil, waste and vent stacks and branch piping shall be as indicated on the drawings, but in no case less than required by the provisions of the applicable codes.

B. Where possible, sewers and branches shall pitch down ¼" per 1’-0”, but not less than 1%. Branches, arms and connections, shall be sloped ¼" per 1'-0" where possible and provided with adequate hangers as specified elsewhere.

C. Interior underground, underfloor, or on-ground piping shall be continuously bedded with depressions for hubs on compacted sand or gravel to undisturbed soil for a minimum depth of 6" under pipe.

D. Connections to soil, waste and drain stacks shall be at 45E; those to vent stacks may be at 45E or 90E except vent stacks shall be connected at 45E to soil, waste or drain stack.

E. Connections to stacks and sewers shall be arranged so that operation of any fixture will not cause fluctuation of water level in traps of other fixtures.

F. Interior down spout shall be connected to roof drains; and provided with ample offsets or expansion joints below or integral with roof drains.

G. All thread joints shall be made up with thread sealant applied to male thread only. Threads exposed after joints are made up shall be painted with thread sealant to prevent rust. Teflon tape may be used at Contractor’s option.

H. Junctions of screwed pipe to bell and spigot cast iron shall be made with ring or half coupling screwed to end of galvanized pipe to form spigot end.

I. Junctions in all drainage lines shall be made with “Y” branches unless closeness of connection prevents it, in which case, where direction of flow is from horizontal to vertical, sanitary tees may be used upon the approval of the Engineer’s superintendent.

J. Compression joint installation for cast-iron soil pipe:

1. Fold and insert the one piece neoprene rubber gasket into the hub which has been properly cleaned.

2. Apply gasket lubricant to the spigot and inside of the gasket.

3. Push, draw or drive the spigot into the gasketed hub with a pulling tool or suitable device.

3.09 STACKS

A. Stacks shall impose no stress or strain on branches or connections, be plumb and straight and supported at base with 18" x 18" concrete or brick pier to undisturbed soil.

B. Unless otherwise noted, soil, waste, drain, and vent stacks shall be concealed in walls, pipe chases, pipe shafts, etc., with cleanouts extended to accessible locations.

3.10 VENTING

A. All plumbing fixtures shall be vented to prevent siphoning of traps. Venting shown on plans is minimum required and vents and vent stacks shall be increased in size and/or number and relocated as required, to prevent trap siphoning and to comply with applicable codes, ordinances, statutes, regulations of all governmental bodies, without increase in contract price.

B. A vent stack shall be run parallel to each soil or waste stack to receive branch vents from fixtures and traps. Each vent stack shall originate from a soil or waste pipe at its base. Each soil or waste stack and each vent stack shall be carried through the roof. Where possible, soil, waste, or vent stacks shall be combined before passing through the roof so as to have as few roof openings as possible. Pipes running close to walls shall be offset away from such walls before passing through the roof to permit proper flashing. All vent pipes passing through the roof shall be sized as indicated on the drawings, and shall extend 12" above roof.

C. All horizontal vent pipes shall grade up to meet the requirements of the local and state codes.

D. Vent risers and branches shall connect to the soil and waste risers above waste of highest fixture.

3.11 ROOF FLASHINGS

A. All roof drains and plumbing piping passing through the roof membrane shall be flashed under the roofing section of the specification.

B. Contractor shall insure all such items are properly flashed and made watertight.

3.12 CLEANOUTS

A. Cleanouts for indoor sanitary and storm drainage systems shall be installed not more than 50 feet apart, including the developed length of the cleanout pipe, in all horizontal drainage lines. A cleanout shall be provided at, or no more than two feet above the base of each vertical soil or waste stack and storm water conductor. Cleanouts shall be installed at such other points as may be necessary for adequate rodding out of drainage piping systems. Cleanouts shall be set flush with floor or wall surfaces.

3.13 INSTALLATION OF WATER HEATER

A. General: Install water heater in accordance with manufacturer's installation instructions. Install unit plumb and level, firmly anchored in location indicated, and maintain manufacturer's recommended clearances. Install on 4" high concrete "housekeeping" pad. Provide a galvanized steel drain pan under the water heater. Pipe drain pan outlet to the nearest floor drain.

B. Support: Orient so controls and devices needing service and maintenance have adequate access.

END OF SECTION 15400

DIVISION 15 - MECHANICAL

SECTION 15440 - PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. All plumbing fixtures, including supply and waste fittings, stops, trim, brackets, carriers, etc. specified, shown on the drawings and required for a complete installation.

B. All piping, fittings, valves, trim, stops, etc. specified, shown on the drawings and required for rough-in and final connection to owner-furnished equipment.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 15010 - "BASIC MECHANICAL REQUIREMENTS" for the following:

1. Plumbing fixtures and trim.

2. Chair carriers.

B. As soon as possible and within thirty (30) days after the award of the contract and before beginning the fabrication of any material or the installation of any equipment, a complete schedule of the materials and equipment proposed for installation shall be submitted to the Engineer for approval. This schedule shall include manufacturers' names, catalog data, diagrams, drawings and other descriptive data as required or requested by the Engineer.

C. Submittals shall be assembled in an orderly manner and shall include a title page with space for the Engineer's approval stamp and remarks. It shall also contain a concise listing of all items being submitted. Refer to general conditions of the specifications for format and number of copies required.

D. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Engineer with written certification that the material/product contains no asbestos. This certificate is mandatory before approval will be

issued. Submittals furnished without the asbestos-free certification will be returned to the Contractor with no action taken until such certification is provided.

E. See applicable sections to this Division for items requiring shop drawings.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with current edition of the following:

1. Vitreous china fixture, NBS-CS-CS20.

2. Enameled iron fixtures, NBS-CS-CS77.

3. Plumbing fixtures (land use), FS-WW-P-541.

B. No plumbing fixture, special equipment, device or piping shall be installed which will provide cross connection or interconnection between potable water system and polluted water or sewage system so as to make possible backflow or back siphonage of sewage or polluted water into the potable water supply system.

C. Where possibility of back siphonage exists, water supplied to fixture shall in introduced through a suitable vacuum breaker installed at code minimum height.

D. The water system of electric water coolers shall be manufactured of pure copper components only (completely lead free material). The water ways shall not contain any internal plating or coatings. All joints shall be made using silver solder brazing alloy. No lead or soft solder shall be used.

PART 2 - PRODUCTS

2.01 PLUMBING FIXTURES AND TRIM

A. All fixtures shall be vitreous china, acid resisting enamel cast iron or stainless steel as specified complete with brass piping, fittings, supplies, stops, flush pipes, trim and brackets. Exposed brass piping and fittings shall be chrome plated.

B. Where manufacturer’s numbers for a complete assembly are called for, such assembly shall be modified as specified in this section.

C. Fixtures shall have water, drain, waste, soil, vent, and other connections as called for. Each water connection fixture shall have an air gap or vacuum breaker as required by local and state departments of health. Water connection sizes are minimum and must be increased to correspond to manufacturer’s standards.

D. Carriers for wall hung fixtures shall be selected for the particular fixture, piping arrangement and building conditions prevailing at each location.

E. Where lavatories without legs are specified, each shall be supported on a chair type carrier with concealed arms.

F. Special sinks, where wall hung, shall have equivalent chair carriers specifically designed for the fixture.

G. Fixture Carriers:

1. Lavatories, urinals and wall-mounted water closets shall be supported by floor mounted carriers. Urinal carriers may be omitted where urinals are mounted on masonry walls that are at least 6" thick.

2. Urinal carriers shall be Jay R. Smith 600 series or approved equal, selected to fit the fixture.

3. Lavatory carriers shall be Jay R. Smith 700 Series (floor mounted) or approved equal, selected to match fixtures.

4. Wall-mounted water closets shall have Jay R. Smith 115 or 210 Series carriers as required by mounting height.

2.02 ACCEPTABLE MANUFACTURERS

A. Brass

1. Chicago Faucet.
2. T & S Brass.
3. Bradley
4. Zurn.

B. Flush Valves

1. Sloan.
2. Zurn.
3. Toto
4. Chicago Faucet

C. Mop Service Basins

1. Fiat.
2. Williams.

D. Seats

1. Beneke.
2. Church.
3. Olsonite.

A. Sinks

1. Elkay.
2. Just.
3. Moen.

B. Valves

1. Ames.
2. Apollo.
3. ASCO.
4. Febco.
5. Keystone.
6. Magnetrol.
7. Stockham.
8. Watts.

C. Water Closet Fixtures, Lavatories & Urinals

1. American Standard.
2. Crane.
3. Eljer.
4. Kohler.
5. Toto.
6. Gerber Commercial.

PART 3 - EXECUTION

3.01 PLUMBING FIXTURES AND TRIM

A. All fixtures shall be set firm and true, connected to all piping services ready for use. Fixtures shall be installed per manufacturer's recommendations.

B. Fixtures intended for accessibility to the handicapped or to meet ADA requirements shall be installed at recommended heights and with appropriate clearances. Report any conflicts or discrepancies to the Engineer. Flush valve and flush tank handles in handicap accessible spaces shall be located on the wide side of the space.

C. Sinks and lavatories for handicapped access shall be installed with offset tailpieces and insulated traps.

3.02 AFFES FURNISHED EQUIPMENT

A. Provide rough-ins and final connections to all AAFES furnished equipment including shut off valves, piping, traps, etc. necessary to connect equipment after it has be installed in place.

B. Install all faucets, sinks drains, tailpieces, overflows, traps, etc. furnished loose with all AFFES furnished equipment.

C. All exposed piping readily visible for Owner furnished equipment shall be chrome plated red brass pipe and fittings. Braces for support of exposed piping shall be chrome plated.

D. Pending installation of AAFES furnished equipment, all service lines shall be suitably capped, plugged and protected. All water lines shall be valved.

E. Furnish vacuum breakers, pressure regulators solenoid valves, traps, piping, etc. as required for installation of equipment.

END OF SECTION 15440

DIVISION 15 - MECHANICAL

SECTION 15488 - NATURAL GAS PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. This Section includes piping, specialties, and accessories for Natural Gas piping systems within the building and outdoors.

1.03 RELATED WORK

A. Section 15050 - “MATERIALS AND METHODS”.

1.04 SUBMITTALS

A. Submit the following in accordance to Section 15010 - “BASIC MECHANICAL REQUIREMENTS”

1. Product data for each type of natural gas specialty and special-duty valve. Include pressure rating in psig, rated capacity in Cubic Feet Per Hour (CFH), and settings of selected models.

2. Maintenance data for natural gas specialties and special-duty valves for inclusion in Operating and Maintenance Manuals.

3. Test reports specified in “Field Quality Control” Article in Part 3.

1.05 QUALITY ASSURANCE

A. Comply with the International Fuel Gas Code for gas piping materials, components, installations, inspection, testing and purging.

B. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.

C. Listing and Labeling: Provide equipment and accessories that are listed and labeled.

1.06 DEFINITIONS

A. Low-Pressure Gas Piping System: Operating at pressure of 7" W.C. to 2 psi, as indicated on drawings.

B. Gas Service: Pipe from the street main to gas point of delivery for the building being served. Piping includes gas service piping, gas valve, service pressure regulator (by Utility Co.).

C. Gas Piping System: Pipe within the building that conveys gas from point of delivery to points of usage. Piping includes dielectric fitting and gas valve immediately downstream from point of delivery.

PART 2 - PRODUCTS

2.01 PIPES AND TUBES

A. Refer to "Pipe Applications" Article in Part 3 for identification of systems where the following materials are used.

B. Steel Pipe: ASTM A53, Type E, Electric-Resistance Welded or Type S, Seamless, Grade B, Schedule 40, black.

2.02 PIPE AND TUBE FITTINGS

A. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threads conforming to ASME B1.20.1.

B. Unions: ASME B16.39, Class 150, black malleable iron; female pattern; brass-to-iron seat; ground joint.

C. Steel Fittings: ASME B16.9, wrought steel, butt-welding type; and ASME B16.11, forged steel.

D. Transition Fittings: Type, material, and end connections to match piping being joined.

2.03 JOINING MATERIALS

A. Common Joining Materials: Refer to Section 15050 - "MATERIALS AND METHODS" for joining materials not included in this Section.

2.04 VALVES

A. Manual Valves: Conform to standards listed, or where appropriate, valves according to ANSI Z21.15 and ANSI Z21.15a.

B. Low-Pressure Gas Stops, 2" and Smaller: AGA-certified design for system pressure, with AGA stamp, plug or ball type, bronze body and bronze plug or chrome-plated brass ball. Include flat head, square head, or lever handle and threaded ends.

C. Gas Valves, 2½" and Larger: MSS SP-78, Class 125 or 175 WOG, lubricated plug type, semisteel body, wrench operated, with flanged ends.

2.05 PIPING SPECIALTIES

A. Gas Pressure Regulators: AGA Z21.80 Certified.

B. Flexible Connectors: ANSI Z21.24 or ANSI Z21.24a, copper alloy.

2.06 ACCEPTABLE MANUFACTURERS

A. Gas Pressure Regulators

1. American Meter Co.
2. Fisher Controls.
3. Gas Energy, Inc., Subsid., Brooklyn Union Gas.
4. Jordan Valve Div., Richards Industries, Inc.
5. Lancaster by National Meter Parts, Inc.
6. Maxitrol Co.

B. Low-Pressure Gas Stops

1. Hammond Valve Corp.
2. Jomar International, Ltd.
3. Lancaster by National Meter Parts, Inc.
4. Rockford-Eclipse Div., Eclipse, Inc.

C. Gas Valves, 2" and Smaller

1. Homestead by Olson Technologies, Inc.
2. Lancaster by National Meter Parts, Inc.
3. Lunkenheimer Co.
4. Milliken Valve Co., Inc.
5. Mueller Co., A Grinnell Co.
6. Mueller Steam Specialty Div., Core Industries, Inc.
7. Nordstrum Valves, Inc.
8. Rockford-Eclipse Div., Eclipse, Inc.

PART 3 - EXECUTION

3.01 PREPARATION

A. Precautions: Close equipment shutoff valves before turning off gas to the premises or section of piping. Perform leakage test as specified in “Field Quality Control” Article to determine that all equipment is turned off in the piping section to be affected.

B. Comply with NFPA 54 “Prevention of Accidental Ignition.”

3.02 SERVICE ENTRANCE PIPING

A. Extend natural gas piping and connect to gas distribution system (gas service) piping in location and size indicated for gas service entrance to building.

3.03 PIPE APPLICATIONS

A. Flanges, unions, transition and special fittings, and valves with pressure ratings same or higher than system pressure rating may be used in applications below, except where specified otherwise.

B. 5 PSI Natural Gas Piping Systems: Schedule 40 black steel pipe with welded fittings and joints.

C. Low-Pressure Natural Gas Piping Systems – Above Ground, Indoors & Outdoors: Use the following:

1. 2" and Smaller: Schedule 40 black steel pipe; malleable-iron threaded fittings.

2. 2½" and Larger: Schedule 40 black steel pipe; welded fittings.

D. Low-Pressure Natural Gas Piping Systems – Underground: Use the following:

1. All Sizes: Schedule 40 black steel pipe with an extruded plastic coating; and welded fittings. No threaded fittings will be permitted underground.

3.04 VALVE APPLICATIONS

A. Provide low-pressure gas stops, tapered plug or ball type, for shutoff to appliances with 2" or smaller low-pressure gas supply.

B. Provide valves for shutoff to appliances.

C. Provide valves of sizes indicated for gas service piping, meters, mains, and where indicated.

3.05 JOINT CONSTRUCTION

A. Refer to Section 15050 - “MATERIALS AND METHODS” for basic piping joint construction.

B. Use materials suitable for natural gas service.

3.06 PIPING INSTALLATIONS

A. Refer to Section 15050 - “MATERIALS AND METHODS” for basic piping installation requirements.

1. Prohibited Locations: Do not install gas piping in return air plenums, or through air ducts, chimneys or flues.

B. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of gas meters. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3" long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

C. Install gas piping at a uniform grade of ¼" in 15', upward toward risers. Install piping upward from service risers to equipment.

D. Connect branch piping from top or side of horizontal piping.

E. Install unions in pipes 2" and smaller, adjacent to each valve, at final connection to each piece of equipment and elsewhere as indicated. Unions are not required on flanged devices.

F. Anchor piping to ensure proper direction of piping expansion and contraction. Install expansion joints, expansion loops and pipe guides as indicated.

G. Install vent of gas pressure regulators pointing down, in accordance with manufacturer’s instructions.

H. All exposed piping (indoors and outdoors) shall be painted. See architectural specifications for product information.

3.07 HANGER AND SUPPORT INSTALLATION

A. Refer to Section 15050 - “MATERIALS AND METHODS” for hanger and support devices.

B. Support piping as follows:

1.	Horizontal ½” pipe:	support every 4’-0”
2.	Horizontal ¾” or 1” pipe:	support every 6’-0”
3.	Horizontal 1-1/4” or larger pipe:	support every 8’-0”
4.	Vertical pipe	support at every floor

3.08 VALVE INSTALLATION

A. Install valves in accessible locations, protected from physical damage.

B. Install a gas valve directly upstream of each gas pressure regulator.

3.09 CONNECTIONS

A. Install gas piping next to gas-utilizing equipment and appliances to allow servicing and maintenance.

B. Connect gas piping to gas-utilizing equipment and appliances with shutoff valves and unions. Make connections downstream of valves and unions, with flexible connectors where indicated.

3.10 TERMINAL EQUIPMENT CONNECTIONS

A. Install a gas valve upstream and within 6' of each gas-utilizing appliance. Install a union or flanged connection downstream from the valve to permit removal of controls.

B. Sediment Traps: Install tee fittings forming drips, as close as practical to gas appliance inlets. Cap or plug bottom outlet.

3.11 ELECTRICAL BONDING AND GROUNDING

A. Install above ground portions of natural gas piping systems that are upstream from equipment shutoff valves, electrically continuous and bonded to a grounding electrode according to NFPA 70.

B. Do not use gas piping as a grounding electrode.

3.12 FIELD QUALITY CONTROL

A. Inspect, test, and purge natural gas systems according to NFPA 54, Part 4 “Gas Piping Inspection, Testing, and Purging” and local gas utility requirements.

B. Repair leaks and defects with new materials, and retest system until satisfactory results are obtained.

C. Report test results promptly and in writing to the Engineer.

D. Verify capacities and pressure ratings of gas meters, regulators, valves, and specialties.

E. Verify correct pressure settings for pressure regulators.

F. Verify that specified piping tests are complete.

3.13 ADJUSTING

A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION 15488

DIVISION 15 – MECHANICAL

SECTION 15510 - HYDRONIC PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. Provide all material as specified in this Section.

1.03 RELATED WORK

A. Section 15050 - "MATERIALS AND METHODS".

B. Section 15067 - "TESTING PIPING SYSTEMS".

C. Section 15100 - "VALVES".

D. Section 15190 - "MECHANICAL IDENTIFICATION".

E. Section 15250 - "PIPING INSULATION".

F. Section 15725 - "ROOFTOP AIR HANDLING UNITS".

G. Section 15763 – "FAN COIL UNITS".

H. Section 15784 – "DEDICATED OUTDOOR AIR UNITS".

I. Section 15990 - "TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEMS".

1.04 SUBMITTALS

A. Submit shop drawings in accordance with Section 15010 - "BASIC MECHANICAL REQUIREMENTS" for the following devices:

1. Pipe and fittings.

2. Heat transfer fluid.

B. Submit certificates of compliance for pipe and fittings specified under this section.

1.05 QUALITY ASSURANCE

A. Code ratings, labels or other data which are die-stamped or otherwise affixed to the surface of the piping shall be in easily visible location.

PART 2 – PRODUCTS

2.01 PIPE AND TUBE MATERIALS

A. All piping and fittings shall be manufactured in the United States. Each length of pipe and each fitting shall be marked with the manufacturer's name or trademark and the specification code to which it conforms.

B. See Part 3 Article "Pipe and Fittings Applications." for the application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems.

1. Hard Copper Tube: ASTM B 88, Types K and L, water tube, drawn temper.

2. Schedule 40 Black Steel: A53 ERW, Grade B.

2.02 PIPE AND TUBE FITTINGS

A. Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.

B. Copper Tube, Grooved-End Mechanical Fittings: ASTM B 75, copper tube and ASTM B 584 bronze castings.

C. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends.

1. Threaded Ends: Threads conforming to ASME B1.20.1.

D. Mechanically Formed Outlets: Manufacturer's standard written procedure for forming tee branch outlet from pipe and tube.

E. Malleable-Iron Unions: ASME B16.39, Class 150 hexagonal stock, with ball-and-socket joint, metal-to-metal bronze seating surfaces, and female threaded ends having threads conforming to ASME B1.20.1.

F. Malleable-Iron Threaded Fittings: ASME B16.39, Class 150, standard pattern, with threads conforming to ASME B1.20.1.

2.03 JOINING MATERIALS

A. Solder, brazing, and welding filler metals are specified in Part 3 of this Section.

B. Schedule 40 Black Steel Pipe and Fittings - 2" and Smaller: Screwed joints with malleable-iron threaded fittings.

C. Schedule 40 Black Steel Pipe and Fittings - 2½" and Larger: Welded joints with standard weight welding fittings.

2.04 VALVES

A. Refer to Section 15100 - "VALVES" for globe, ball, butterfly, and check valves.

2.05 BALANCING VALVES

A. Balancing valves are not required at units having pressure-independent control valves. Refer to plans.

B. Valves shall provide measurement taps, balancing element, memory stop, calibrated dial, and positive shutoff.

C. Griswold or Flowset self-adjusting balancing valves are recommended and may be used. If so, certified testing and balancing of each one of these valves is not required; one valve of each size and each flow rating shall be tested and reported, near the end of each main run of piping.

2.06 PIPE SPECIALTIES

A. Unions in copper pipe 2" and smaller shall be brass solder joint unions constructed for 150 psi working pressure.

B. Unions in steel pipe 2" and smaller shall be screwed, malleable-iron, brass-to-steel type (F.S. WW-U-531c Class 1) for 150 psi working pressure.

C. Unions 2½" in size and larger shall be companion flanges. (ANSI B16.1). Flanged unions shall be flanges over welding nipples welded into pipelines.

D. Flanges shall be forged steel flanges (ANSI B16.5) constructed for 150 psi working pressure. Bolts for flanged joints shall be made of bolt steel and shall have clean cut threads with upset square heads and semi-flush hexagonal cold pressed nuts (F.S. WW-F406b).

E. Flange connections shall be made up with high pressure special type graphited 1/16" sheet packing; or rubber, for temperature up to 200°F (F.S. HH-G-156 class A).

F. Dielectric unions suitable for dielectric service shall be provided at pipe connections between steel or cast iron piping and copper tubing.

2.07 PRESSURE GAUGES

A. Ranges of gauges shall be two times indicated operating pressure or 5 PSIG above relief valve setting. Verify ranges on shop drawings.

B. Gauges shall be 4½" dial gauges encased in an aluminum die-cast housing with a threaded access cover and glass crystal. The gauge body shall be water and dust tight with back flange and 1/2" npt. connection.

C. Movements shall be rotary geared stainless steel with Grade "A" phosphor bronze Bourdon tube rated from 30" vacuum to 1000 PSIG maximum. Accuracy shall be within 1% of the scale range.

2.08 HEAT TRANSFER FLUID

A. A solution of 25% DOWTHERM SR-1 and 75% demineralized water (by volume) shall be used. Any substitute for DOWTHERM SR-1 shall be approved in writing by the engineer prior to use. Any fluids submitted for approval must meet the following requirements as a minimum:

1. The fluid must be an industrially inhibited ethylene glycol (phosphate-based). Specifically excluded are automotive antifreezes or any formulations containing silicates.

2. The fluid must be dyed (fluorescent pink) to facilitate leak detection.

3. The fluid must be easily analyzed for glycol concentration and inhibitor level, and easily reinhibited using replacement inhibitor readily available from the fluid manufacturer.

4. The fluid must pass ASTM D1384 (less than 0.5 mils penetration per year for all system metals).

2.09 ACCEPTABLE MANUFACTURERS

A. Unions (in copper pipe 2" and smaller)

1. Anaconda.
2. Chase Brass.
3. Mueller.

B. Flange Connections

1. Cranite.
2. Garlock.

C. Balancing Valves

1. Amtrol.
2. Armstrong.
3. Bell & Gossett.
4. Flowset (self-adjusting type).
5. Griswold (self-adjusting type).
6. Illinois.
7. Tour and Anderson.
8. Wheatley.

D. Gauges

1. Ashcroft.
2. Marsh.
3. Marshalltown.

E. Heat Transfer Fluid

1. Dow Chemical Co.

PART 3 - EXECUTION

3.01 PIPE AND FITTINGS APPLICATIONS

A. Use pipe, tube, fittings, and joining methods for piping systems according to the following applications:

1. Exterior HVAC Piping Below Ground: Use the following:

a. Schedule 40 black steel pipe; standard weight fittings; welded joints. The complete pipe assembly shall be coated with a .70 mil (min. thk.) opaque yellow color plastic coating equal to "Republic X-true Coat" and covered with ½" flexible foamed plastic insulation equal to Armstrong "Armaflex-AP-II".

2. HVAC Piping Above Ground: Use the following:

a. 2" and Smaller: Type L copper tube or Schedule 40 black steel pipe with malleable-iron threaded fittings and screwed joints.

b. 2½" and Larger: Type L copper tube or Schedule 40 black steel pipe with standard weight fittings and welded joints.

3. HVAC Condensate Piping:

a. Condensate lines shall be hard copper tube, Type L.

b. Vertical condensate lines which are not downstream of larger piping may be ¾".

3.02 JOINTING OF PIPING

A. Threads shall be full and clean cut, and ends of pipe shall be reamed. When screwed joints are assembled, the male thread shall be thoroughly coated with appropriate thread compound to serve as a joint sealer and as a prime coat of paint for the exposed threads. (Teflon tape may be used at Contractor's option.) Care shall be taken to keep all other foreign matter from entering the interior of the piping. Each section of pipe and all fittings shall be carefully inspected for dirt, grease, or other foreign matter on the inside and where necessary they shall be properly cleaned before assembly.

B. Soldered or brazed joints made with fittings having pre-inserted rings of solder or brazing alloy shall have the tube and fittings cleaned bright and fluxed. The joint shall be heated sufficiently to make a tight connection. Tubes and fittings without such rings, shall be cleaned bright, fluxed and heated until the solder is drawn into the joint by capillarity and the connection is tight. Flux shall be water soluble binder flux. In potable water systems, the use of solder and flux exceeding 0.2 percent lead content is prohibited.

3.03 EXPANSION AND CONTRACTION

A. Provisions shall be made for expansion and contraction in all piping. Piping shall be installed in a manner such that joints will not develop leaks. All expansion shall be taken up by swing-connections, and the Contractor shall be responsible for the installation of these connections whether or not they are shown on the Drawings with specific means for relieving expansion and contraction. Slip-type expansion joints shall not be used. Particular care must be exercised at branches on underground piping to allow free movement at branch connection to main.

3.04 INSTALLATION OF PIPING

A. Piping shall be installed on long continuous lengths, with a minimum number of joints. Joints, where necessary shall be carefully made to insure against leakage.

B. All piping shall be firmly supported using hangers, brackets and braces to prevent sagging and/or lateral movement. All hangers, brackets, and other supports shall be securely fastened to the construction as may be required and in a manner acceptable to the Engineer. All piping shall be installed to maintain maximum head room. No piping shall be suspended from the roof deck.

C. Arrangement of all piping shall be as shown on plans. It is especially necessary that all mains be installed with view to accessibility in case of repair and location of pipe lines and spacing between same shall be so made that there will be no conflict between pipe lines by the several trades.

D. Contractor shall give careful consideration to clearances and locations of lines and type of fittings used to obtain these clearances. Provide maximum headroom in all cases. Piping shall be installed parallel to building walls and at a height so as not to obstruct any portion of a window, light fixture, doorway, pipe tunnel or passageway. Ascertain from

the drawings heights of all suspended ceilings, size of all pipe shafts in which piping is to be concealed, and location and size of structural members in and adjacent to all pipe shafts.

E. Where interferences develop in the field, Contractor shall offset or reroute piping as required to clear such interferences. In all cases consult architectural drawings for exact location of pipe spaces, ceiling heights, or other architectural details before installing piping.

F. Under no circumstances shall the size of piping shown on the drawings be changed without written approval of the Engineer.

G. Provide eccentric reducers where required for proper drainage or venting of horizontal pipe lines. Reducing fittings shall be used for all changes of pipe size and bushings shall not, under any circumstances, be used.

H. Unions or flanges are to be installed on the equipment side of all valves in pipe connections from mains to equipment, to enable equipment to be drained and disconnected without necessitating the draining of mains.

I. Valves must be arranged for easy access and be within easy reach and the piping shall be arranged to accomplish this.

3.05 HEAT TRANSFER FLUID INSTALLATION

A. Follow these installation procedures:

1. Clean new or lightly corroded existing systems with a 1% to 2% solution of trisodium phosphate in water prior to the installation of industrially inhibited ethylene glycol fluid.

2. Extensively corroded existing systems should be cleaned by an industrial cleaning company and all necessary replacements and repairs should be made.

3. Use only distilled or demineralized water in solution with the ethylene glycol fluid. Water shall have low levels (less than 25 ppm) of chloride and sulfate and less than 50 ppm of hard water ions (Ca++, Mg++).

3.06 CLEANING THE PIPING SYSTEMS

A. Before pipe covering is applied and final tests are made, flush the water piping systems thoroughly to remove grit, sand, oil, etc., for as long a time as is required to thoroughly clean the apparatus and piping. Make the required temporary connections for this purpose.

B. Care must be taken not to get dirt, grease, etc., upon the floors or walls. Any damage done shall be promptly repaired.

C. After the period of these operations, any defects or damages that may have developed in the equipment and apparatus as a result of the cleaning process or the operation of the system shall be repaired.

END OF SECTION 15510

DIVISION 15 – MECHANICAL

SECTION 15725 – ROOFTOP AIR HANDLING UNITS

PART 1: GENERAL

1.01 WORK INCLUDED

A. Modular outdoor air-handling units and components as indicated on the plans.

1.02 RELATED SECTIONS

A. The requirements of the General Conditions, Supplementary Conditions, Division 1, and Drawings apply to all work herein.

B. Requirements of the following sections apply.

1. Section 15010 – "BASIC MECHANICAL REQUIREMENTS"
2. Section 15100 – "VALVES"
3. Section 15510 – "HYDRONIC PIPING"
4. Section 15800 – "AIR DISTRIBUTION"
5. Section 15950 – "HVAC CONTROLS"
6. Section 15990 – "TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEMS"
7. Section 16480 – "MOTOR CONTROL"

1.03 QUALITY ASSURANCE

A. If equipment manufactured by manufacturer other than that scheduled is utilized, then the Mechanical Contractor shall be responsible for coordinating with the General Contractor and all affected Subcontractors to ensure proper provisions for installation of the furnished unit. This coordination shall include, but not be limited to, the following:

1. Structural supports for units.

2. Piping size and connection/header locations.

3. Electrical power requirements and wire/conduit and overcurrent protection sizes.

4. The Mechanical Contractor shall be responsible for all costs incurred by the General Contractor, Subcontractors, and Consultants to modify the building provisions to accept the furnished units.

1.04 REFERENCES

A. AMCA 99 – Standard Handbook
B. AMCA 210 – Laboratory Methods of Testing Fans for Rating Purposes
C. AMCA 300 – Test Code for Sound Rating Air Moving Devices

D. AMCA 301 – Method of Publishing Sound Ratings for Air Moving Devices
E. AMCA 500 – Test Methods for Louvers, Dampers, and Shutters
F. ANSI/AFBMA 9 – Load Ratings and Fatigue Life for Ball Bearings
G. ANSI/UL 900 – Test Performance of Air Filter Units
H. ARI 410 – Forced-Circulation Air Cooling and Air Heating Coils
I. ARI 430 – Standard for Application of Central-Station Air Handling Units
J. ARI 260 - Sound Rating of Ducted Air Moving and Conditioning Equipment
K. NFPA 90A – Installation of Air Conditioning and Ventilation Systems
L. SMACNA – Low Pressure Duct Construction Standards
M. AMCA 611-95 – Methods of Testing Airflow Measurement Stations for Rating
N. ASHRAE 52.1/52.2 – Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size
O. ASHRAE 62 – Ventilation for Acceptable Indoor Air Quality
P. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15010.

B. Shop drawings shall indicate assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.

C. Product data shall indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, gauges, and finishes of materials.

D. Provide fan curves with specified operating point clearly plotted.

E. Submit product data of filter media, filter performance data, filter assembly, and filter frames.

F. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

G. Submit manufacturer's installation instructions under provisions of Section 15010.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 15010.

B. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.07 RATINGS AND CERTIFICATIONS

A. Conform to AMCA 210 for fan performance ratings.

B. Conform to E.T.L. or U.L. standards.

C. Conform to ARI 410 for capacities, pressure drops, and selection procedures of air coils.

D. Conform to ARI 430 for all fabrication procedures of air handling units.

E. Utilize only ANSI/UL 900 listed Class I or Class II filter media, approved by local authorities.

F. Utilize only ISO9001, 9000, or 9002 certified facilities in the manufacturing of the air-handling unit.

G. Electric control wiring shall be in accordance NEC codes & ETL requirements.

H. Motors shall satisfy the Federally mandated Energy Policy Act (EPACT).

1.08 DELIVERY, STORAGE AND HANDLING

A. All handling and storage procedures shall be per manufacturer's recommendations.

B. Unpainted units shall be shrink-wrapped by the manufacturer prior to shipment to prevent damage due to weather and road debris during transportation and thereafter while in storage awaiting installation. Alternatively, units may be completely covered by tarps while in transit or shipped in an enclosed truck. Units not factory shrink-wrapped shall be re-covered by the contractor at the job-site while awaiting installation. Protection of the complete unit for avoidance of general rusting must be handled as best suits the circumstances. Store in a place protected from construction traffic and handle carefully to avoid damage to components, enclosures, and finish.

C. All openings shall be protected against damage from shipping.

D. All loose-shipped items need to be packed, protected and secured with the air units.

E. Pipe chases will ship attached to the unit as indicated on the drawings unless the total unit width including the pipe chase exceeds 102", in which case the pipe chase will ship loose.

F. Factory Packaged Controls (FPC) are to be factory-installed. Motor control devices will be factory-mounted as selected and indicated on the drawings. Electronic equipment cannot be stored in wet or damp areas even though they are sealed and secured.

G. Motors should be protected and inspected in accordance with the manufacturer's specific instructions regarding periods of long storage.

1.09 WARRANTY

A. The manufacturer's standard warranty shall be for a period of twelve months from the date of shipment. The warranty shall include parts and labor during this period. A factory-trained and factory-employed technician shall be available within 50 miles of the job site to respond to a service call. The warranty shall not include parts associated with routine maintenance, such as belts, air filters, etc. Warranty is not extended to any

alteration, modifications or external component attached to “original” equipment “as-built” and shipped from manufacturing facilities.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

B. Manufacturers “start-up” requirements must be complied with to ensure safe and correct operation.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Johnson controls
B. Trane
C. McQuay

2.02 GENERAL DESCRIPTION

A. Factory-manufactured air-handling units designed to the performance levels specified with a combination of air-handling components in unitized housings to form complete, integrated machines as indicated on the drawings.

B. Fabricate air-handling units suitable for the scheduled capacities.

C. Factory-test and balance fan design and drives to limit vibration (displacement in mils) at operating speeds.

D. Base performance on sea level conditions.

E. All internal components specified in the air-handling unit schedule shall be factory-furnished and installed. Unit(s) shall be completely factory-assembled.

F. Unit(s) shall ship in one (1) piece whenever possible. Unit splits will be provided only where necessary for shipping. Lifting lugs will be supplied on each side of a shipping split and at all unit corners to facilitate rigging and aid in joining shipping sections. Lifting lugs to be suitable for rigging without requiring additional support frames.

2.03 UNIT CASING

A. The air-handling unit shall be specifically designed for outdoor use.

B. The construction of the air-handling unit shall consist of a complete structural frame with removable panels. Casing shall be supported in such a manner so that maximum allowable air leakage shall not exceed 1% and panel deflection shall not exceed an L/240 ratio when subjected to ±8-in. w.g. static pressure. All panels shall be completely

gasketed prior to shipment and shall be completely removable for unit access and removal of components. Removal of any or all panels shall not affect the structural integrity of the unit.

C. The air-handling unit shall be supplied with double wall panels for walls, roof, and floor constructed of G90 mill galvanized sheet steel.

D. The air handling unit shall be provided with a full-perimeter, gasketed roof curb. Roof curb shall ship loose for field installation prior to unit placement.

E. Roof curb shall be a prefabricated galvanized steel-mounting curb.

F. Roof curb application shall provide for continuous insulation between unit panels and roof curb.

G. Roof curb shall be a perimeter type providing complete perimeter support of the air-handling unit.

H. Gasketing shall be provided for field mounting between the unit base and the roof curb.

I. The curb shall include a 1" x 4" wood nailer.

J. Roof mounted unit(s) shall be provided with an external, insulated pipe-chase to fully contain field piping. Pipe-chase must provide sufficient space for coil connections to be installed without interference. Pipe-chase enclosures of adjacent segments shall be combined to be a continuous open pipe-chase.

K. Pipe-chase shall be 24 in nominal depth, with an internal clearance of not more than 2” less than nominal dimension.

L. The pipe chase walls and hinged door(s) will be double-wall construction.

M. The air-handling unit casing shall be constructed of 2” thick double wall roof panels, floor panels, and wall panels having exterior construction of 20-gauge G90 galvanized steel. The interior lining shall be a solid lining of minimum 20-gauge galvanized steel or a minimum .080” thick aluminum or 20-gauge 304 stainless steel perforated lining in specific segments as indicated. Exterior casing screws shall be zinc chromate coated.

N. Floor panels shall be double-wall construction, designed to provide at most L/240 deflection based on 300 lb. concentrated load at mid-span. The interior liner of the floor panels shall be a solid lining of minimum 20-gauge galvanized steel.

O. An additional galvanized diamond tread plate liner shall be provided as a walk-on surface in unit access areas.

P. Unit(s) shall be supplied with a double-sloped roof to promote drainage of precipitation and prevent standing water.

1. Roof construction design shall accommodate a minimum snow-load of 30 lb/ft^2

2. The roof shall have a minimum pitch of 1/4" per foot.

3. The roof shall overhang all side and end panels to prevent precipitation drainage from streaming down the unit wall panels.

4. Outdoor units supplied with flat roofs shall not be acceptable.

Q. The air-handling unit shall be completely insulated throughout all panels and structural frame members with spray injected foam to thoroughly insulate and seal the air unit structure. Openings in structural channels shall be covered. If structural channels are not internally insulated, then structural channels must be wrapped with an *Armaflex* type insulation to maintain unit thermal performance and prevent sweating. Any portion of the unit that is not insulated (gaps) or has less than 2” of insulation shall be the responsibility of the contractor to modify.

1. Insulation shall be a full 2" throughout the entire unit.

2. Units with less than 2" of insulation in any part of the walls, floor, or roof shall not be acceptable.

3. Insulation application shall conform to NFPA 90A requirements.

4. Panels shall have a minimum thermal conductivity R of 12.5 BTU/hr-ft2-°F.

5. For outdoor units, all pipe-chases, coil header panels and return bend panels shall be fully insulated with a minimum 2” of insulation.

6. All drain pans shall have double-wall construction and be insulated with spray injected foam. Fiberglass insulation is not acceptable.

R. Double wall access doors shall be provided on sections as scheduled. Doors shall be of the same material type as the wall panels. A bulb-type gasket shall be provided around the entire door perimeter. Industrial-style stainless steel hinges shall permit a complete 180 degree door swing. All doors shall open against positive pressure. Alternatively, if doors opening against positive pressure are not available, a safety chain mechanism and warning labels shall be provided to prevent injury to maintenance personnel.

1. Access door must be of the same material type as exterior/interior casing.

2. Access door latches shall utilize a roller cam latching mechanism to insure maximum sealing. Latches featuring a rotating “paw” are not acceptable.

3. Stacked indoor units shall insure door handles are positioned at the lowest possible point of the top tier segments for convenient access.

S. All windows shall be double-pane tempered glass.

T. Provide auxiliary drain pans in segments as indicated on the schedule.

1. The auxiliary pans shall be double-sloped, positive-draining with stainless steel liner and double-wall construction with drain connection of like material, draining to one side of the unit.

2. Coat auxiliary drain pans with a mastic coating.

3. Drain connection shall be welded to the drain pan. If threaded screw-type joint is used, all joints must be easily accessible for inspection and service.

2.04 FANS

A. Fans shall be Class I, II, and III, as scheduled, selected to provide the airflow and pressure specified.

B. Fan segments shall be equipped with double width double inlet (DWDI) housed fans. Double width, double inlet (DWDI) fans, having airfoil AF blades as scheduled. Flat plate blades are not acceptable.

C. All airfoil fans shall bear the AMCA Seal. Airfoil fan performance shall be based on tests made in accordance with AMCA standards 210 and comply with the requirements of the AMCA certified ratings program for air and sound. In addition, all airfoil wheels shall comply with AMCA standard 99-2408-69 and 99-2401-82.

D. Industrial-grade DWDI airfoil fans shall be provided with an access door in the fan scroll.

E. Fans shall have polished steel shafts sized so the first critical speed is at least 25% over the maximum operating speed for each pressure class. Close tolerances shall be maintained where the shaft makes contact with the bearing. Shaft shall be factory coated after assembly with an anti-corrosion coating.

F. After the pre-balanced fan is installed on the fan skid and isolator rails, the entire fan skid shall be run-balanced at the specified speed to insure smooth and trouble-free operation. The run-balance shall include filter-in and filter-out balancing in all three (3) planes, on both sides of the fan assembly at the bearings.

1. Filter-in measurements shall be taken in the horizontal and vertical planes on the drive and opposite-drive sides of the fan shaft.

2. Filter-out measurements shall be taken in the horizontal, vertical and axial planes on the drive and opposite-drive side of the fan shaft.

G. The fan motor and fan-assembly shall be internally mounted. The fan motor and fan-assembly shall be mounted on a common base to allow consistent belt tension with no relative motion between the fan and motor shafts. The common base shall be isolated on a full width isolator support channel using 1" springs.

1. The fan motor shall be on an adjustable base.

2. The fan discharge shall be connected to the cabinet through a canvas flexible connection to insure vibration-free operation.

3. Fan segments shall be equipped with an access door located on left side of the segment.

2.05 BEARINGS AND DRIVES

A. Fan bearings shall be designed for an average life (L50) of at least 200,000 hours.

B. Plenum fans (where specified) shall be belt-driven.

C. All re-greaseable bearings shall be factory-lubricated and equipped with standard hydraulic grease fittings and lube lines extended to the motor side of the fan. Re-greaseable bearings provided without factory-installed lubrication lines are unacceptable.

D. Fan drives shall be selected for a 1.5 service factor and anti-static belts shall be furnished.

1. All drives shall be fixed pitch.

2. All fans shall be equipped with multiple belt drives.

3. Sheaves shall be machined from a close grain cast iron and statically balanced by the manufacturer. A fixed pitch sheave shall be provided on the motor.

4. Drive belts shall be a V type. All drive belts shall be precision molded raw edge construction. Belts shall be oil and heat resistant.

2.06 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Fan motors shall be furnished in sizes, electrical power and starting characteristics as shown in the schedule.

1. All fan motors will be built in accordance with the latest standards of the National Electrical Manufacturer's Association (NEMA) and IEEE and shall be rated for continuous duty at full load at 40°C ambient temperature rise and a service factor of 1.15.

2. Fan motors shall be NEMA design ball bearing type.

3. Fan motors shall be 1750 RPM open drip proof type.

4. Direct drive plenum fans shall be coupled with appropriately sized motors to nearly match synchronous motor speed, as detailed in the schedule.

5. All fan motors shall be high efficiency.

6. Motors shall be suitable for use in variable frequency application, per NEMA MG-1 Part 30.

7. Where variable frequency drives are scheduled, the drives shall be factory mounted, wired and tested.

B. Constant volume units shall be equipped with factory mounted and wired or motor starter panel(s) serving supply fan motor(s).

1. The motor starter panel(s) and all associated components shall be U.L. listed.

2. The motor starter panel shall be protected by an environmental enclosure per ETL rating.

3. Individually protected supply fan starter with short circuit and overload protection.

4. 115 volt control power transformer with primary and secondary protection.

5. The starter panel shall be provided with a 5 point terminal strip for field connections.

6. An integral fused main power-disconnect shall be provided.

a. The disconnect shall be an integral part of the motor starter panel.

b. The disconnect shall be factory-wired.

C. The motor starter panel shall contain a main power block, single speed fan motor contactor(s) with overload device(s), three phase ambient compensated overload heater elements, two primary control fuses, one secondary control line size fuse, terminal strip, and a door-mounted on/off auto switch.

D. The air-handling unit shall be equipped with factory mounted and wired external non-fused disconnect in a separate NEMA non-fused enclosure.

E. The air-handling unit shall be power wired for independent power source for receptacle and lights, having multiple switches for independent light control, separate from the Motor power source entrance. Lighting circuit shall receive power from a “Dedicated Circuit Breaker” --- remotely provided by others.

F. 120V Incandescent Light shall be provided in segments as indicated on the schedule.

2.07 HEATING/COOLING COMPONENTS

A. Coil segment length shall be optimized to contain selected coil(s), spacer(s), and optional access doors. Coils shall be selected to maximize unit tunnel area using single coil arrangements as needed to satisfy required coil face areas.

1. Coil segment design and coil selection shall not require a drain pan in any downstream section to contain the coil condensate.

2. All cooling and/or heating coils shall be furnished to meet the performance requirements set forth in the schedule.

3. All water and steam coils shall have performance certified in accordance with ARI Standard 410 for coil capacity and pressure drop.

4. Coils used with glycol are outside the scope of ARI-410, but shall be selected to meet scheduled performance.

5. All coils must be circuited to operate at design load with water velocity within the ARI range of certified rating conditions.

6. Coil segment side panels shall be removable to allow for removal and replacement of coils, without affecting the structural integrity of the unit.

7. Upstream and downstream segment door clearances shall accommodate a minimum of 2-inches of field installed external piping insulation.

8. Coil segment shall accommodate full-face height or reduced face height coils, as specified.

B. Cooling Coil Segment shall be provided with a full-width, multi-sloped (IAQ) drain pan that extends downstream a minimum 19" beyond the last coil in the section to provide drain pan access for cleaning and inspection

C. Drain pan design and application shall comply fully with the stated intent of ASHRAE 62-2001

D. Drain pans shall be sloped in a minimum of 2 planes; cross break interior pans and pitch toward drain connections to ensure complete condensate drainage. Units with cooling coils shall have drain pans under complete cooling coil section. A minimum of 1" clearance shall be provided from the bottom of the coil casing to the drain pan so that the drain pan can be visually inspected and physically cleaned, including underneath coil, without removal of the coil. All drain pan connections will be to one side of the unit to enable proper trapping. Drain pans that do not comply with these maintenance requirements will be the responsibility of the contractor to field modify.

E. The drain pan shall be of double wall construction with a minimum stainless steel liner and shall be insulated with spray-injected foam to completely seal the drain pan assembly. Fiberglass insulation is not acceptable.

F. The drain pan liner shall be of double wall construction of 16-gauge stainless steel and shall be fully insulated with spray-injected foam, completely sealing the drain pan assembly.

G. The drain pan shall have a mastic coating.

H. Drain pan shall be provided with a minimum 1-1/4" MPT condensate connection positioned beneath the lowest point of the drain pan. Drain connection shall be welded to the drain pan and shall match the drain pan liner material type. If threaded screw-type joint is used, all joints must be easily accessible for inspection and service.

I. All coils shall be slide out, “shipping” type, mounted on tracks, and easily removable from the air handling unit by removing only one exterior panel. Coils that require additional disassembly of the unit or replacement of the entire coil section (e.g. “unit” type coils) for coil removal are unacceptable.

J. Coils shall be supported by galvanized coil support members, constructed of channeled members, allowing uninhibited access for inspection and safe cleaning.

K. All vertical coil supporting members (bulkheads) and block offs shall be constructed of galvanized steel and shall entirely seal off the coil, preventing air bypass.

L. Coil grommets shall be provided on all coils to completely seal the area between the coil connection and the unit casing.

M. Drainable Water coils shall be designed to operate at 250 psig design working pressure and up to 300° F and shall be tested with 325 psig compressed air under water. Circuiting shall provide free and complete draining and venting when installed in the unit. All vent and drain connections shall be extended to the outside of the unit casing.

N. The primary surface shall be 1/2" O.D. copper tube, staggered in direction of airflow. Tubes shall be mandrel expanded to form fin bond and provide burnished, work-hardened interior surface. The tubes shall have a minimum tube wall thickness of .016" for 1/2" O.D. coils. Specified thickness shall be maintained throughout the tube including brazed U-bends.

O. Extended surface shall consist of die-formed, continuous, aluminum corrugated fins. The fins shall have fully drawn collars to accurately space fins, and to form a protective sheath for the primary surface. The fin thickness shall be .006" Aluminum.

P. Coils with finned height greater than 48 inches shall have an intermediate drain pan extending the entire finned length of the coil. Cooling coils in excess of 48 inches in height shall not be acceptable unless provided with an intermediate drain pan. The intermediate pans shall have down spouts to guide condensate to the main drain pan.

Q. Coil casing shall be constructed of 16-gauge galvanized steel. Tube sheets on each end shall have drawn collars to support tubes. A single intermediate coil support shall be provided on coils with a finned length of more than 62 inches, two (2) intermediate supports above 100 inches in length, and three (3) intermediate supports on coils with a finned length of more than 141 inches. Casing channels shall be free-draining, without depressions to collect moisture and contaminants. Casing channels shall not block fin area.

R. Headers shall be of heavy seamless copper tubing, silver-brazed to tubes. Connections shall be of steel, with male pipe threads, silver-brazed to the headers. A 1/4" FPT,

plugged vent or drain tap shall be provided on each connection. All vent and drain connections shall be extended to the outside of the unit casing.

S. Circuiting shall be to provide free draining and venting, through one vent and one drain on each coil, when installed with casing level. Coils shall be circuited, and have connections arranged, for counter-flow of air and water with supply on bottom and return on top of coil headers. Coil circuiting shall provide for design water velocity in tubes without exceeding total water pressure drops in schedule.

T. Coils using turbulators are unacceptable.

2.08 FILTERS

A. Filters racks shall be 4”. The filter media shall be MERV 13. Filter tracks shall be constructed of galvanized steel and be built as an integral part of the unit. Filter media shall be listed Class 2 or Class 1 under U.L. Standard 900 as required by local codes.

B. Two spare sets of spare filters shall be provided.

2.09 DAMPERS

A. Dampers will be of ultra-low leak design having airfoil blades. The damper blades shall be provided with extruded vinyl edge seals and flexible metal compressible jamb seals. Outside air and Exhaust Air dampers shall have leakage not exceeding 4 CFM/square foot at 1" w.g., complying fully with the requirements of ASHRAE 90.1. Damper blades shall be parallel acting.

2.10 APPURTENANCES

A. Filter/Mixing box (FM) segment(s) shall be provided with combination Filter/Mixing Box combining the filtering and mixing functions in one segment.

1. Segments shall be designed to accommodate 2” angled filter media. The filter media shall be side-loading.

2. The return air inlet shall be constructed of galvanized steel with parallel blades. Damper configuration shall be full faced.

3. The outside air inlet shall be left open, having no damper, constructed of galvanized steel with parallel blades. Damper configuration shall be full faced.

4. The airflow monitoring station must be tested for pressure drop in accordance with AMCA Standard 611-95 in an AMCA registered laboratory. The airflow monitoring station must bear the AMCA Certified Ratings Seal for Airflow Measurement Performance.

B. Cooling Coil (CC) segment(s) shall be supplied as indicated on the drawings.

1. The outdoor unit shall have a pipe chase with a nominal depth of 24 inches.

C. Access (XA) segment(s) shall be supplied as indicated on the drawings. Access segments shall be of length specified in schedule.

2.11 FINISHES

A. Air-handling units shall be painted prior to shipment, as specified.

1. The exterior of the unit shall be completely cleaned prior to application of finished coats.

2. A prime coat shall be applied to the unit.

3. A finish coat of desert sand (or other owner approved color) acrylic polyurethane shall be applied.

4. The finished unit shall exceed 500-hour salt spray solution (5%) without any sign of red rust when tested in accordance with ASTM B-117.

B. Air-handling units constructed of G90 galvanized sheet steel with no paint shall exceed 220-hour salt spray solution (5%) without any sign of red rust when tested in accordance with ASTM B-117.

PART 3: EXECUTION

3.01 INSTALLATION

A. General: Installing contractor shall install air-handling unit(s), including components and controls required for operation, in accordance with air-handling unit manufacturer's written instructions and recommendations.

1. Air-handling unit(s) shall be stored only in a clean, dry place, protected from weather and construction traffic.

2. Air-handling unit(s) shall be handled such that damage to components, enclosure, and finish is avoided.

3. Install in conformance with ARI 435.

4. Isolate fan segments with flexible duct connections.

END OF SECTION 15725

DIVISION 15 – MECHANICAL

SECTION 15763 – FAN COIL UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. This Section includes units and accessories listed below, complete with valving and controls.

1. Fan-Coil Units.

1.03 RELATED WORK

A. Section 15800 - “AIR DISTRIBUTION”.

1.04 SUBMITTALS

A. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data including weights and dimensions and data on features and components. Include plan and elevation views of units, minimum clearances, and data on ratings and capacities.

2. Maintenance data for products for inclusion in “Operating and Maintenance Manual” specified in Division 1.

3. Wiring diagrams from manufacturers detailing electrical requirements for power and control wiring. Include ladder-type wiring diagrams for interlock and control wiring required for field installation. Differentiate between portions of wiring that are factory installed and portions that are to be field installed.

1.05 QUALITY ASSURANCE

A. Units shall be listed and labeled as defined by Article 100 of NFPA 70, “National Electrical Code”.

B. Units shall be factory assembled and factory tested.

PART 2 - PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. Cabinet: Galvanized steel with foil-faced, glass fiber interior insulation. Removable panels expose all items requiring access for maintenance.

B. Fan: Factory-balanced, resilient-mounted, thermally protected. Provide variable speed fan motors for two-stage heating & cooling where scheduled.

C. Control Valves Factory installed.

D. Disconnect Switches: Unit mounted fused disconnect switches.

E. Filters: Filter racks shall be two inch and filters shall be MERV 13. Provide two spare sets of filters.

2.02 FAN-COIL UNIT

A. Contractor shall furnish and install fan coil units with capacity as listed on the schedule. Units shall include coils, main drain pan, auxiliary drain pan, fan housing, motor, control valves and thermal insulation.

B. Heating/Cooling Coils shall consist of seamless copper tubes mechanically bonded to aluminum fins with continuous fin collars and sleeves. Minimum working pressure shall be 300 psig. Each coil shall have a manual air vent.

2.03 CONTROLS

A. Include control components required for satisfactory operation of units and auxiliary equipment in all seasons, including:

1. Unit controller, factory mounted and wired. Controller shall be a DDC controller compatible with the specified BAS.
2. Relays, transformers, temperature sensors and control devices that will directly control the unit.

2.04 FINISHES

A. External Casings and Cabinets: Galvanized steel.

2.05 ACCEPTABLE MANUFACTURERS

A. Johnson Controls
B. Trane
C. McQuay

PART 3 - EXECUTION

3.01 INSTALLATION AND CONNECTION

A. Installation and connection of units and systems shall be in accordance with applicable local codes and regulations, and manufacturer's published installation instructions.

B. Suspend from structure using threaded rods, spring hangers and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is plumb and level.

C. Connect ducts in accordance with Section 15800 - "AIR DISTRIBUTION."

D. Controls: Conform to Section 15950 - "CONTROLS."

3.02 COMMISSIONING

A. Test functions, operations, and control sequences and protective features. Adjust to assure operation is in accordance with sequence of operations shown on the plans.

B. Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.03 CLEANING AND ADJUSTING

A. Cleaning: Upon completion of installation, inspect units and associated components. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

B. Adjusting: Make control, fan speed, and other adjustments for optimum performance and efficiency. Verify proper drainage of condensate.

END OF SECTION 15763

DIVISION 15 – MECHANICAL

SECTION 15784 – DEDICATED OUTDOOR AIR UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of air handling unit and accessories work required by this section is indicated on drawings and schedules, and by requirements of this section.

B. Types of air handling units specified in this section include the following:

1. Dedicated Outdoor Air Units and accessories.

C. Refer to other section of the specifications for the primary cooling and heating source; not work of this section.

D. Refer to 15950 for temperature control work.

1. Control wiring specified as factory-installed is work of this section.

E. Refer to Division-16 sections for the following work; not work of this section.

1. Power supply wiring from power source to power connections on air handling units including fan motors, pumps, control panels, electric heaters where indicated, and receptacles where indicated. Include disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

2. Interlock wiring between air handling unit starters; and between air handling unit starters and field-installed control devices.

a. Interlock wiring specified as factory-installed is work of this section.

F. Provide the following electrical work as work of this section, complying with requirements of Division-16 sections:

1. Motor starters (and disconnects where specified herein) in accordance with Electrical Requirements for Mechanical Equipment.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air handling units, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Codes and Standards:

1. AMCA Compliance: Air handling unit fans shall have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Rating Seal.

2. ARI Compliance: Air Handling unit cooling and heating coils shall have been tested and rated in accordance with ARI standard 410 and shall bear ARI Certified Rating Seal

a. Where coil operating conditions exceed the standard ARI rating ranges select the coils using the ARI rating method. In these cases the certified rating seal will not be required, however, all other aspects of the coil performance and construction shall be in accordance with the ARI Standard.

3. UL or ETL Compliance: Provide air handling unit electrical components which are listed by UL or ETL and have UL or ETL label affixed.

4. NEMA Compliance: Provide energy efficient motors and electrical accessories complying with NEMA standards.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for air handling units, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions.

B. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to air handling units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

C. Maintenance Data: Submit maintenance data and parts list for each type of air handling unit, accessory, and control. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 1.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide dedicated outdoor air units as scheduled on the drawings. Capacity and electrical characteristics shall be as scheduled on the drawings.

2.02 ENHANCED HUMIDITY CONTROL SYSTEM

A. Provide an enhanced humidity control system as described herein. The base bid system shall include the patented TRICOIL® method of air conditioning for enhanced temperature and humidity control as provided by Sensible Equipment Company, P.O. Box 669, Goldenrod, Florida 32733, phone number (407) 296 - 8068. The system shall be as configured on the drawings and as specified herein with performance characteristics as scheduled.

B. Alternates to the base bid are encouraged. The contractor may furnish, with the Engineer's approval, a deductive alternate to the base bid to use other equipment or methods that provide performance as scheduled. Alternate bids must be submitted in writing with complete engineering analysis including, equipment performance data, psychrometric analysis with chart, flow diagrams, equipment specifications, manufacturer's descriptive literature, reduction in bid amount, and other information required by the engineer to analyze the proposed alternate. The alternate must include any and all costs for the work of other trades required to provide complete and operational equivalent systems. The contractor shall assume single source responsibility for all the subsystems that he chooses to integrate and submit for his alternate bid. All responsibilities for equivalencies for the performance of the alternate system or method to the base bid system or method plus the coordinated supporting central plant utilities (electrical and/or mechanical) plant shall constitute a required single source responsibility and shall be so acknowledged by the contractor with the alternate proposal.

C. The air handling units shall have the following features;

1. TRICOIL® method of enhanced humidity control with components as specified, scheduled and/or indicated on the drawings.

2. Primary cooling coil shall be chilled water as specified.

3. A wrap around recuperative precooling and reheat system shall be provided that shall exchange energy from the outside air stream to the supply air stream for simultaneous precooling and reheating. The base bid system shall use a hydronic piping loop and circulating pump. Space shall be provided between each coil and heat exchange surface for cleaning. A method of controlling the amount of energy exchange from 0% to 100% of rated capacity between the reheat and precooling elements shall be provided for part load performance.

4. Supplemental reheat: The base bid TRICOIL® method shall use the wrap around reheat coil to provide the supplemental reheat energy to the supply air stream. The supplemental reheat energy shall be from the hot water source as indicated on the drawings.

5. Preheat: The base bid TRICOIL® method shall use the wrap around precooling coil as the preheat coil to provide preheat energy for freeze protection and heating duty as required. The heating energy shall be from the hot water source as indicated on the drawings.

6. Access space, 18" wide, must be provided between each coil for servicing and cleaning purposes. Provide required service doors opposite coil connections.

D. TRICOIL® METHOD COMPONENTS

1. The TRICOIL® method is a recuperative wrap around type system which provides simultaneous precool and reheat for temperature and humidity control. The TRICOIL® method shall also provide heating and supplemental reheat control when indicated on the drawings. The TRICOIL® method components shall be provided factory wired and piped in a cabinet or on a frame for wall or floor mounted as indicated. The TRICOIL® method components shall consist generally of the following:

    a. Site specific license for a TRICOIL® air handling unit designed to produce the scheduled recuperative heat exchange, primary cooling and hot water heating.
    b. TRICOIL® loop circulating pump.
    c. TRICOIL® loop control valves with actuators. Quantity of valves and type of actuators as required by the specific operating sequence.
    d. TRICOIL® loop water balancing valve.
    e. Piping accessories including manual and auto air vents, drain and fill valves, pressure gauge, and temperature/pressure plugs.
    f. Operating and safety controls including prewired motor control and temperature control panels.

2. The pump shall be a Bell and Gossett PL series circulator pump or Taco series 1900 other approved. Pump and motor shall be selected for non-overloading operation. Pump characteristics shall be as scheduled on the drawings.

3. Control valves shall be two or three port ball valves as indicated on the drawings. Valves shall have bronze bodies with female NPT threads. Valves shall have blowout proof stem design, glass reinforced Teflon thrust seal washer and stuffing box ring with minimum 400 psi rating. Stem packing screw shall be adjustable for wear. Valve ball shall be chromium plated bronze and shall be rated at a minimum of 400 psi WOG, cold, non-shock service. All valves shall be provided with reinforced Teflon seats.

4. Control valve actuators shall be fully modulating or two position as indicated in the control sequence. Modulating valves shall be positive positioning, responding to a 2-10 VDC or a 4-20 mA signal (with the addition of a 500 ohm resistor). There shall be a visual valve position indicator and an actuator generated 2-10 VDC valve position output signal for electronic feed back to the control system. Valve power required shall be 24 VAC and power consumption shall not exceed 8 watts at 24 VAC. The actuator shall provide minimum torque required for proper valve close-off. The actuator shall be designed for with current limiting motor overload protection or shall have adjustable single pole double throw travel stop limit switches. A release button or handle on the motor shall be provided to allow for manual override, except when using spring return valves. All valves shall be U.L. listed.

5. Motor Control Panel: Components shall be factory assembled in an NEMA rated enclosure. Pump motor, starter or control relay, control valve(s), pressure and CT switches, pump status light, and hand/off/auto switch shall be factory wired to a numbered terminal strip ready for connection to the electrical power supply.

6. Temperature Control Panel. Direct Digital Control (DDC): The temperature control panel shall be factory assembled in an NEMA rated enclosure and factory mounted on the unit. The control panel shall be factory wired to numbered terminal strips to ready for connection to any field installed temperature control components. The controller shall be a stand-alone DDC controller which shall be factory programmed to provide the operating sequence of the TRICOIL® system. The controller may be connected to a building automation system using either BACnet, Modbus, N2, or Lonworks. The controller shall support remote access support over the internet/intranet or modem and shall be equipped with a built-in display.

7. The installing contractor shall provide the start-up of the TRICOIL systems in accordance with manufacturer's written start-up instructions with field supervision by the factory authorized representative.

2.03 UNIT CASING

A. The unit shall be constructed of a complete frame and removable double wall panels. Panels and access doors shall be 2-inch nominal thickness, thermally broke double wall, injected with foam insulation for an R-value of not less than R-13. Removal of side panels must not affect the structural integrity of each module. The casing must be able to with stand up to six inches of negative static pressure and up to five inches of positive static pressure. All exterior wall panels shall be made of a minimum of 18 gauge G90 galvanized steel. The inner liner shall be G90 galvanized steel. The panel deflection shall not exceed L/240 at 125% of design static pressure. The casing leakage shall not exceed 0.5 cfm per square foot of cabinet area at up to six inches of negative static pressure and up to five inches of positive static pressure. The unit shall be delivered in modules. Modules to module assembly shall be accomplished with an overlapping, full perimeter, insulated, internal splice joint sealed with bulb type gasketing on both mating modules.

B. Units shall have an insulated type 304 stainless steel drain pan under the primary and precooling coils. Drain pans shall slope to the drain connection for positive drainage. Insulation shall be a minimum of 2” thick.

C. Access doors shall be flush mounted to cabinetry, with a minimum of two six inch long stainless steel piano-type hinges, latch and full size (4.5” minimum) handle assembly.

D. Units shall be factory assembled (within freight limitations) to a galvanized steel base rail.

2.04 FANS

A. Fans shall be double width, double inlet, multi-blade type or single inlet plenum type as indicated and shall be forward curved or air foil as required for stable operation.

B. Fans shall be certified as complying with ARI standard 430. Centrifugal fans shall be dynamically and statically balanced at the factory as a complete fan assembly (fan wheel, motor, drive, and belts). Fan shafts shall not pass through their first critical speed at any cataloged rpm.

C. Fans shall be equipped with self aligning, antifriction pillow block grease lubricated bearings with a minimum L-50 life of 200,000 hours.

D. Fan and motor assembly shall be isolated from the unit casing by spring isolators, furnished and installed at the factory.

E. Sound baffles shall be factory installed in the fan section when indicated.

2.05 MOTORS

A. Motors shall be mounted integral to an isolated fan assembly furnished by the manufacturer. Motors shall be mounted inside the unit casing. Motor mounts shall be adjustable to permit drive belt tensions. Electrical characteristics shall be as scheduled.

B. Drives shall be fixed pitch and shall be selected at a minimum 1.3 service factor.

C. Motors shall be premium efficiency and suitable for operation on a variable frequency drive.

D. Variable frequency drives shall be factory mounted installed, wired and tested.

2.06 FILTERS

A. Provide a filter section with filter rack and guides with hinged and latching access door for filter removal on the drive side of the unit.

B. Filters shall be 4 inch thick, pleated, MERV 13 efficiency .

C. A filter gauge shall be provided, Minihelic II with a 0-2” range.

2.07 COILS

A. The water coils shall be the air handling unit manufacturer's standard coil having copper tubes and aluminum fins. Fins shall have a minimum thickness of 0.075” with collars drawn, belled and firmly bonded to the tubes by method of mechanical expansion of the tubes. Tubes shall be seamless 5/8 inch copper, 0.020” nominal tube wall thickness. No soldering or tinning shall be used in the bonding process. Return bends shall have a nominal wall thickness of 0.025 inches. Coils shall be mounted in the unit casing with the same end connections to accessible for service and can be removed form the unit either through the roof or through the side of the unit without disassembly of the unit. Capacities, pressure drops and selection procedure shall be certified in accordance with ARI Standard 410.

B. Water Coils: All coils shall be installed in insulated coil sections. Water flow shall be counter to the air flow. Coils shall be proof tested to 300 psig and leak tested to 200 psig, air pressure under water. Coil headers and U-bends shall not be exposed. Headers shall be extended through the casing and shall have NPT threaded carbon steel pipe connection.

2.08 AIR FLOW MONITORING

A. The unit shall be equipped from the factory with a flow station capable of measuring the outdoor air flow rate to within +/-15%. The flow rate shall be displayed on digital display mounted on the unit. Connectivity to the BAS is required.

B. Flow measuring station shall utilize the thermal dispersion technique.

C. The flow measuring devices shall be *Ebtron* or equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which air handling units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION OF AIR HANDLING UNITS

A. General: Install air handling units where indicated, in accordance with manufacturer's installation instructions, and with recognized industry practices, to ensure that air handling units requirements and serve intended purposes.

B. Access: Provide access and service space around and over centrifugal fans as indicated, but in no case less than that recommended by manufacturer.

C. Electrical Wiring: Install electrical and control devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Ensure that rotation is in direction indicated and intended for proper performance. Ensure that unit controls are operating properly as intended. Do not proceed with unit start-up until wiring installation is acceptable to air handling unit Installer.

D. Ductwork Connections: Refer to Division-15 "Ductwork" sections.

E. Install hydronic piping accessories for the wrap around loop and the primary heating and cooling systems as indicated and as required by the specification.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of air handling units, and after controls and motor have been energized with normal power source, test equipment to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment which cannot be satisfactorily corrected.

3.04 ADJUSTING AND CLEANING

A. Start-up, test and adjust air handling units in presence of contractor's authorized service representative.

3.05 SPARE PARTS

A. General: Furnish to owner, with receipt, one spare set of belts for each belt driven centrifugal fan

END OF SECTION 15784

DIVISION 15 – MECHANICAL

SECTION 15790 – HEAT RECOVERY CHILLERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Types of units specified in this section include the following:

1. Non-reversing water to water heat pump units and accessories.

B. Refer to other section of the specifications for the primary cooling and heating source; not work of this section.

C. Refer to 15950 for temperature control work.

1. Control wiring specified as factory-installed is work of this section.

D. Provide the following electrical work as work of this section, complying with requirements of Division-16 sections:

1. Motor starters and disconnects for Mechanical Equipment.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of water-to water heat pump units, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Codes and Standards:

1. UL or ETL Compliance: Provide electrical components which are listed by UL or ETL and have UL or ETL label affixed.

2. NEMA Compliance: Provide energy efficient motors and electrical accessories complying with NEMA standards.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for the units, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions.

B. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to air handling units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide water to water heat pump units as scheduled on the drawings. Capacity and electrical characteristics shall be as scheduled on the drawings.

B. The liquid source water-to-water heat pump shall be a single packaged non-reversing heating/cooling unit. The unit shall be listed by a nationally recognized safety testing laboratory or agency, such as ETL. Testing shall be equal to CSA C22-2 or UL 427. The EKS-R liquid source water-to-water heat pump unit as manufactured by Kube Solutions, Dartmouth, Nova Scotia, shall be designed to operate with evaporator entering liquid temperatures between 10°F(-12°C) and 70°F(21°C), and condenser entering liquid temperatures between 50°F(10°C) and 100°F(38°C). The EKS liquid source water-to-water heat pump unit as manufactured by Ice Kube Systems Ltd., West St. Paul, Manitoba, shall be designed to operate with evaporator entering liquid temperatures between 30°F(-1°C) and 70°F(21°C), and condenser entering liquid temperatures between 50°F(10°C) and 130°F(54°C).The evaporator entering fluid temperature must be lower than the condenser entering fluid temperature. Each unit shall be run-tested at the factory. Each unit shall be pallet mounted.

2.02 UNIT CASING

A.The cabinet shall be fabricated from heavy gauge stainless steel. The cabinet shall have removable access panels on all four sides, and a hinged access door over the electrical cabinet. The interior shall be insulated with ½” (13mm) thick multi-density, coated glass fiber, with edges sealed or tucked under flanges. All units shall have 7/8” (22mm) and 1 1/8” (29mm) knockouts for entrance of low and high voltage wiring. Cabinet dimensions shall be less than 31” (788mm) in width or depth to permit units to be easily moved through a standard size door. The unit shall be built on a heavy gauge stainless steel baseplate. The cabinet shall be built to allow service access to the internal components. The baseplate shall have skids to allow a forklift to lift the unit and to sit the unit on the floor or mount to a stand. This design minimizes the physical space requirements of the units. An optional welded unit support / pump stand shall be available from the manufacturer.

2.03 REFRIGERANT CIRCUIT

A. All units shall contain a sealed refrigerant circuit including a hermetic motor-compressor, uni-directional electronically controlled thermal expansion valve assembly, two (2) stainless brazed plate fluid to refrigerant heat exchangers, factory-installed high and low pressure safety switches and service ports, and a liquid line filter-drier. The refrigerant circuit shall include a valve that prevents migration of refrigerant to the evaporator when the compressor is not activated. Low-pressure lockout switch shall be electrical reset with interruption to power supply. High-pressure lockout switch shall be manual reset.

B. The electronic thermal expansion valve assembly shall provide proper superheat over the liquid temperature range with minimal “hunting”. The electronic thermal expansion valve shall be designed for single direction refrigerant flow. Bi-directional valves shall not be permitted. Externally mounted pressure controlled water regulating flow valves are not acceptable. The fluid-to-refrigerant evaporator and refrigerant suction lines shall be insulated to prevent condensation at low liquid temperatures.

C. Compressor shall be designed for refrigeration duty, with internal isolation and mounted on rubber vibration isolators. Compressor shall be manufactured with oil-sight glass (model dependent). Compressor motor shall have internal motor protection and shall be single-phase PSC type or 3 phase. Compressor shall be designed for use with R410A refrigerant.

D. Refrigerant piping shall be connected to compressor through a vibration isolator to permit absorption of compressor vibration and start-up torque without stress on piping. All refrigerant piping on suction side of compressor shall be insulated with ½” (13mm) closed-cell foam insulation to prevent condensation. Evaporator shall be insulated with ½” (13mm) closed cell insulation to prevent condensation. Refrigerant piping shall be clamped and supported to minimize vibration and stress cracking.

E. The liquid to refrigerant heat exchangers shall be brazed plate type constructed with type 316 stainless steel plates and brazed with copper. The heat exchangers shall be designed for minimum operation from -321°F (-196°C) to 350°F (177°C), and be capable of withstanding 650 PSIG (4480kPa) working pressure on liquid and refrigerant sides. Heat exchangers shall be manufactured with built in refrigerant distributor tube with calibrated orifices to distribute gas evenly throughout heat exchanger, and be designed for use with R410A refrigerant.

2.04 ELECTRICAL

A. Controls and safety devices will be factory wired and mounted within the unit. Controls shall include compressor contactor, 24 VAC-100 VA transformer with built-in circuit breaker, reset relay, and anti- short-cycle relay. A terminal block will be provided for field control wiring. To prevent short cycling when the safety controls are activated, the reset relay shall provide a lockout circuit that requires resetting of low voltage supply or main circuit breaker. A lockout indicating signal shall be provided on the low voltage terminal block. Evaporator outlet temperature sensor and condenser outlet fluid temperature sensor will provide high and low temperature limit settings, dependant on application, for the heat pump. Run signal and fault signal can be through dry contacts or BAS interface. The refrigerant suction and discharge pressure and suction temperature are monitored with the electronic thermal expansion valve driver.

2.05 PIPING

A. All supply and return liquid connections shall be MPT flush-mounted threaded fittings, sizes indicated on unit specification sheet. All water piping shall be insulated by customer on site to prevent condensation at low liquid temperatures. Pressure/temperature ports shall be included on both condenser and evaporator fluid inlets and outlets.

B. Each unit shall be factory run-tested for a minimum of two hours under actual load conditions. A copy of the run test shall include:

- Amperage and voltage draw
- Refrigerant pressures
- Sight glass status
- Operation & verification of high & low pressure controls
- Entering and leaving fluid temperatures for condenser and evaporator
- Entering and leaving fluid pressures for condenser and evaporator
- Superheat measurement
- Operation of compressor overload protection

A copy of the run-test shall be included in the installation manual shipped with the unit and a copy shall be maintained at the factory.

2.06 MOUNTING RACK

A. The units shall be stacked. A welded rack shall be supplied by the manufacturer.

2.07 APPROVED MANUFACTURERS

A. Kube Solutions, 11 Morris Drive, Suite 114, Dartmouth, Nova Scotia

Phone 902-481-2398

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which air handling units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 WARRANTY

A. The unit shall be warranted by the manufacturer against defects in materials and workmanship for a period of one (1) year from date of delivery to original purchaser-user including the compressor, condenser, evaporator and expansion valve. The stainless steel cabinet shall be warranted for life against defect in materials and workmanship, excluding damage due to rough handling, abuse, accident or casualty loss, chlorine or salt air exposure, airborne contaminants or outdoor installation. Other warranty options are available, please contact manufacturer for details.

B. General: Install units where indicated, in accordance with manufacturer's installation instructions, and with recognized industry practices.

C. Access: Provide access and service space around the units as recommended by manufacturer.

D. Electrical Wiring: Install electrical and control devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Ensure that unit controls are operating properly as intended. Do not proceed with unit start-up until wiring installation is acceptable to unit installer.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of air handling units, and after controls and motor have been energized with normal power source, test equipment to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment which cannot be satisfactorily corrected.

3.04 START UP

A. Start-up, test and adjustment of the units shall be performed by a factory authorized service representative.

END OF SECTION 15790

DIVISION 15 - MECHANICAL

SECTION 15800 - AIR DISTRIBUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. Provide all ductwork with extractors, dampers, turning vanes, hangers, access doors, etc., as indicated on the drawings, as specified and as required to complete this portion of the work in conjunction with the air distribution system.

B. Provide factory fabricated units, exhaust fans, wall louvers, access doors, fire dampers, security grilles, grilles, registers, diffusers, etc., as specified and as shown on the drawings.

C. Provide control dampers, fire dampers, and balancing dampers as shown on drawings or as required for proper duct system operation.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 15010 - “BASIC MECHANICAL REQUIREMENTS” for the following equipment:

1. Registers, grilles and diffusers.

2. Fire dampers.

3. Exhaust fans.

4. Duct liner.

5. Sealing materials.

6. Fire stopping materials.

B. NFPA Compliance: Comply with the following:

1. NFPA 90A, “Standard for the Installation of Air Conditioning and Ventilating Systems,” except as indicated otherwise.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Duct lining materials, separately and in combination shall be UL listed and shall have maximum fire hazard classifications of flame spread 25 and smoke development 50.

B. Units shall be factory assembled and tested. Fan ratings to be based on current AMCA Standards.

C. Roof exhaust fans shall bear AMCA seal.

D. Fire dampers shall conform to requirements of National Fire Protection Association and the state and local fire marshal.

PART 2 - PRODUCTS

2.01 DUCTWORK

A. Construction: Ductwork, unless otherwise shown, shall be galvanized steel sheets (F.S. QQ-S-775 Type l, Class e) or aluminum alloy 3003 (F.S. QQ-A-250/2c Temper H-14). Ductwork (unless noted otherwise on drawings) shall be constructed in accordance with SMACNA low pressure duct construction standards for 1" w.c. pressure. For convenience, they may be constructed per the following table:

DIMENSION	GAUGE	REINFORCING	MAX SPACING
0" - 12"	26	None	
13" - 26"	26	1" standing “S”	5'0"
27" - 42"	24	1" standing “S”	4'0"
43" - 60"	22	1" x 1" x 3/16"	2'6"

Install reinforcing on four sides of duct where depth exceeds 16"; install on two sides only where duct depth is 16" or less.

B. Ductwork to be Painted: Where ducts will be exposed and painted, use “Paint-Grip” galvanized steel (this includes spiral duct). Duct inside clear dimensions, unless otherwise approved by the Engineer, shall conform accurately to the sizes indicated on the drawings and shall be straight, with joints neatly finished. Ducts shall be securely anchored to the building in an approved manner and shall be installed so as to be completely free from vibration under all conditions of operation. Turning vanes shall be installed in all elbows, in

both supply and return ducts. Sheet metal ducts shall be properly braced and reinforced. All rectangular duct with dimensions over 12" shall be cross-broken to prevent “oil-canning.”

C. Exposed Rectangular Ductwork: The rectangular ducts shall be assembled with transverse joints made with the “Ductmate” system or an approved equal. The Ductmate joints shall be assembled with corners, cleats and gasket tape per the manufacturer’s instructions. Duct metal gauges may be reduced per the Ductmate recommendations.

D. Concealed Rectangular Ductwork: **All duct joints and seams shall be sealed with a water-based brush on type duct sealer equivalent to “United McGill Duct Sealer”.** The sealant shall be applied per the manufacturer’s instructions. No leakage shall be detectable when the duct is pressurized to 1" water column. Unsealed duct joints will not be accepted.

E. Round Ductwork: Round low-pressure ductwork in concealed locations shall be galvanized steel “Snaplock” pipe. Tape all transverse joints. Spiral duct shall be used where indicated on drawings. Where indicated on drawings, round ductwork and all below-grade ductwork shall be spiral galvanized round duct, “United” or approved equal. Spiral duct shall conform to SMACNA duct construction standards Section III. Spiral seams shall be lock-formed or continuous-welded. Elbows referred to as “radiused” may be gored elbows, 5 sections minimum. Duct sizes may be increased 1" as required to allow “nesting” for economical shipment.

F. Flexible connectors at connections to equipment shall be fabricated of “Elgen Silent-Duct” neoprene commercial grade strip, 9" wide with 3" flexible section, or equal. Place as indicated on drawings, or as required. Use care to avoid violating fire integrity of ducts.

2.02 FLEX DUCT

A. Flexible air duct shall be insulated fabric acoustical flexible air duct. The ductwork shall be UL listed, Class 1 Air Duct and comply with NFPA 90A and 90B. Core material shall be an acoustical transparent CPE fabric supported by helically wound galvanized steel mechanical locked construction. Wire helix type supported core not acceptable. The fabric shall be mechanically fastened to the steel helix without the use of adhesive. The duct shall be rated for minimum 4000 feet per minute velocity and positive pressure of 6 inches W.G. and negative pressure of 4 inches W.G. Factory insulation shall be flexible fiberglass insulation with an R value of at least 6.0 at a mean temperature of 75 degrees F. (R4.2 not acceptable). Insulation shall be covered with a reinforced aluminum pigmented vapor barrier jacket having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E 96, procedure A. Flexible duct routing shall not exceed 8’-0” in length.

B. Flexible ductwork shall be Flexmaster USA Type 8M. **For alternate flexible duct manufacturer, a sample is required and shall be submitted to the engineer for approval.**

2.03 EXHAUST DUCTS

A. Exhaust ducts shall be round or rectangular galvanized steel as shown on the plans. Flexible duct is not permitted. Do not insulate exhaust duct work unless called for on the drawings and as specified below.

2.01 DUCT LINER

A. Unless specified otherwise on the plans, duct liner shall only be used for sound attenuation purposes on rooftop units and split systems 10 nominal tons and above. Supply and return ductwork shall be lined for the first 10’ of duct nearest the equipment connection. Duct liner shall be 2 lb/cu ft density, ½” thick insulation equal to *Owens Corning type 200 Aeroflex Plus.*

2.02 DUCT WRAP

A. Duct wrap shall be *Owens Corning Fiberglass All Service Duct Wrap* or equal. Thickness shall be as specified on the plans.

2.03 FLEXIBLE CONNECTIONS

A. Where sheet metal connections are made to fan or where ducts of dissimilar metal are connected, a noncombustible flexible connection of approved noncombustible material approximately 6" in width, conforming to ASTM Specification D1571-67, shall be installed.

2.04 INSPECTION AND ACCESS DOORS

A. Duct access doors shall be 12" x 12" unless otherwise indicated. Where size of duct will not accommodate this size, the doors shall be 12”W X (smallest duct dimension minus 2”). All access doors shall be rigid and shall be provided with airtight neoprene gaskets. Doors shall be provided with a galvanized piano hinge and two camlock type brass fasteners. Man-size access doors shall be provided with door handles operable from both sides. Doors in insulated ducts shall be of the insulated type.

B. Access doors for access to dampers or equipment behind gyp. board ceilings and walls shall be as specified in the architectural specifications.

2.05 HANGERS AND SUPPORTS FOR DUCTS

A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA “HVAC Duct Construction Standards,” Tables 4-1 through 4-3 and Figures 4-1 through 4-8.

B. Support horizontal ducts within 2' of each elbow and within 4' of each branch intersection.

C. Support vertical ducts at a maximum interval of 16' and at each floor.

D. Upper attachments to structures shall have an allowable load not exceeding ¼ of the failure (proof test) load but are not limited to the specific methods indicated.

2.06 REGISTERS AND GRILLES

A. Registers and grilles shall be of the size indicated on the drawings. Registers and grilles shall have vanes slanted to prevent direct sight into grille.

B. Anything visible through grille in customer contact and office areas shall be painted flat black.

C. Provide anti-smudge rings on all ceiling diffuser located in gypsum board and lay-in ceilings. Where ceiling height permits.

2.07 TAKEOFF FITTINGS

A. Branch duct takeoff fittings shall be minimum 26 gauge galvanized steel with flange connector and adhesive neoprene gasket. Flange shall be pre-drilled for securing to duct with screws. Branch duct takeoff fittings for supply and exhaust diffusers and registers shall include an integral manual volume damper with locking quadrant clearly indicate damper position. Damper is not required on return air branches.

B. “Spin-in” fittings or job-fabricated units are not acceptable.

C. Takeoff fittings shall be Buckley model ATM and ATMD or equal. Where duct height requires a rectangular to round takeoff, utilize a Buckley model 3300 and 3300D or equal.

2.08 FIRE DAMPERS

A. Fire dampers shall have the following features:

1. UL #555 listed and labeled to close, if activated, even if air distribution system is in operation.

2. One piece steel frame.

3. Steel blades with interlocking joints.

4. Stainless steel negator closure spring if required for horizontal mounting.

5. 160°F. U.L. listed fusible links and blade locks.

6. Type “B” construction (recessed curtain).

2.09 FANS

A. Roof Mounted Fans:

1. Housing: The housing and base shall be constructed of 16 gauge aluminum. The fan base shall have continuously welded corners and shall overlap and protect the curb. Each fan housing shall have a permanently attached engraved aluminum nameplate indicating the fan manufacturer and model number.

2. Fan Motors & Drives: Motors shall be the heavy duty type with permanently lubricated sealed ball bearings. Disconnect switches shall be factory mounted inside the fan housing and out of the airstream. Fan bearings shall be the heavy duty regreasable ball type in a cast iron housing. The minimum L50 bearing life shall be 200,000 hours. The drive assembly shall be mounted to a 14 gauge steel channel isolated with rubber-in-shear vibration isolators. Where belt drives are scheduled, they shall be adjustable.

3. Fan Wheels: Direct or belt driven, as scheduled, of the centrifugal type and backwardly inclined. The fan wheel shall be constructed of aluminum and balanced in accordance with AMCA Standard 204-96.

4. Curbs: Aluminum (0.08”) or galvanized steel (18 gauge) construction, continuously welded corners, 12" minimum curb height, 1-1/2” 3lb acoustical insulation. Provide ¼" sponge rubber pad on top of curb for vibration isolation.

5. Backdraft Dampers: Each roof mounted fan except grease exhaust fans shall be provided with an aluminum backdraft damper w/sealed blades. Dampers shall be automatic or motorized as indicated on plans.

6. Grease Exhaust Fan Accessories: Vented curb extension, hinged base, grease trough.

B. Ceiling and In-Line Fans:

1. Construction: The fans shall be all metal construction. The housing shall be constructed of 20 gauge galvanized steel and acoustically insulated. The blower assembly shall be mounted to 14 gauge steel channel isolated with rubber-in-shear vibration isolators. The assembly shall be removable. The fan wheel shall be constructed of galvanized steel and balanced in accordance with AMCA Standard 204-96. The motor shall be the open drip proof type with permanently lubricated sealed bearings and built in thermal overload protection.

2. Accessories: Ceiling mounted exhaust fans shall be provided with an architectural style aluminum grill with a polished aluminum finish. A solid state variable speed controller shall be provided for all units with a single phase motor. The controller shall be mounted on or adjacent to the fan housing.

2.10 ACCEPTABLE MANUFACTURERS

A. Grilles and Registers

1. Kreuger
2. Anemostat.
3. Price.
4. Titus.
5. Carnes.
6. Tuttle and Bailey.

7. Nailor

B. Louvers and Dampers

1. Carnes.
2. Greenheck.
3. Ruskin.
4. Nailor.
5. Cesco
6. Louvers & Dampers Co.

C. Flexible Ductwork

1. Flexmaster USA

D. Duct Lining

1. Owens-Corning “Aeroflex Plus Type 300".
2. Certain-Teed “Ultralite Duct Liner”.
3. Johns-Manville “Microlite Duct Liner”.

E. Duct Wrap Insulation

1. Owens Corning All Service Duct Wrap.
2. Certain-Teed Standard Duct Wrap.

F. Fire Dampers

1. Air Balance.
2. Cesco.
3. Greenheck.
4. Nailor.
5. Louvers & Dampers Co.
6. Ruskin.
7. Vent Products.

G. Fans

1. Cook
2. Greenheck
3. Acme
4. Twin City Fan & Blower

PART 3 - EXECUTION

3.01 DUCTWORK

A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.

B. Ducts shall be of the internal dimensions shown on the Drawings. In no case shall the Contractor change the indicated size of the ductwork without approval of the Engineer. Wherever necessary to change the shape of the duct, it shall be done gradually and the full cross-sectional area shall be maintained.

C. Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. All joints shall be sealed with duct sealant. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.

D. Ducts 24" or greater in width or height shall be stiffened with galvanized structural angle reinforcing, not to exceed 4' on centers and on all four surfaces, to prevent sagging or buckling and to provide a rigid installation and freedom from vibration and noise. Where angle cleats are made of same gauge metal as ducts (or heavier) the angle cleats will serve as reinforcing members on two surfaces of the ducts at joints in the ducts. Additional reinforcing angles shall be provided adjacent to branch duct connections which are of less width or depth than the surface of the main duct at point of connection, and at all other locations as necessary to make the duct work free from noise and vibration when fans are operating.

E. This Contractor shall carefully check the arrangement of ducts and dimensions for all working spaces at the building so that there will not be interference with the running of ducts.

F. Where ducts pass through walls and ceilings (exposed and concealed), this Contractor shall provide bent angle collar (as required to cover annular space) having flanges at corners lapped and riveted and the other leg of angle cut short and bent around corner of duct. Collars shall serve to confine sound barrier packing and shall fit tight around ducts. Where more than one duct passes through the same opening the collars shall form a complete seal of the spaces between and around all such ducts. This shall apply to concealed ductwork as well as exposed ductwork. The space between the duct and wall shall be packed with fiberglass duct-seal to provide an effective sound and dust barrier. Where the bent angle collar in any wall opening must support masonry in the wall above the opening, the top member of the bent angle collar shall be reinforced with rolled section steel angles suitable for the weight to be carried as approved by the Engineer and placed so as to be concealed in the wall in all locations where exposed in finished rooms.

3.02 FLEXIBLE CONNECTIONS

A. Flexible connections shall be securely fastened by zinc-coated iron clinch-type draw bands, for round ducts. For rectangular ducts, flexible connections locked to metal collars shall be installed using normal duct construction methods.

3.03 INSPECTION AND ACCESS DOORS

A. Access doors in ductwork shall be provided at all fire dampers, motorized dampers, and where indicated on the drawings. Unless otherwise indicated, doors shall swing so that fan pressure or suction holds the door closed. Access doors in ductwork with duct liner or insulation shall be insulated.

3.04 HANGING OF DUCTS

A. Horizontal ducts shall be supported with angle and rod or strap iron trapeze hangers. Strap iron hangers shall be placed around sides and bottom of ducts with sheet metal screws in sides and bottom. Trapeze hangers shall be securely fastened to ducts and to the construction above. Horizontal duct supports shall be spaced not to exceed 8' apart and not less than one trapeze support per section of duct.

B. Special hanging systems, where indicated, will be installed in lieu of duct supports specified above.

C. No equipment or ductwork shall be hung from roof deck.

3.05 TAKEOFF FITTINGS

A. Install takeoff fittings with dampers in each supply air branch takeoff. Mark damper open and closed positions on side of duct with black paint.

B. Fittings shall be secured in duct with screws. Operators shall be outside the duct system. All holes shall be carefully covered and sealed.

3.06 FIRE DAMPERS

A. Fire dampers shall be installed as required by NFPA 90A, and as indicated on the drawings. Fire dampers must be installed in 10 gauge sleeve above ceiling terminal air devices or in masonry wall. Steel retaining angles, 10 gauge, shall be bolted or welded to sleeve on both sides of wall, with duct connected to sleeve on both sides with slip connector held with not less than one No. 8 sheet metal screw on each vertical side of duct.

3.07 INSTALLATION OF EQUIPMENT

A. Install all fans, fire dampers, registers, grilles, etc., per manufacturer’s recommendation and instructions.

B. Care shall be taken with installation of roof exhaust fans and roof vents to prevent damage. Any fan or vent dented or damaged in any other way during construction shall be repaired or replaced.

3.08 ACOUSTICAL DUCT LINING - INSTALLATION

A. Acoustical duct lining shall be installed at locations as indicated on plans and as specified in Part 2 of this specifications section.

B. Duct liner shall be installed as called for in latest edition of manufacturer's installation manual and/or as called for or shown in the SMACNA HVAC Duct Construction Manual - 1995.

C. Adhere liner with coated side toward air stream to all interior sides of duct with 100% coverage of fire-resistant insulation bonding adhesive. Adhesive shall completely cover sheet metal at each end of each section of ductwork. Provide Z bar liner retainer on leading edge of liner.

D. When duct width exceeds 12" or height exceeds 24" further secure the liner to these surfaces with mechanical fasteners at 16" o.c.

E. Velocities - 1500 to 4000 FPM: Install as above but additionally paint all joints of liner and butter the edges of liner where sections of ductwork will be joined with fire-resistant mastic.

F. Note: All duct sizes shown are inside of linings. Increase sheet metal sizes as required.

3.09 DUCT WRAP - INSTALLATION

A. Duct wrap shall be installed at locations as indicated on plans.

B. Duct wrap shall be installed as called for in latest edition of manufacturer's installation manual and/or as called for or shown in the SMACNA HVAC Duct Construction Manual - 1995.

3.10 EXHAUST DUCTS

A. Exhaust ducts shall not be insulated or lined unless specifically noted otherwise.

3.11 ADJUSTING AND CLEANING

A. Adjust volume control devices as required by the testing and balancing procedures to achieve required air flow. Refer to Section 15990 - "TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS" for requirements and procedures for adjusting and balancing air systems.

END OF SECTION 15800

DIVISION 15 – MECHANICAL

SECTION 15870 –COMMERCIAL KITCHEN VENTILATION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. This Section includes units and accessories listed below, complete with controls. Burger King and Popeyes hood requirements shown on the plans shall prevail over this specification.

1. Type 1 Hoods (hoods designed for grease exhaust applications).

1.03 RELATED WORK

A. Section 15800 - “AIR DISTRIBUTION”.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 15010 - “BASIC MECHANICAL REQUIREMENTS”:

1. Product data including weights and dimensions and data on features and components. Include plan and elevation views of units, minimum clearances, and data on ratings and capacities.

2. Maintenance data for products for inclusion in “Operating and Maintenance Manual” specified in Division 1.

3. Wiring diagrams from manufacturers detailing electrical requirements for power and control wiring for furnaces. Include ladder-type wiring diagrams for interlock and control wiring required for field installation. Differentiate between portions of wiring that are factory installed and portions that are to be field installed.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70, “National Electrical Code.”

B. NRTL Listing: Provide electrical components specified in this Section that are listed and labeled.

1. Terms “Listed” and “Labeled”: As defined in the “National Electrical Code,” Article 100.

2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.

1.06 DEFINITIONS

A. Control Wiring: Wire, conduit, and miscellaneous materials for mounting and connecting electric control devices.

PART 2 - PRODUCTS

2.01 KITCHEN EXHAUST HOOD (TYPE 1)

A. This Contractor shall furnish and install Kitchen Exhaust Hoods as shown on the drawings and specified herein. Hoods shall be complete with exhaust fans and make-up air unit (if scheduled) as scheduled on the drawings and shall be in compliance with NFPA-96.

B. Type 1 Hoods shall be provided with the following:

1. Supply air configuration as indicated on the plans.

2. Aluminum grease filters for the full-length of the hood.

3. Vapor-proof lights fluorescent lights.

4. Grease gutters leading to removable grease containers.

5. Hood shall be complete with wet chemical fire extinguishing system as required by NFPA-96. (See following paragraphs under “Kitchen Hood Fire Extinguishing System”.)

6. Utility cabinet: Provide a panel housing fire alarm system components, on/off toggle switches with pilot lights for control of the exhaust fan(s), lights, and supply fan(s). Refer to plan for location of utility cabinet.

7. Fire damper (UL 555 listed) in each supply air opening.

8. Enclosure panels to span between the hood and the ceiling.

9. Stainless steel backsplash panel.

C. Construction:

1. Ductwork: See plans for duct construction. Where duct cleanouts are required, provide access doors in the wall or ceiling as required for access to concealed duct cleanouts.

2. Hoods: Hoods shall be constructed of welded, 18 GA., type 430 stainless steel. All exposed joints shall be liquid tight. Hood shall meet or exceed "NSF" requirements and shall be UL classified.

2.02 KITCHEN HOOD FIRE EXTINGUISHING SYSTEMS (TYPE 1 HOODS)

A. On all hoods so indicated on the plans, the contractor shall provide a fire extinguishing system. The system shall be a pre-engineered automatic fire suppression system using a wet chemical agent for grease related fires. The system shall be in compliance with UL Standard 1254, UL Standard 300, NFPA 96 and NFPA 17A. The system shall be capable of suppressing fires in the following areas associated with cooking equipment: ventilating equipment including hoods, ducts, plenums, and filters; fryers; griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, mesquite or gas-radiant char-broilers. The system shall be the pre-engineered type having minimum and maximum guidelines established by the manufacturer and listed by Underwriters Laboratories, Inc. (UL). The pre-engineered restaurant fire suppression system components shall be warranted for five years from date of delivery against defects in workmanship and material. The system shall be installed and serviced by personnel trained by the manufacturer. The system shall incorporate a "dry" contact for interlocking to the cooking equipment power. Refer to the electrical drawings for contactors, etc.

B. Prior to the installation of any portion of the fire extinguishing system, a complete shop drawing showing the proposed installation shall be prepared and submitted for approval. All equipment proposed to be used shall be fully described in the submittal. Head types and dimensioned locations shall be shown.

C. The system shall consist of the agent regulated release assembly which includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzles, blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows shall be supplied in separate packages in the quantities needed for fire suppression system arrangements. Additional equipment shall include remote manual pull station, mechanical gas valves, pressure switches and electrical switches for automatic equipment and gas line shut-off.

D. Distribution piping shall be Schedule 40 black iron, chrome-plated, or stainless steel pipe conforming to ASTM A120, A53, or A106. All exposed piping for the fire extinguishing system shall be chrome plated.

E. Contractor shall test the completed system and provide a test certification to the owner at the completion of the project. Contact the local fire officials prior to testing.

2.03 ACCEPTABLE MANUFACTURERS

A. Kitchen Exhaust Hood and Make-up Air Unit

1. Captive-Aire.
2. Greenheck.
3. Gaylord

PART 3 - EXECUTION

3.01 INSTALLATION

A. Hang each hood in accordance with the manufacturer's installation instructions and at the mounting height indicated on the plans. In no case shall the bottom of the hood be lower than 6'-6" A.F.F. Provide any miscellaneous work which may be required to achieve a complete and functional system. Report any discrepancies noted to the Engineer.

B. Connect ducts in accordance with Section 15800 - "AIR DISTRIBUTION."

C. Equip all horizontal kitchen exhaust ducts with accessible cleanout openings as required by code. Access doors shall be provided where ductwork is concealed.

3.02 COMMISSIONING

A. Test functions, operations, and control sequences and protective features. Adjust to assure operation is in accordance with specification.

B. Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.03 CLEANING AND ADJUSTING

A. Cleaning: Upon completion of installation, inspect hoods and associated components. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

B. Adjusting: Hood exhaust and make-up air shall be balanced in accordance with SECTION 15990 – "TESTING, ADJUSTING, & BALANCING OF HVAC SYSTEMS".

END OF SECTION 15870

DIVISION 15 – MECHANICAL

SECTION 15950 – HVAC CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide a Building Automation System (BAS) incorporating Direct Digital Control, including equipment monitoring and control consisting of microprocessor based plant control processors interfacing directly with sensors, actuators and HVAC units. Provide a primary communications network to allow data exchange between microprocessor based devices and the user interface.

B. The system will consist of a web-based, open architecture that utilizes the BACnet and/or LonTalk protocol as the common communication protocol between all controlled and controlling devices. A front-end gateway for BACnet or LON communication will not be acceptable. Field bus controllers shall be BACnet (BTL Certified) or LON (LonMark Certified).

C. All points of user interface shall be on standard PCs that do not require the purchase of any special software from the BAS manufacturer for use as a building operations terminal. The primary point of interface will be through a standard Web Browser.

D. LON system controllers shall utilize the Echelon Neuron microprocessor for network communications. BACnet system controllers shall use the MS/TP or IP protocol.

E. System monitoring and supervisory control shall be provided through the user interface. The user interface shall allow for command entry, information management and all database management functions. Real time control functions such as scheduling, history collection and alarming shall be resident in the Building Controller. Systems that require a workstation with BAS software for interface will NOT be acceptable.

F. The control system shall be able to accommodate multiple user operation. Access to the control system data should be limited only by operator password. Multiple users shall have access to all valid system data, based on their permission level.

G. The control system shall be designed such that mechanical equipment will be able to operate under stand-alone control. In general, the operation of any controllers on the network shall not rely on any other controller for its operation. As such, in the event of a network communication failure, or the loss of any other controller, the control system shall continue to independently operate under the resident program stored in nonvolatile memory.

H. The documentation contained in this section and other contract documents pertaining to HVAC Controls is schematic in nature. The Contractor shall provide hardware and software necessary to implement the functions shown or as implied in the contract documents.

I. All system controllers shall utilize a peer-to-peer communications scheme to communicate with each other.

J. System shall utilize standard BACnet and/or standard LONmark defined network and command protocol types for all system data. Proprietary commands shall not be used for system control.

K. The system shall be modular in nature, and shall permit the expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices. The overall BAS shall be capable of networking with other buildings through expansion. Expansion shall not require a replacement of system components.

1.02 SUMMARY OF WORK

A. All work of this section shall be provided by the single BAS Contractor.

B. Provide any required routers and repeaters to allow for reliable communication across the field bus and to the user interface. The BAS contractor may use wired or wireless communication. The integrity of the communication between the controls shall be the responsibility of the controls contractor. Controller, router or automation network modifications required to ensure proper communications will be the responsibility of the BAS contractor.

C. Provide Building Controllers, Programmable Controllers, and Application Specific Controllers, as needed to perform functions indicated in the input/output summaries and sequences of operation, and/or indicated on the HVAC drawings.

D. Provide all required wire, conduit, junction boxes, wall boxes, and 24V power supplies.

E. The BAS Contractor shall provide all controls, sequences of operation, and systems monitoring as required by these specifications and by the drawings. Provide all required devices, sensors, hardware, software, wiring, controllers, etc. The BAS shall be configured to provide all controls, sequences of operation, and systems monitoring as required by these specifications and by the drawings. Provide all required devices, sensors, hardware, software, wiring, controllers, etc.

1.03 QUALITY ASSURANCE

A. Hardware and Software Component Manufacturer Qualifications

1. The manufacturer of the hardware and software components must be primarily engaged in the manufacture of control systems and must have been so for a minimum of five (5) years.

2. The BAS contractor shall be the recognized manufacturer or local representative that regularly programs, installs and services the approved control system.

3. The manufacturer of the hardware and software components shall have an authorized representative capable of providing service and support within 75 miles of the project location. Subject to the full compliance with this specification, acceptable manufacturers are limited to the following:

   a. Johnson Controls.
   b. Trane.
   c. TAC.

4. The BAS contractor shall have a 24-hour service phone number for after-hours troubleshooting and control system service.

1.04 SUBMITTALS

A. General: Submit the following according to conditions of Section 15010 “BASIC MECHANICAL REQUIREMENTS”.

1. Submit functional temperature control diagrams (include sequences) for each mechanical system served by the HVAC Control System. Indicate and Tag each input/output served by each Control Unit or Intelligent Device.

2. Product data on all components used to meet the requirements of the specifications such as enclosures, sensors, configuration parameters, power supplies, etc.

B. Shop Drawings

1. The controls contractor shall submit AutoCAD or Visio generated schematic drawings for the entire control system for review and approval before work shall begin. Included in the submittal drawings shall be a one-page diagram depicting the complete system architecture complete with a communications riser. Drawings shall include point-to-point wiring diagrams and must show all temperature controls, start-stop arrangement for each piece of equipment, equipment interlocks, wiring terminal numbers and any special connection information required for properly controlling the mechanical equipment. The submittal shall include a bill of material reference list as well as equipment sequences of operation.

2. The submittals shall include manufacturer's catalog data describing each item of control equipment or component provided and installed for the project.

C. Close-Out Documents

1. Submit final copies of the shop drawings outlined above. These final submittals shall reflect all field modifications and change orders required to complete the installation. Submit the following quantities of record submittal drawings immediately following receipt of notification of substantial completion. Auto CAD drawing or VISIO files of all shop drawings on CD-R disks.

2. Three complete sets of documents.

1.05 OPERATION AND MAINTENANCE MANUALS

A. Submit 3 sets of operation and maintenance manual in accordance with requirements of Section 15010 “BASIC MECHANICAL REQUIREMENTS”.

B. Include the following documentation:

1. Network Management Software User Manual specific to each tool package provided.

2. Documentation of network variables, network node configurations, priority interrupts, node binding, addressing structure, etc.

1.06 INSTRUCTION OF OWNER OPERATING PERSONNEL

A. Operator training shall include a minimum of eight hours of training. The training shall occur in two four hour sessions occurring on separate days.. The operator training program shall be to establish a basic understanding of Windows based BAS software, functions, commands, etc. The training shall encompass as a minimum:

1. Sequence of operation review.

2. Sign on – sign off.

3. System initialization.

4. Use of all dialogue boxes and menus.

5. Selection of all displays and reports.

6. Troubleshooting of input devices, i.e., bad sensors.

1.07 WARRANTY

A. The HVAC Control System shall be free from defects in workmanship and material under normal use and service. If within twelve (12) months from the date of substantial completion, the installed equipment is found to be defective in operation, workmanship or materials, the building systems contractor shall replace, repair or adjust the defect at no cost. Service shall be provided within 24 hours (during the business week) upon notice from the Owner’s designated Representative.

PART 2 – PRODUCTS

2.01 DISTRIBUTED USER INTERFACE

A. The BAS contractor is not required to provide a workstation for the building owner. However, following are the general requirements for owner/operator interface with the control system:

1. The control system shall support a distributed user interface and be capable of interfacing with a typical Windows based PC workstation.

2. The user interface shall use an *Internet Explorer* web browser and JAVA applications for communicating with the building controller(s). No additional BAS software shall be required on the PC for user interface.

2.02 PROGRAMMABLE CONTROLLERS

A. General Requirements

1. System programmable controllers shall communicate with other controllers that reside on the automation network using BACnet or LON protocols.

2. All programming software and applications shall be stored in non-volatile memory.

B. Input/Output Requirements

1. The controller inputs shall be capable of handling current, voltage, resistance, or open and closed contacts.

2. The controller shall accommodate both digital and true analog outputs. Voltage (0-10V) and current (4-20 mA) outputs shall be accommodated. All analog outputs shall be proportional current or voltage type with a minimum incremental resolution of 0.5% of the full operating range of the output.

C. Programming

1. Custom DDC programs are to be provided to meet the control strategies as called for in the sequence of operation sections on the plans.

2. Application Specific DDC programs are to be based on standard BACnet and LON profiles. However, each sequence must match the design sequence.

2.03 ELECTRONIC INPUT/OUTPUT DEVICES

A. Temperature Sensors and Transmitters

1. General Sensor & Transmitter Requirements

a. Provide sensors and transmitters required as outlined in the input/output summary and sequence of operation, and as required to achieve the specified accuracy as specified herein.

b. All temperature sensors shall be accurate to 0.5°F.

2. Outside Air Sensors

a. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.

b. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate surrounding the sensor element.

c. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.

3. Duct Type Sensors

a. Duct mount sensors shall mount in a hand box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement. A neoprene grommet (sealtite fitting and mounting plate) shall be used on the sensor assembly to prevent air leaks.

b. Duct sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.

4. Averaging Duct Type Sensors

a. For ductwork greater any dimension than 48 inches and/or where air temperature stratification exists, utilize an averaging sensor with multiple sensing points.

b. Provide capillary supports at the sides of the duct to support the sensing string.

5. Room Sensors

a. Room Temperature sensor shall be a digital type with a digital display, setpoint adjustment and override button.

B. Relative Humidity Sensors/Transmitter

1. Humidity transmitter shall be equipped with 4-20ma or 0-10 vdc linear proportional output.

2. The humidity transmitter shall meet the following overall accuracy including lead loss and A to D conversion.

a. Room Type Sensor ±3% RH

2.04 ELECTRICAL CONTROL POWER AND LOW VOLTAGE WIRING

A. Plenum rated cable may be used in concealed, accessible locations. Where plenum rated cable is used, it shall be supported a minimum of every 5 feet from the building structure and shall be run parallel to the building structural lines. Cable routed in all other locations shall be in conduit.

B. Provide all other wiring required for the complete operation of the specified systems.

C. All wiring raceway systems shall comply with Division 16 requirements.

D. Network Communication Requirements

1. Wired network communication shall be via channels consisting of a 22 AWG stranded cable.

2. There shall be no power wiring, in excess of 30 VAC rms, run in conduit with communications wiring.

E. Input/Output Control Wiring

1. RTD wiring shall be two-wire or four-wire minimum number 22 gauge stranded.

2. Other input / output wiring shall be a minimum of number 22 gauge stranded.

3. BAS contractor is responsible for providing reliable communication, regardless of wire size.

2.05 BAS HARDWARE IDENTIFICATION

A. Wire Tags

1. All multi-conductor cables in all pull boxes and terminal strip cabinets shall be tagged.

B. Miscellaneous Equipment Identification

1. Screwed-on, engraved black lamicoid sheet with white lettering on all control panels and remote processing panels. Lettering sizes subject to approval.

2. Inscription, subject to review and acceptance, indicating equipment, system numbers, functions and switches. For panel interior wiring, input/output modules, local control panel device identification.

2.06 SYSTEM FUNCTIONS

A. Basic Functions:

1. As a minimum, the system shall permit the operator to perform the following tasks with a minimum knowledge of the HVAC Control System provided and basic computing skills.

    a. View HVAC equipment status (on/off/mode) as applicable.

    b. Locate potentially faulty equipment through audible or visible alarms.

    c. Adjust and add schedules for equipment

2. On-Line Help: Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen.

3. Security: Each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system supervisor shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operator's access for viewing and/or changing each system application, full screen editor, and object.

4. System Diagnostics: The system shall automatically monitor the operation of network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

5. Alarm Processing: Any object in the system shall be configurable to alarm in and out of normal state. The operator shall be able to configure the alarm limits, warning limits, and reactions for each object in the system.

    a. Binary Alarms shall be set to alarm based on the operator specified state.

    b. Analog Alarms: Each analog object shall have both high and low alarm limits and warning limits. Alarming must be able to be automatically and manually disabled.

6. Trend Logs: The operator shall be able to define a custom trend log for any data in the system. This definition shall include interval. The system operator with proper password shall be able to determine how many samples are stored in each trend. Trend data shall be sampled and stored on the Building Controller. Trends will be stored based on capacity.

7. Alarm and Event Log: The operator shall be able to view all logged system alarms and events from any location in the system. Events shall be listed chronologically. An operator with the proper security level may acknowledge and clear alarms.

8. Scheduling: Provide the capability to schedule each object or group of objects in the system, regardless of the manufacturer.

a. Weekly Schedule: Provide separate schedules for each day of the week.

b. Exception Schedules: Provide the ability for the operator to designate any day of the year as an exception schedule for holidays or other purposes. This exception schedule shall override the standard schedule for that day. Exception schedules may be defined up to one year in advance. Once an exception schedule is executed it will be discarded and replaced by the standard scheduled for that day of the week.

9. Graphics: A graphic application program shall be an integral part of the control system. The graphics application shall allow for the creation and modification of graphics through the distributed user interface. Graphics may be created through using an AutoCAD, Visio or .jpeg file. The software points for the system shall be bound to the graphical background and shall incorporate various animations to display moving parts (such as fans, etc.). The system shall allow for direct control through the graphical interface. As part of the project, the BAS Contractor shall provide the following graphics (at a minimum):

a. Floor Plan: A floor plan graphic for each floor shall be provided that shows the zone temperature based on the temperature sensor locations. By clicking on the temperature readout, the system shall bring up the graphical representation for its associated equipment.

b. Equipment: A separate graphic shall be provided for each unique HVAC system that is being controlled. For identical equipment, a single graphic may be used that is updated with the current status, name and setpoints associated with the equipment.

B. Remote Connectivity.

1. The system shall be able to connect to remote sites via Ethernet LAN. Ethernet connection is by others.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. After completion of installation, test and adjust control equipment.

B. Install equipment, piping, wiring/conduit parallel to building lines (i.e., horizontal, vertical, and parallel to walls).

C. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.02 SEQUENCE OF OPERATIONS

A. Refer to the plans for normal operating mode sequences of operations.

3.03 IDENTIFICATION OF HARDWARE AND WIRING

A. All wiring and cabling, including that within factory-fabricated panels shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information.

B. Permanently label or code each point of field terminal strips to show the instrument or item served.

C. Identify control panels with minimum 1 inch letters on nameplates.

D. Identify all other control components with permanent labels. Identifiers shall match record documents.

E. Label the room sensors to identify the associated terminal box.

3.04 PROGRAMMING

A. Provide sufficient internal memory for the specified control sequences and trend logging.

B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index.

C. Software Programming

1. Provide programming for the system as per specifications and adhere to the strategy algorithms provided. The HVAC Control System Contractor shall also provide all other system programming necessary for the operation of the system but not specified in this document.

3.05 CHECK OUT, START UP AND TESTING

A. The control system shall be properly commissioned prior to acceptance. The Contractor shall coordinate with others (including mechanical, electrical and test and balance contractors) to properly start up and verify proper operation of the system.

END OF SECTION 15950

DIVISION 15 - MECHANICAL

SECTION 15990- TESTING, ADJUSTING, & BALANCING OF HVAC SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. The HVAC systems shall be tested and balanced by an independent agency under contract directly with the General Contractor.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS (NEBB OR AABC CERTIFIED)

A. This Agency shall be certified by the National Environmental Balancing Bureau (NEBB) or by the American Air Balance Council (AABC). Five (5) copies of the final balancing report shall be submitted to the Contracting Officer on applicable NEBB Reporting Forms for review. Each individual final reporting form submitted shall bear the name of the person who recorded the data and the seal of the supervisor of the performing firm. Identification of all types of instruments used and their last dates of calibration shall be submitted with the final report.

B. HVAC systems will be tested and balanced by an independent agency retained by the Contractor.

C. The independent air/hydronic testing and balancing agency (TAB) shall perform the balancing and testing of the HVAC in accordance with the procedures of AABC or NEBB to analyze, balance, adjust and test air and water moving equipment, air and water distribution system including kitchen exhaust hood system.

D. The Contractor shall put all heating, ventilating and air conditioning systems and equipment into operation and shall continue the operation of same during each working day of testing and balance and shall place the automatic temperature control system in satisfactory operation before the TAB agency shall begin work.

E. Prior to the final acceptance of the HVAC system by the Engineer, the Contractor shall allow the TAB agency to schedule this work in cooperation with other trades involved and comply with the completion date of the project.

F. The Contractor shall make available to the TAB agency a complete copy of shop drawing submittal data on mechanical equipment including performance curves (fans and pumps, chillers, air distribution devices, etc.) necessary to test and balance the HVAC system.

G. The Contractor shall schedule the following necessary personnel:

1. Automatic Temperature Control Manufacturer's Service Representative to set adjustments of automatic operated damper and devices to operate as specified, and/or noted, including setting of all controls for proper calibrations.

2. Mechanics - To operate, adjust, replace or repair the HVAC equipment that is found requiring any change/replacement in the pulleys, belts, dampers, valves, etc., of Contractors furnished and installed equipment.

3. Electrician - To assist in any problems resulting from any of the power or control wiring installation, including replacement of starters, and heater elements.

4. The Contractor shall make any changes in pulleys, belts and dampers or the addition of dampers as required for correct balance of the system as recommended by TAB agency, at no cost to Owner.

H. The Contractor shall make all necessary corrections within 48 hours upon notification of TAB agency of the deficiencies requiring adjustment, (piece-meal correction is not acceptable) and within 10 working days for items that require replacement or installation.

I. The Contractor shall leave all strainers clean and all air filters replaced prior to the start of testing and balancing activity.

J. If the Contractor had scheduled the TAB agency to perform the work and the HVAC systems are not ready to be tested and balanced, any additional cost required to extend the TAB work shall be at the Contractor's expense.

END OF SECTION 15990

DIVISION 16 - ELECTRICAL

SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.

1.02 WORK INCLUDES

A. The work to be performed under this Division shall include all labor, materials, equipment, transportation, construction plant, and facilities necessary to provide a complete and satisfactory system ready to use. The Contractor shall examine all Drawings and all Sections of the Specifications and shall be responsible for ascertaining to what extent other Drawings and Sections affect the work herein specified.

B. All rough-in and final connections to AAFES furnished equipment unless otherwise noted.

1.03 CODES, REGULATIONS, AND STANDARDS

A. All work must be performed in accordance with the requirements of local, county, state and national codes and regulations including the requirements of the locally adopted edition of the following codes:

1. International Building Code.

2. National Electrical Code.

3. Occupational Safety and Health Act. of 1970.

4. Life Safety Code, N.F.P.A. No. 101.

1.04 SUBMITTALS

A. See Division 1 for requirements for shop drawings and product data.

B. As soon as possible and within thirty (30) days after the award of the contract and before beginning the fabrication of any material or the installation of any equipment, a complete schedule of the materials and equipment proposed for installation shall be submitted to the

Engineer for approval. This schedule shall include manufacturers' names, catalog data, diagrams, drawings and other descriptive data as required or requested by the Engineer.

C. All items of materials and equipment used for the project shall be submitted.

D. Submittals shall be assembled in an orderly manner and shall include a title page with space for the Engineer's approval stamp and remarks. It shall also contain a concise listing of all items being submitted. Submit five (5) copies as follows: Architect (for records); Engineer (for records); Owner (for records); and two (2) copies for Contractor's use.

E. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Engineer with written certification that the material/product contains no asbestos. This certificate is mandatory before approval will be issued. Submittals furnished without the asbestos-free certification will be returned to the Contractor with no action taken until such certification is provided.

1.05 SUBSTITUTION OF EQUIPMENT

A. All proposed substitutions for specified products on this project (except as listed above) require approval in advance of bidding. Approval will not be granted after award of contract. See Substitution Request Form in the bidding documents at the beginning of these specifications for the appropriate approval form. If no form is found, submit by mail, or hand-carried on contractor's or supplier's letterhead. **DO NOT FAX.** Substitutions must be submitted for review five (5) working days prior to the bid date to be considered.

B. It is incumbent on the Contractor to submit technical data that will fully establish the equality of the proposed substitute equipment with that listed and evidence to substantiate the availability of the required repair and maintenance service. Each request for substitution shall be accompanied by the following information for each piece of equipment:

1. Statement indicating that this substituted equipment will not increase the contract cost nor extend the completion date.

2. Manufacturer's name and model number.

3. Catalog cuts, diagrams and other data published by the manufacturer with the particular model identified and the pertinent design data for that model highlighted or underlined for easy reference.

4. Each request for substitution shall also include the following information relating to service maintenance and repair:

   a. Name, address and telephone number of nearest factory authorized technical representative.

   b. Name, address and telephone number of firm(s) qualified to perform preventive maintenance, minor or major repairs in the locale of the project.

c. Name, address and telephone number of firm(s) from whom spare parts and major components are available.

d. Building name and address, and the name, address and telephone number of its owner's representative where equipment of the same manufacturer as that requested for substitution has been installed and in operation for two or more years. Two or more such installations shall be listed and the location should be in the vicinity of the proposed project.

C. In the event of Engineer's approval of a substitution of equipment, the requesting entity will be notified by telephonic message or FAX by the Engineer (or authorized representative), and/or by the issuance of an amendment to the contract documents incorporating the equipment by name and model number.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with the NEC (NFPA-70), Latest Edition.

1.07 DEFINITIONS

A. FURNISH: The term furnish means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation and similar operations.

B. INSTALL: The term install describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.

C. PROVIDE: The term provides means to furnish and install, complete and ready for intended use.

1.08 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1. In addition to the requirements specified in Division 1, indicate installed conditions for:

1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.

2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.

3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.09 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1. In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.

3. Maintenance procedures for routine preventative maintenance and trouble-shooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

4. Servicing instructions and lubrication charts and schedules.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

1.11 GUARANTEES AND WARRANTIES

A. Submit to the Owner, two copies of all warranties and guarantees specified in the General Conditions, Supplementary Conditions, the individual sections of the specifications, or as provided by the various subcontractors and material suppliers. All such documents shall show the name and location of the project and the name of the purchaser.

B. The Contractor shall provide to the Owner a non-prorated guarantee of all materials and workmanship for a period of not less than one year from the date of the Owner's final certificate.

C. The Contractor shall be responsible for enforcing all special or extended guarantees required in individual sections of the specifications that might be provided by various subcontractors or material suppliers.

D. Acceptance of the work under this Division shall be subject to the conditions that all installed systems, equipment, apparatus, and appliances included in the work shall operate and perform as designed, including code clearances, and as selected with respect to efficiency, capacity and quietness and shall operate and perform without producing objectionable noise within occupied areas of the building.

E. Acceptance of the work shall also be subject to the conditions that any time within one year after date of final payment, any defective part of the work resulting from the supply of faulty workmanship or material shall be immediately amended, repaired or replaced as a part of the contract work without cost to the Owner.

F. This guarantee shall be extended to include the capacity and integrated performance of the component parts of the various systems in strict accordance with the true intent and purpose of the specification. The contractor shall conduct such tests as herein before specified or as may be required by the Engineer to demonstrate the capacity and performance ability of the various systems to maintain specified conditions.

G. Exclusions: lamps furnished by the Contractor shall be guaranteed for their rated life, not to exceed one year from the date of final acceptance. Lamps failing to meet the rated life shall be replaced by the Contractor. Replacement lamps shall be furnished to the Owner and installation of the replacement lamps shall be by the Owner.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.02 ELECTRICAL INSTALLATIONS

A. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components.

2. Verify all dimensions by field measurements.

3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.

4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.

6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.

7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.

9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

11. Install access panel or doors where units are concealed behind finished surfaces.

12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

13. Prior to energizing, verify that all equipment is suitable for the voltage being applied.

3.03 CUTTING AND PATCHING

A. Perform cutting and patching in accordance with Division 1. In addition to the requirements specified in Division 1, the following requirements apply:

1. Perform cutting, fitting, and patching of electrical equipment and materials required to:

   a. Uncover work to provide for installation of ill-timed work.

   b. Remove and replace defective work.

   c. Remove and replace work not conforming to requirements of the Contract Documents.

   d. Remove samples of installed work as specified for testing.

   e. Upon written instructions from the Engineer, uncover and restore work to provide for Engineer observation of concealed work.

2. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

3. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

4. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

END OF SECTION 16010

DIVISION 16 - ELECTRICAL

SECTION 16110 - RACEWAYS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.
G. Section 16010 – "Basic Electrical Requirements".

1.02 WORK INCLUDES

A. Provide raceways for all conductors, including, but not limited to, that required for service, feeders, branch circuit power, and lighting.

B. Provide power raceways to connecting point for all equipment. Make final electrical connections unless noted otherwise.

C. Provide identification of all raceways.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 16010 - "BASIC ELECTRICAL REQUIREMENTS."

1.04 QUALITY ASSURANCE

A. Provide all new materials, without blemish or defect, in accord with standards specified and UL listed or labeled.

1.05 SYSTEM DESCRIPTION

A. Raceways Include:

1. Rigid Metal conduit and fittings.

2. Intermediate metal conduit and fittings.

3. Flexible metallic conduit and fittings.

4. Liquidtight flexible conduit and fittings.

5. Electrical metallic tubing and fittings.

6. Rigid non metallic conduit and fittings.

7. Liquidtight flexible metallic tubing and fittings.

8. Surface metallic raceway system.

9. Power/Communications poles.

1.06 REFERENCES

A. Specified references, or cited portions thereof, current at date of bidding documents unless otherwise specified, govern the work.

B. American National Standards Institute (ANSI):

1. C80.1 - Rigid Steel Conduit, Zinc coated.

2. C80.3 - Electrical Metallic Tubing, Zinc coated.

3. C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing.

C. American National Standards Institute/National Electrical Manufacturers Association (ANSI/NEMA): FB 1 - Fittings and Supports for Conduit.

D. American National Standards Institute/National Electrical Manufacturers Association (ANSI/NEMA): ANSI C1/NFPA 70 - National Electrical Code, Latest Edition.

E. Federal Specifications (FS):

1. FS-WW-C-563 - Electrical Metallic Tubing (EMT).

2. FS-WW-C-566 - Flexible Metal Conduit.

3. FS-WW-C-581 - Galvanized Rigid Conduit (GRS).

F. National Electrical Manufacturers Association (NEMA):

1. NEMA TC-3 - PVC Fittings for use with Rigid PVC Conduit and Tubing.

G. Manufacturers' Catalogs: Specified manufacturers' catalogs are incorporated by reference to same force and effect as if repeated herein in full.

1.07 DELIVERY, STORAGE AND HANDLING

A. Materials shall be suitably packaged by manufacturers to prevent damage during shipment. Damaged materials will not be acceptable for use.

B. Store materials on site in clean, dry storage area or, if outside, elevated above grade and covered.

PART 2 - PRODUCTS

2.01 RACEWAYS

A. Conduit:

1. Steel Rigid Metal: Comply with ANSI C80.1, FS-WW-C-581 and UL-6.

2. Intermediate Metal: Comply with ANSI C80.1, FS-WW-C-581 and UL-6.

3. Steel Flexible Metal: Comply with FS-WW-C-566 and UL-1.

4. Steel Liquidtight Flexible: Comply with FS-WW-C-566 and UL-1.

5. Rigid Nonmetallic: Comply with NEMA TC-2, PVC, Schedule 40.

B. Tubing:

1. Steel Electrical Metallic (EMT): Comply with ANSI C80.3, FS-WW-C-563 and UL 797.

C. Surface metallic raceway:

1. Comply with UL E4376 and E41751.

2. Branch circuit wiring - one or two piece raceway as required by wire quantity Color ivory.

3. Combination power and /or low potential services - .050" thickness, two-piece raceway 1¾" H x 4¾" W. provide divider, fitting, and all device mounting hardware.

D. Power/Communications Pole shall be two compartment 2¼" X 2¼" steel, .036" thickness. Adjustable base with entrance end fitting and ceiling trim. Color shall be ivory.

2.02 FITTINGS

A. Rigid and IMC Conduit fittings and conduit bodies:

1. Comply with ANSI C80.4, ANSI/NEMA FB 1, threaded type.

2. Locknuts; steel or malleable iron.

3. Bushings; insulating or insulated throat type.

4. Couplings; threaded or gland compression malleable iron type. Set screw or indenter type not acceptable.

5. UL listed hazardous location fittings (with sealing compound).

B. Electrical Metallic Tubing fittings and conduit bodies:

1. Couplings and Connectors; steel compression type or zinc die cast set screw type. Comply with ANSI/ NEMA FB 1.

C. Flexible conduit fittings and conduit bodies:

1. Connectors; malleable iron, threadless, squeeze clamp type for nonjacketed conduit.

2. Connectors; steel or malleable iron compression type with insulated throat and “O” ring assembly for liquidtight conduit.

3. Comply with ANSI/NEMA FB 1.

D. Nonmetallic conduit fittings and conduit bodies:

1. Comply with NEMA TC 3.

2.03 CONDUIT SEALING

A. Fire Seal: Seal penetrations of fire-rated walls, floors or ceilings by raceways for compliance with NEC 300-21. Fill void around raceway. Use heavy wall steel pipe sleeves, anchored to building construction and finished plumb with wall, ceiling or floor lines.

B. Thermal Seal:

1. Seal penetrations of thermally insulated equipment (such as walk-in coolers or freezers) or rooms to prevent heat transfer. Exterior of raceway with fiberglass. Interior of raceway at entry to equipment or room with explosion-proof seal fittings filled with U.L. listed sealing compounds.

C. Water Seal:

1. Seal penetrations of perimeter walls or floors below grade to prevent entry of water. Use materials compatible with wall or floor construction and reviewed by Engineer’s Representative. Use pre-manufactured fittings.

2. Seal penetrations of roof with flashings compatible with roof design and reviewed by Roofing System Manufacturer and Engineer’s Representative.

D. Hazardous Location Seal: Reference Drawing GE1.0.

1. Install conduit sealing fitting on conduits entering the hazardous location. Fill fittings with sealing compound.

2. Install conduit sealing fittings on conduits entering devices within the hazardous location.

2.04 RACEWAY SUPPORTING DEVICES

A. Suspended conduits less than 1 inch.

1. For exposed construction, provide strap type hangers supported from beam clamps or threaded rods.

2. For conduits suspended above ceilings, anchor to building structural steel. When span exceeds NEC limits, provide channel steel between framing members. Tie wiring of conduit to air ducts, or other piping not permitted. Plumber's perforated strap not permitted.

B. Suspended Conduit 1" or larger.

1. Provide threaded rod with "U" type hangers for single conduit.

2. Provide trapeze hanger assemblies with Unistrut P-1000, Husky HP-200 or Kindorf B-901 and threaded rod for two or more conduits. Anchor conduits to hanger assembly with split pipe clamps.

3. Anchor threaded rod to inserts in concrete or beam clamp on steel structure.

C. Surface Mounted Conduit:

1. Provide one-hole galvanized steel straps for conduits one inch or less manufactured by Appleton, Steel City or RACO. Provide clampbacks on exterior walls below grade or in wet areas.

2. For conduit larger than one inch and all exterior surfaces, use malleable iron pipe straps.

3. For multiple conduits, provide channel anchored to wall with conduit attached to channel with split pipe clamps.

D. Surface Metallic Raceways

1. Provide two-hole straps matching raceway.

E. Anchoring:

1. Hollow Masonry: Toggle bolts or spider type expansion anchors.

2. Solid Masonry: Lead expansion anchors or preset anchors.

3. Concrete: Self-drilling anchor or powder driven studs.

4. Metal: Machine screws, bolts or welded studs.

5. Wood: Wood screws.

2.05 ACCEPTABLE MANUFACTURERS

A. Raceways

1. Allied Tube and Conduit.
2. Anaconda.
3. B-line.
4. Carlon.
5. Certain-Teed Corp.
6. Electri-Flex.
7. ETP.
8. International Metal Hose.
9. Jones & Laughlin Steel.
10. Republic Steel.
11. Robintech.
12. Steelduct Conduit Products.
13. Square D.
14. Triangle.
15. Walker.
16. Wheatland Tube.
17. Wiremold.
18. Youngstown Steel.

B. Fittings

1. Carlon
2. Crouse-Hinds.
3. Killark.
4. O.Z./Gedney.
5. RACO.
6. Steel City.

C. Conduit Sealing

1. Chase Technology-CTC, PR-855.
2. Dow Corning - Silicone RTV foam 3-6548.
3. Nelson - Flameseal.

4. T & B - Flamesafe.
5. 3M - Fire Barrier.

D. Conduit Supporting Devices

1. Crouse-Hinds.
2. Midwest Electric.
3. Minerallac.
4. T & B.

PART 3 - EXECUTION

3.01 INTERFERENCES

A. Coordinate work with other trades so that interference between piping, equipment, structural and electrical work will be avoided.

B. When interference develops, Engineer's Representative will decide which equipment will be relocated; regardless of which apparatus was installed first.

3.02 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A. In general, conduit shall be concealed within walls, ceilings, and floors. Conduit in spaces such as electrical/mechanical equipment rooms may be exposed.

B. Size conduit for conductor type installed; ½" minimum size unless noted otherwise.

C. Arrange conduit to maintain headroom and present a neat appearance.

D. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.

E. Maintain minimum 6" clearance between conduit and uninsulated piping. Maintain 12" clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

F. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

G. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25% additional conduit.

H. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

I. **DO NOT SUPPORT ANY CONDUITS, BOXES OR ANY OTHER ELECTRICAL WORK DIRECTLY FROM UNDERSIDE OF ROOF DECK WITHOUT WRITTEN CONSENT OF THE ENGINEER.**

3.03 CONDUIT INSTALLATION

A. All conduits in finished spaces shall be concealed unless otherwise noted.

B. Cut conduit square using a saw or pipe cutter; de-burr cut ends.

C. Bring conduit to the shoulder of fittings and couplings and fasten securely.

D. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.

E. Install no more than the equivalent of four 90° bends between boxes. (Two 90° bends for telephone conduits, data conduits, and sound system conduit).

F. Use conduit bodies to make sharp changes in direction, as around beams.

G. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2" size.

H. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

I. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

J. Provide #12 AWG insulated conductor or nylon pull string in empty conduit, except sleeves and nipples.

K. Provide UL listed expansion-deflection joints where conduit crosses building expansion or seismic joints.

L. Where conduit penetrates fire-rated walls and floors, provide mechanical fire-stop fittings with UL listed fire rating equal to wall or floor rating, or, at contractor’s option, seal opening around conduit in accord with paragraph 2.03.

M. Route conduit through roof openings for piping and ductwork where possible. Provide flashing making waterproof joints where conduits pass through roof or roofing membrane.

N. Maximum Size Conduit in floor slabs: ¾" Do not route conduits to cross each other in slabs. Run larger conduits below floor slabs or above ceilings.

O. Thermally seal conduit where conduits leave heated area and enter unheated area. See 2.03.

P. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

3.04 CONDUIT INSTALLATION SCHEDULE

A. Underground Installations: Rigid steel conduit. Plastic-coated rigid steel conduit. Schedule 40 PVC conduit.

B. Installations In or Under Concrete Slab: Schedule 40 PVC conduit.

C. In Slab above Grade: Schedule 40 PVC conduits.

D. Exposed Outdoor Locations: Rigid steel conduit. Intermediate metal conduit.

E. Interior Locations Above Floor Slabs: Rigid steel conduit. Intermediate metal conduit. Electrical metallic tubing.

F. Where nonmetallic conduits is used in or below slab or underground, continue the conduit runs above slab or grade using IMC or rigid steel conduit.

G. Provide a green insulated equipment grounding conductor in all feeder and branch circuit raceways. Size conductor according to NEC Article 250.

H. Connections to ballasted lighting fixtures: Flexible Metallic Conduit, UL listed Fixture Whip or Type MC Cable. Provide green insulated equipment grounding conductor. Length not to exceed 6'.

I. Connections to food service equipment, equipment in exterior locations or equipment in wet locations: Liquidtight flexible conduit. Provide green insulated equipment grounding conductor. Length not to exceed 4'.

J. Connection to motors, compressors or equipment with motors: Flexible Metallic Conduit. Provide green insulated equipment grounding conductor. Length not to exceed 4'.

K. Hazardous Locations: Intermediate metal conduit. Rigid steel conduit.

L. Interior exposed locations in finished spaces: surface metallic raceway system.

END OF SECTION 16110

DIVISION 16 - ELECTRICAL

SECTION 16120 - WIRES & CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.
G. Section 16010 – “Basic Electrical Requirements”.

1.02 WORK INCLUDES

A. Wiring and cables including, but not limited to, feeders, branch circuit power, lighting and control.

B. Electrical connections to all equipment unless noted otherwise.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 16010 - “BASIC ELECTRICAL REQUIREMENTS.”

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Wire, cable and installation thereof shall be in accord with the National Electrical Code, Latest Edition.

2. All materials shall be new, without blemish or defect, in accord with standards specified and UL listed or labeled.

3. Test power and signal wire and cable according to Section 16950 - “TESTING”.

1.05 REFERENCES

A. Specified references, or cited portions thereof, current at date of bidding documents unless otherwise specified, govern the work.

B. National Electrical Manufacturers Association (NEMA):

1. WC 3 - Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

2. WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

3. WC 7 - Cross-Linked-Thermosetting-Polyethylene-Insulated. Wire and Cable for the Transmission and Distribution of Electrical Energy.

C. National Fire Protection Association (NFPA): NFPA 70 - National Electrical Code, Latest Edition.

D. Underwriters' Laboratories, Inc. (UL): Listed and labeled materials.

E. Manufacturers' Catalogs: Specified manufacturers' catalogs are incorporated by reference to same force and effect as if repeated herein in full.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be suitably packaged by manufacturer to prevent damage during shipment. Damaged materials will not be acceptable for use.

B. Store materials on site in clean, dry storage area.

C. Handle all materials carefully to preclude damage. Material with damaged insulation shall not be acceptable for use.

PART 2 - PRODUCTS

2.01 BUILDING WIRE

A. Thermoplastic insulated building wire: NEMA WC 5, UL-83 ICEA S-61-402 or S-66-524.

B. Color code conductor insulation for #8 AWG or smaller. Standard colors:

		120/208V 3 phase	277/480V 3 phase
1.	Phase A	Black	Yellow
2.	Phase B	Red	Brown
3.	Phase C	Blue	Orange
4.	Neutral	White	Gray
5.	Ground	Green	Green

B. Feeders and branch circuits: Copper, stranded conductor, 600 volt insulation THHN/THWN. (Exception: Wire sizes #10 AWG and smaller shall be solid.).

C. Exterior fuel dispensing system conductors shall have THWN2 insulation.

D. Control circuits: Copper, solid or stranded conductor, 600 volt insulation, THHN/THWN.

E. Provide 1" wide taped, colored bands at panelboards, cabinets, and boxes for sizes larger than #8 AWG. Identify both phase and circuit numbers at these locations.

2.02 JOINTS & SPLICES

A. Make terminations, taps and splices with an indent type pressure connector with insulating cover for #8 AWG and smaller.

B. Instead of indent type connectors, insulated spring compression connectors may be used for #10 AWG and smaller.

C. Use mechanical compression or bolted type connector for #6 AWG or larger. Cover connector with insulating tape or heat shrinkable insulation equivalent to 150% conductor insulation.

2.03 ACCEPTABLE MANUFACTURERS

A. Building Wire

1. Anaconda Wire & Cable Co.
2. Crescent.
3. General Cable Corp.
4. General Electric Co.
5. Okonite.
6. Phelps Dodge Cable & Wire Co.
7. Pirelli.
8. Sigma Corra-Clad (MC Cable).
9. Triangle.

B. Joints and Splices - Indent Type Pressure Connector for #8 AWG and Smaller

1. Buchanan.
2. Burndy.
3. Ideal.
4. Thomas & Betts.

C. Joints and Splices - Insulated Spring Compression Connectors for #10 AWG and Smaller

1. Buchanan, Bcap.
2. Ideal, Wing nut.
3. ITT Holub, Free Spring.
4. T & B, Piggy.
5. 3M, Scotchlok.

D. Joints and Splices - Mechanical Compression or Bolted Type Connector for #6 AWG or Larger

1. AMP, Inc.
2. Anderson.
3. Blackburn.
4. Burndy Corp.
5. General Electric Co.
6. Ideal Industries.
7. ITT Weaver.
8. O.Z./Gedney Co.
9. T & B.
10. 3M Co.

PART 3 - EXECUTION

3.01 BASIC WIRING

A. All wiring with a circuit voltage in excess of 24 volts, all exposed wiring, and all fire alarm system wiring shall be installed in a raceway.

B. Use no wire smaller than #12 AWG for power and lighting circuits (unless scheduled otherwise on construction documents), and no smaller than #14 AWG for control wiring for fused control circuits.

C. Multi-wire branch circuits will only be permitted for general use receptacle circuits and individual branch circuits. All other circuits shall have individual neutrals (where a neutral is required).

D. Splice only in accessible junction or outlet boxes. Do <u>not</u> splice in panelboard cabinets and gutters.

E. Neatly train and lace wiring inside boxes, equipment and panelboards.

F. Make conductor lengths for parallel circuits equal.

3.02 WIRING IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling #4 AWG and larger wires.

B. Install wire in raceway after interior of building has been physically protected from weather, all plumbing, heating and ventilating work likely to injure conductors completed, conduit system is complete and interior of raceway cleaned.

3.03 OPEN WIRING

A. Open wiring shall be routed in a neat and orderly manner. Wiring shall be routed parallel or perpendicular to structural lines and be supported at intervals necessary to avoid sagging or strain.

B. Where a cable tray system is not specified, wiring shall be supported by the use of individual cable support “rings”, “hooks” or other methods approved by the Contracting Officer.

3.04 CONNECTIONS AND TERMINATIONS

A. Identify each conductor in panelboards, junction or pull boxes, or troughs with a permanent pressure sensitive label with suitable numbers or letters for easy recognition. Identify control wiring at each end and in junction boxes with numeric wire number corresponding to control wiring diagram. See Section 16195 - “ELECTRICAL IDENTIFICATION”, for identification requirements.

B. Thoroughly clean wire before installing lugs and connectors.

C. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

D. Terminate spare conductors with electrical tape and roll up in box.

3.05 FIELD QUALITY CONTROL

A. Inspect wiring for physical damage and proper connection.

A. Torque test conductor terminations to manufacturer’s recommended values.

B. Perform continuity test on all power and branch circuit conductors. Verify proper phasing.

END OF SECTION 16120

DIVISION 16 - ELECTRICAL

SECTION 16130 - BOXES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.
G. Section 16010 – "Basic Electrical Requirements".

1.02 WORK INCLUDES

A. Provide all boxes for the work.

B. Provide coordination of boxes requiring access with General work.

C. General Construction Trades provide access panels for boxes hidden by building construction.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 16010 - "BASIC ELECTRICAL REQUIREMENTS."

1.04 QUALITY ASSURANCE

A. Regulatory Requirements

1. Comply with NFPA. National Electrical Code, Latest Edition.

2. Provide materials listed/labeled by UL.

1.05 SYSTEM DESCRIPTION

A. Boxes include:

1. Wall and ceiling outlet boxes.

2. Floor Boxes.

3. Pull and junction boxes.

1.06 REFERENCES

A. Specified references, or cited portions thereof, current at date of bidding documents unless otherwise specified, govern the work.

B. American National Standards Institute/National Electrical Manufacturers Association (ANSI/NEMA OS-1-Sheet Steel Outlet Boxes, Device Boxes, Covers and Box Supports).

C. National Electrical Manufacturers Association (NEMA): NEMA 250 - Enclosures for Electrical Equipment.

D. National Fire Protection Association (NFPA): NFPA 70 - National Electrical Code, Latest Edition.

E. Manufacturers' Catalogs: Specified manufacturers' catalogs are incorporated by reference to same force and effect as if repeated herein in full.

1.07 DELIVERY, STORAGE AND HANDLING

A. Materials shall be suitably packaged by manufacturer to prevent damage during shipment. Damaged materials not acceptable for use.

B. Store materials on site in clean, dry storage area.

C. Handle all materials carefully to preclude damage.

PART 2 - PRODUCTS

2.01 BOXES

A. Pull Boxes and Junction Boxes:

1. Comply with NEC - 370, UL 50 and ANSI/NEMA OS 1; galvanized steel.

2. Flush mounted boxes: Overlapping cover with flush head retaining screws, prime-coated.

3. Surface mounted boxes: Screw-on or hinged cover. Provide silicon bronze standard retaining screws.

4. Boxes in finished areas: Constructed of 14 gauge steel minimum, galvanized or prime coated.

5. Boxes greater than 144 square inches: Shall be constructed of 1½" x 1½" x ¼" galvanized angle covered with 10 gauge galvanized sheet steel riveted or bolted with hinged cover of 11 gauge galvanized steel.

6. Boxes larger than 12" in any dimension: hinged enclosure.

7. Exterior Below Grade: Non-metallic, sand-gravel polymer base fiberglass reinforced.

8. Boxes used in the fuel dispensing system shall be approved for such use.

B. Outlet Boxes:

1. Hot dipped galvanized, 1.25 oz. per sq. ft., sherardized or cadmium plated. Conform to UL 514.

2. Interior boxes: Sheet steel with conduit knockouts, attached lugs for locating. ANSI/NEMA OS 1.

3. Exterior boxes or exposed interior in wet/damp locations: Cast aluminum, deep type, corrosion proof fasteners, watertight, gasketed, threaded hubs.

4. For suspended or surface mounted fixtures:

a. 4" octagonal or square according to devices used. Minimum 1½" deep. Furnished with fixture studs. Installed with ¾" minimum depth plaster rings on suspended ceilings. 4" octagonal or square for all exposed conduit work with fixture extension pan or deep fixture canopy to enclose the box.

b. Fixtures listed for thru-way wiring may be used as such without an outlet box.

5. For recessed fixtures:

a. 4" octagonal or square. Minimum 1½" deep. Complete with blank cover.

b. Fixtures listed for thru-way wiring may be used as such without an outlet box.

6. Switch and Receptacle Boxes:

a. Wall: 4" square for up to two devices. Single gang with 18 cubic inch minimum capacity for one device. Solid gang boxes for two devices. Complete with 1" minimum depth tile ring where used in exposed tile, paneled walls. Complete with 1" minimum depth plaster ring where used in plastered walls. Install with ½" raised galvanized device covers where used for exposed conduit work. Provide concrete-tight masonry boxes in poured concrete or CMU walls.

C. Conduit Bodies:

1. Galvanized cast metal of type, shape and size to fit location.

2. Constructed with threaded conduit ends, removable cover, corrosion resistant screws.

D. Floor Boxes

1. Single Service Floor Boxes.

a. Deep, cast iron with leveling legs meeting U.L. 714 and Fed. Spec. W-C-583b.

b. Rectangular, multi-gang compartmental type, semi-adjustable, cast iron, deep.

c. Brass flanges and covers.

1) 1½" x 1½" duplex threaded cover for duplex power receptacles.

2) 2_" x ¾" combination threaded cover for telephone outlets and other signal outlets. Provide 2_" threaded brass split nozzle for cable protection.

2. Multi-service Floor Boxes:

a. Floor boxes shall be multiple services and shall be activated with services recessed.

b. Floor box unit shall be constructed of a cast-iron base, a steel cover-plate, and steel wiring compartment cover to allow wiring feed-thru from one compartment to another.

1) Cast-iron base shall be .188" min.

2) Cover- plate shall be galvanized steel (14 ga.).

3) Steel receptacle brackets shall be .062" min.

c. Box construction shall be as required by UL 514A.

d. Entire cover-plate shall be removable for unrestricted access to all connector locknuts inside base.

e. Unit shall contain 4 wiring compartments (enclosed and/or non-enclosed).

f. Total box volume shall be 215 cu. in. and shall be broken down as follows:

1) 2 compartments - 27 cu. in. each.

2) 2 compartments - 36 cu. in. each.

g. Size and quantity of threaded conduit openings shall be as follows:

1) 2 - 27 cu. in. compartments - one ¾".

2) 2 - 36 cu. in. compartments - two 1¼" and one ¾".

h. Hand access area shall be no less than 38 sq. in.

i. Unit shall provide for minimum of 1_" pre-pour adjustment and ¾" post-pour adjustment.

j. Floor box unit shall be capable of being activated in either the flush or recessed mode.

k. Recessed activations shall provide no less than 2 wire/cable egress points. These shall include wire management blocks to adequately control wire/cables.

l. Activation units shall be as selected by the Engineer.

2.02 ACCEPTABLE MANUFACTURERS

A. Appleton Electric Co.
B. Crouse-Hinds Co.
C. General Electric Co.
D. Hoffman Co.
E. Hubbell.
F. Killark Electric Mfg. Co.
G. O.Z./Gedney Co.
H. Pyle-National
I. RACO
J. Square D.
K. Steel City
L. Thomas & Betts Co.
M. Walker.
N. Quazite.

PART 3 - EXECUTION

3.01 COORDINATION

A. Provide boxes as shown and for splices, taps, wire pulling, equipment connections and code compliance.

B. Locations shown are approximate unless dimensioned. Verify location of boxes and outlets prior to rough-in.

C. Locate boxes to allow access. When inaccessible, provide access doors.

D. Locate boxes to maintain headroom and present a neat appearance.

3.02 INSTALLATION

A. Provide knockout closures to cap unused knockout holes where blanks have been removed.

B. Support all boxes independently of conduit except for cast boxes connected to two rigid conduits both supported within 12" of box.

C. Floor Boxes:

1. Confirm exact placement with related work before installing. Set level and flush with finish floor. Securely anchor box to avoid movement during concrete pour.

2. Securely anchor to floor box.

D. Outlet Boxes:

1. Flush mount outlet boxes in areas other than mechanical rooms, electrical rooms, and above removable ceilings.

2. Do not install boxes back-to-back in same wall. Provide at least 6" separation where possible.

3. Masonry Walls:

a. Adjust position of outlets in finished masonry walls to suit masonry course lines.

b. Coordinate cutting of walls to achieve neat openings for boxes.

c. Locate boxes in walls so that only corner need be cut from masonry units.

d. Use only concrete tight masonry boxes in all masonry walls.

4. Use multiple gang boxes where more than one device is mounted together. Do not use sectional boxes. Provide barriers to separate different voltage systems.

5. For boxes mounted in exterior walls, make sure insulation is behind outlet boxes. Do not damage insulation.

6. For outlets mounted above counters, benches, or backsplashes, coordinate location and mounting heights with units. Where boxes are mounted on sidewalls at counters and lavatories, hold boxes to front of counter or lavatory for handicapped accessibility.

7. Adjust outlet mounting height to agree with specified location for equipment served.

8. Position outlets to locate luminaires as shown on reflected ceiling drawings.

9. Position outlets and junction boxes in inaccessible ceilings areas within 6" of luminaire; accessible through luminaire ceiling opening.

10. Provide recessed boxes in finished areas; secure to interior wall and partition studs, allow for surface finish thickness. Use stamped steel stud hangers in hollow stud wall, and adjustable steel channel fasteners for flush ceiling boxes.

11. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

12. Provide cast boxes for exterior locations and wet locations.

E. Pull and Junction Boxes:

1. Locate above accessible ceilings or in unfinished areas.

2. Support independent of conduit.

F. Provide covers for all boxes.

END OF SECTION 16130

DIVISION 16 - ELECTRICAL

SECTION 16150 - WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.
G. Section 16010 – “Basic Electrical Requirements”.
H. Section 16120 – “Wires and Cables”.
I. Section 16130 – “Boxes”.

1.02 WORK INCLUDES

A. Provide:

1. Switches.

2. Receptacles.

3. Device plates.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 16010 - “BASIC ELECTRICAL REQUIREMENTS.”

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: All materials: U.L. listed or labeled.

1.05 REFERENCES

A. Specified references, or cited portions thereof, current at date of bidding documents unless otherwise specified, govern the work.

B. National Electrical Manufacturers Association (NEMA):

1. WD-1 - General Purpose Wiring Devices.

2. WD-5 - Specific Purpose Wiring Devices.

C. National Fire Protection Association (NFPA): NFPA 70 - National Electrical Code (NEC), Latest Edition.

D. Underwriters' Laboratories, Inc. (UL): All materials UL listed and labeled.

E. Federal Specification WC596F (Receptacles) and WS896E (Switches).

F. Manufacturers' Catalogs: Specified manufacturers' catalogs are incorporated by reference to same force and effect as if repeated herein in full.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be suitably packaged by manufacturer to prevent damage during shipment. Damaged materials will not be acceptable for use.

B. Store materials on site in clean, dry storage area.

C. Handle all materials carefully to preclude damage during installation.

PART 2 - PRODUCTS

2.01 WALL SWITCHES

A. Heavy duty, 20a, 120-277 v., quiet type, back and side wired, toggle handle. Color - Ivory. Hubbell #CS1201 series or equal.

B. Dimmer Switches: Equal to Lutron Nova Series.

1. Provide incandescent dimmers rated for load controlled.

2. Provide fluorescent dimmers rated to control the load shown on drawings. Dimmers shall be compatible with the dimming ballasts furnished.

3. Provide multi-gang cover plates where dimmers are ganged.

2.02 RECEPTACLES

A. Duplex:

1. Flush, straight blade, 3 wire grounding, specification grade, 20 ampere, 125 v. NEMA 5-20R, designed for split feed.

2. Hubbell #CR5362, or equal.

3. Color: Ivory (Gray for "Designated Receptacle").

B. Ground Fault Circuit Interrupter:

1. Specification grade feed through type capable of protecting downstream receptacles on same circuit, grounding type, UL class A-Group 1, 20 amp 125 v.

2. Solid State ground fault sensing and signaling, 5 ma. trip level.

3. Color: Ivory.

4. Hubbell GF5362 or equal.

C. Special purpose devices shall be of amperage rating and configuration for equipment served.

D. Isolated ground:

1. Single or duplex, 3-wire, heavy duty specification grade, 20 amp.

2. Color: orange.

3. Hubbell IG5362 or equal.

E. Telephone:

1. Hubbell CX14I for single, or equal.

2. Hubbell CX244I for duplex, or equal.

2.03 DEVICE PLATES

A. Materials:

1. Finished Spaces: .04" thick, type 302, satin finished stainless steel.

2. Weatherproof; Cast metal, gasketed. Provide spring-loaded gasketed door for receptacles.

3. Surface Devices in Unfinished Areas: Galvanized steel.

B. Use plates manufactured by device manufacturer.

C. Provide factory engraving on device plates in food service areas and for momentary contact switches controlling contactors.

2.01 ACCEPTABLE MANUFACTURERS

A. Hubbell.
B. Leviton.
C. Pass & Seymour.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install wall switches with OFF position down.

B. Install convenience receptacles with grounding pole on top when mounted vertically or with grounding pole on left when mounted horizontally.

C. Install plates on all switch, and receptacle outlets. Install blank plates on all unused boxes.

D. Install devices and plates flush and level.

E. Seal all connections on GFCI with seal coat compound and wrap with two layers tape.

END OF SECTION 16150

DIVISION 16 - ELECTRICAL

SECTION 16195 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.
G. Section 16010 – “Basic Electrical Requirements”.

1.02 WORK INCLUDES

A. Provide identification of manual and automatic operable equipment:

1. Safety Switches.
2. Starters.
3. Contactors, relays and time switches.
4. Panelboards & Switchboards.
5. Control panels, relay panels, and special junction boxes.
6. Manual starters and interval timers.

B. Provide identification of all passive equipment:

1. Terminal Cabinets.

C. Provide identification of conduit system including boxes.

D. Provide identification of wiring system.

1.03 QUALITY ASSURANCE

A. Comply with:

1. ANSI A 13.1., Identification of Piping Systems.
2. National Electric Code (NEC), Latest Edition.

3. Local Rules & Regulations.

1.04 REFERENCES

A. Specified references, or cited portions thereof, current at date of bidding documents unless otherwise specified, govern the work.

B. American National Standards Institute (ANSI): ANSI A13.1 - Identification of Piping Systems.

C. National Fire Protection Association (NFPA): NFPA 70 - National Electrical Code (NEC), Latest Edition.

D. Underwriters' Laboratories, Inc. (UL): All products UL listed and labeled.

E. Manufacturers' Catalogs: Specification manufacturers' catalogs are incorporated by reference to same force and effect as if repeated herein in full.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Section 16010 - "BASIC ELECTRICAL REQUIREMENTS." Provide schedule of proposed identification plate wording for Engineer review.

PART 2 - PRODUCTS

2.01 EQUIPMENT IDENTIFICATION PLATES

A. Provide plates for all equipment consisting of machine engraved laminated plastic. Plate field shall be black with white core.

1. Size of plate shall be commensurate with lettering thereon.

2. Lettering for major items of equipment, such as a disconnect or panelboard, shall be ½" in height. Lettering for smaller items, such as light or timer switches shall be ¼" in height.

3. Wording on plate shall contain the following information as appropriate and approved by the Engineer.

a. Equipment served, such as AHU-1.

b. Voltage.

c. Originating or controlled circuit number, such as AL 1, 3, & 5.

d. Maximum fuse size (if applicable).

2.02 CONDUIT SYSTEM IDENTIFICATION

A. Identify all fire alarm system components, except those concealed in walls.

1. Conduit: 2" wide red tape or paint strip 50' on center.

2. Boxes: Paint cover red with stenciled words “FIRE ALARM”.

2.03 WIRING SYSTEM IDENTIFICATION

A. Wire Insulation Color: See Section 16120 - “WIRES AND CABLES”.

B. Code all wire and cable larger than color coded sizes available from manufacturer by application of electrical plastic tape in colors specified. Apply tape in uniform manner circling wire or cable. Apply tape in all boxes and cabinets. Half-lap tape for length of cable as required by Local Authorities or NEC. Tape shall be 3M, Plymouth or Permacel.

C. Maintain consistent coding throughout installation to ensure proper phase identification.

D. Control wiring may use numbered or lettered marker tape. Record wiring so marked on project record documents. Marker tape shall be 3M Scotch Code, Panduit Insta-Code, T & B E-Z Coder, Stranco Tuff-Code, Bradypack or Electrovert.

2.04 MISCELLANEOUS IDENTIFICATION

A. Complete all panel directories completely typewritten. Each circuit shall be identified by location and type of load. Example: Lighting - Office.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Affix Equipment Identification Plates to equipment with stainless steel self tapping screws. Do not use adhesive.

END OF SECTION 16195

DIVISION 16 – ELECTRICAL

SECTION 16400 - ELECTRICAL EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.
G. Section 16010 – “Basic Electrical Requirements”.

1.02 WORK INCLUDES

A. Provide:

1. Panelboards.

2. Safety Switches.

3. Contactors.

4. Transient Voltage Surge Suppressors (TVSS).

5. Fuses.

1.03 SUBMITTALS

A. Submit shop drawings, product data, and installation drawings in accordance with Section 16010 - “BASIC ELECTRICAL REQUIREMENTS”.

B. See Division 1 Complete for requirements for record of “as-built” drawings and specifications for all components.

C. Panelboard submittals shall include overall dimensions, wiring gutter dimensions, location of the main, branches, and neutral.

1.04 QUALITY ASSURANCE

A. Regulatory requirements:

1. Panelboards:

a. UL Standard 67.

b. NEMA Standards PBI-1977.

c. Fed. Spec. W-P-115A Type 1, Class 1.

2. Safety Switches:

a. UL Std. 98.

b. NEMA Std. KS1-1975.

3. Contactors:

a. UL Std. 508.

b. NEMA Std. 1CSZ-Z11B.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in time to maintain approved construction schedule.

B. Store in safe, dry location. Protect from dust, moisture, weather and extreme temperatures.

C. Follow manufacturer's recommendation for transportation, handling and storage.

PART 2 - PRODUCTS

2.01 PANELBOARDS - LIGHTING AND APPLIANCE

A. Circuit breaker panelboards shall meet Federal Spec W-P-115A for Type 1 panels. Panelboard bussing may be tinned-aluminum. Circuit breakers shall be quick-make, quick-break, thermal-magnetic, trip indicating, and have common trip on all multi-pole circuit breakers. Trip indication shall be shown by the breaker handle taking a neutral position between ON and OFF when the breaker is tripped. The ampacity of the circuit breaker shall be stamped in a location visible without removing the front of the panelboard. The minimum circuit breaker interrupting capacity shall be as indicated on plans. Circuit breakers shall be plug on type. All circuit breakers on lighting panels shall be UL labeled "SWD" and "HACR". All circuit breakers serving HID loads shall be so rated. Panelboards shall be equal to the style/type shown on schedules.

B. All terminals shall be UL listed as suitable for the type of conductor specified.

C. Main lugs shall be bolt type.

D. Panelboard bus assemblies shall be enclosed in galvanized or rust-resisting steel cabinets. Fronts shall include doors and cylinder tumbler type locks with catches and spring loaded door pulls. All doors shall be keyed alike. Door hinges shall be concealed when panel doors are closed. Fronts shall not be removable with doors locked. A circuit directory frame and card with clear plastic cover shall be locked on the inside of the front. Door and front shall be of code gauge steel with rust inhibiting primer and gray baked enamel finish.

E. Panelboards shall be provided with the total branch mounting space shown in the schedule.

F. Panelboards shall have solid neutral and equipment grounding bus. Panels designated for electronic equipment (Cpx) shall have 200% neutral bus.

2.02 PANELBOARDS - POWER DISTRIBUTION CIRCUIT BREAKER (INTERIOR)

A. Shall be rated 600 volts AC or 250 volts DC maximum. Continuous main current ratings as indicated on associated schedules, not to exceed 1200 amperes maximum. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.

B. Provide UL Listed Short Circuit Current Ratings (SCCR) as indicated on the associated schedules, not to exceed the lowest interrupting capacity rating of any circuit breaker installed with a maximum of 200,000 RMS symmetrical amperes. Main lug and main breaker panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and G.

C. The bussing shall be fully rated with sequentially phased branch distribution. Panelboard bussing rated 100 - 600 amperes shall be plated aluminum. Bussing rated 800 amperes and above shall be plated copper.

D. Interior trim shall be of dead-front construction to shield user from all energized parts. Main breakers up to 800 amperes shall be vertically mounted. Main breaker and main lug interiors shall be field convertible for top or bottom incoming feed.

E. Equipment ground bar shall be bonded. Ground bar shall be aluminum. Solid neutral shall be equipped with a full capacity grounding strap for service entrance applications. Gutter mounted neutral will not be acceptable.

F. Metal nameplates shall contain system information, catalog number or factory order number. Nameplate shall be secured to the dead-front with rivets or screws. Sticker or foil nameplates are not permitted. Interior wiring diagram, neutral wiring diagram, UL listed label and Short Circuit Current Rating shall be displayed on the interior. Leveling provisions shall be provided for flush mounted applications.

G. The branch mounting space shown in the panelboard schedules provides provisions for future breakers. Provide provisions equal to the space allowed for the specified panelboards.

2.03 SAFETY SWITCHES

A. All safety switches shall be the fusible type, horsepower rated, NEMA type, general duty unless otherwise noted on drawings.

B. Enclosures shall be code gauge steel with rust inhibiting primer and gray baked enamel finish. Install safety switches with NEMA 1 enclosures in dry locations and NEMA 3R enclosures in wet locations.

C. Switches shall have quick-make, quick-break operating handle and mechanism which shall be an integral part of the enclosure. Switches shall be lockable in both positions and shall have an interlock to prevent opening switch door with handle in the OFF position. This feature shall have a defeater mechanism.

D. Switch blades shall be visible in OFF position with door open. Switches shall be dead front type with arc suppressors. Lugs shall be UL listed for copper or aluminum. All current carrying parts shall be plated.

E. Switches shall have a solid neutral unless otherwise noted.

F. Switches shall have factory installed kits to prevent the use of other than UL class R fuses.

2.04 LIGHTING CONTACTORS

A. Contactors shall be electrically held and shall switch the load at the voltage required and shall have the quantity of poles required.

B. The contactor shall be continuously rated per pole for all types of ballast and tungsten lighting and resistance loads, and shall not be de-rated for use on high-inrush loads.

C. The contactor shall have double-break, silver-cadmium-oxide power contacts. Auxiliary arcing contacts are not acceptable. All power contacts shall be convertible from N.O. to N.C. or vice-versa. All contacts shall have clearly visible N.O. and N.C. contact-status indicators.

D. The contactor shall be industrial-duty rated for applications to 600 volts maximum.

E. The contactor shall have NEMA type enclosure as required by installation.

2.05 TRANSIENT VOLTAGE SURGE SUPPRESSORS (TVSS)

A. Refer to the drawings for tvss units.

2.06 FUSES

A. Circuits 601 to 6000 amperes shall be protected by current limiting time-delay fuses. Fuses shall hold 500% of rated current for a minimum of 4 seconds, clear 20 times rated current in .01 seconds or less and be listed by Underwriters' Laboratories, Inc., with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class L.

B. Circuits 0 to 600 amperes shall be protected by current limiting dual-element fuses. All dual-element fuses shall have separate overload and short-circuit elements. Fuse shall incorporate a spring activated thermal overload element having a 284°F. melting point alloy and shall be independent of the short-circuit clearing chamber. The fuse shall hold 500% of rated current for a minimum of 10 seconds (30A, 250V Class RK1 case size shall be a minimum of 8 seconds at 500% of rated current) and be listed by Underwriters' Laboratories, Inc., with an interrupting rating of 200,000 amperes RMS symmetrical.

C. Motor circuits - All individual motor circuits with full load ampere ratings (FLA) of 480 amperes or less shall be protected by dual-element fuses. The fuses shall be UL Class RK1, or J, dual-element time-delay.

D. The ampere rating of fuses shall be as required by the load served. Field verify by inspecting the nameplate of the equipment being protected.

2.07 ACCEPTABLE MANUFACTURERS

A. Electrical Equipment

1. Eaton/Cutler-Hammer.
2. GE.
3. Siemens.
4. Square D.

B. Transient Voltage Surge Suppressors (TVSS)

1. Eaton/Cutler-Hammer.
2. LEA-Dynatech.
3. Leviton.
4. Liebert.
5. United Power.

C. Fuses

1. Bussman.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Prior to energization, confirm that equipment is suitable for voltage to be applied.

B. Comply with equipment manufacturer's written installation instructions for all equipment.

C. Install equipment with minimum of 3'-6" working clearance measured from front of enclosure.

D. Set equipment true and plumb using a carpenter's level.

E. Support panels adequately in the same manner as described for outlet boxes for different types of construction.

F. Wiring within equipment cabinets shall be done in a neat and workmanlike manner with branch circuit conductors run along the outside edges of the wiring gutters and then horizontally into the terminals.

G. For flush mounted panelboards, stub a minimum of three empty ¾" diameter conduits into the ceiling cavity space for future use.

H. Install safety switches which serve as equipment disconnecting means so that equipment maintenance can be performed within sight of the disconnect, if possible.

I. When safety switches are mounted directly to equipment in wet locations, the installation shall be watertight. Install sealing locknuts with rubber O-rings for equipment with knockouts.

J. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std. 486A.

K. Adjust operating mechanisms for free mechanical movement.

L. Touch-up scratched or marred surfaces to match original finishes.

M. Prior to energization of circuitry, check all accessible connections to manufacturer's tightening torque specifications.

N. Prior to energization of equipment, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.

O. Prior to energization, check equipment for electrical continuity to circuits, and for short-circuits.

P. Subsequent to wire and cable hook-ups, energize equipment and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

Q. Provide engraved plastic nameplates for each switch in main panel, for each panelboard and for each safety switch. Indicate type of load and maximum fuse size. Provide schedule of nameplates with submittals.

R. Fuses shall not be installed until equipment is ready to be energized.

END OF SECTION 16400

MASTER

DIVISION 16 – ELECTRICAL

SECTION 16426 - SWITCHBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.
G. Section 16010 – "Basic Electrical Requirements".
H. Section 16195 - "Electrical Identification".

1.02 WORK INCLUDES

A. Main Switchboard - Furnish and install the Service Entrance switchboard as herein specified and shown on the associated electrical drawings.

B. Distribution Switchboard - Furnish and install the Distribution Switchboard as herein specified and shown on the associated electrical drawings.

1.03 SUBMITTALS

A. Comply with Section 16010 "BASIC ELECTRICAL REQUIREMENTS".

B. Shop drawings shall indicate front and side enclosure elevations with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of horizontal bus bars per phase, neutral, and ground; one-line diagrams; equipment schedule; and switchboard instrument details.

1.04 QUALITY ASSURANCE

A. ANSI/NFPA 70 - National Electrical Code (NEC), Latest Edition.

B. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

C. NEMA PB 2 - Dead-front Distribution Switchboards.

D. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Dead-front Switchboards Rated 600 Volts or Less.

E. NEMA PB 2.2 - Application Guide for Ground Fault Protective Devices for Equipment.

F. UL 50 - Cabinets and Boxes

G. UL 489 - Molded Case Circuit Breakers

H. UL 891 - Dead-Front Switchboards

PART 2 - PRODUCTS

2.01 GENERAL

A. Short Circuit Current Rating:
   1. _____42,000_____RMS symmetrical amperes at _____ volts AC maximum.

B. Future Provisions: All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.

C. Enclosure: Type 1 - General Purpose.

   1. Align sections at front and rear.

   2. Switchboard Height: 91½" including 1½" floor sills and excluding lifting members and pull boxes.

   3. The switchboard shall be of dead-front construction.

   4. The switchboard frame shall be of formed UL gauge steel rigidly bolted together to support all cover plates, bussing and component devices during shipment and installation.

   5. Steel base channels shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.

   6. Each switchboard section shall have an open bottom and an individually removable top plate for installation and termination of conduit.

   7. The switchboard enclosure shall be painted on all exterior surfaces. The paint finish shall be a medium light gray, ANSI #49, applied by the electro-deposition process over an iron phosphate pre-treatment.

   8. All front covers shall be screw removable with a single tool and all doors shall be hinged with removable hinge pins.

   9. Top and bottom conduit areas shall be clearly indicated on shop drawings.

D. Nameplates:

1. Provide 1"h X 4"w engraved laminated (Gravoply) nameplates for each device. Furnish black letters on a white background for 208Y/120V services; red letters on a white background for 480Y/277V services; and orange letters on a white background for 600 v. services.

E. Bus Composition: Plated Aluminum.

1. Plating shall be applied continuously to all bus work. The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements. The phase and neutral through-bus shall have an ampacity as shown in the plans. For 4-wire systems, the neutral shall be of equivalent ampacity as the phase bus bar. Full provisions for the addition of future sections shall be provided. Bussing shall include all necessary hardware to accommodate splicing for future additions.

F. Bus Connections:

1. Shall be bolted with Grade 5 bolts and conical spring washers. Welded connections are not acceptable.

G. Ground Bus:

1. Sized per NFPA 70 and UL 891 Tables 25.1 and 25.2 and shall extend the entire length of the switchboard. Provisions for the addition of future sections shall be provided.

H. Accessibility:
1. Accessible from the front only of the switchboard.

2.02 INCOMING MAIN DEVICE - MAIN CIRCUIT BREAKER

A. Electronic trip molded case standard function 80% rated circuit breaker.

B. Shall be fixed, individually mounted.

C. Power terminals shall accommodate either cable or bolted bus connections as drawings indicate.

D. Shall be equipped with internal ground fault protection.

2.03 DISTRIBUTION - BRANCH CIRCUIT BREAKERS

A. Thermal magnetic molded case circuit breaker.

1. Branch circuit breaker shall be group mounted on a common pan or rail assembly.

2. Circuit breaker shall be mounted in the switchboard to permit installation, maintenance and testing without reaching over line side bussing.

2.04 MCCB ELECTRONIC TRIP 80% RATED

A. Electronic Trip Molded Case Circuit Breakers (Standard Function).

1. Circuit protective devices shall be of the molded case circuit breaker type. Frame/Sensor ampere ratings shall be as shown on the drawings.

2. All circuit breakers shall be constructed in accordance with the following standards:

a. UL 489.

b. NEMA AB1.

c. Federal Specification W-C 375B/GEN.

d. CSA 22.2, No. 5-M1986.

B. Electronic Trip System.

1. The entire trip system shall be a microprocessor-based, peak sensing design. MICRO-LOGIC standard function as manufactured by Square D or approved equivalent is acceptable.

2. Provide local visual trip indicators for overload, short circuit and ground fault trip functions.

3. Provide magnetic/thermal backup for all electronic trip circuit breakers.

C. Equipment Ground Fault Protection.

1. The main circuit breaker shall be provided with integral equipment protection for grounded systems. The circuit breaker shall be suitable for use on three phase, three wire circuits where the neutral is grounded but not carried through the switchboard, or on three phase, four wire systems.

D. Terminations.

1. All lugs shall be UL Listed to accept solid and/or stranded copper and aluminum conductors. Lugs shall be suitable for 90°C rated wire, sized according to the

75°C temperature rating in the NEC. Lug body shall be bolted in place; snap-in designs are not acceptable.

2. All circuit breakers shall be UL Listed to accept field installable/removable mechanical type lugs.

3. All circuit breakers shall be suitable for bus connection.

2.05 ACCEPTABLE MANUFACTURERS

A. Eaton.
B. GE.
C. Siemens.
D. Square D.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine area to receive switchboard to provide adequate clearance for switchboard installation.

B. Check that concrete pads are level and free of irregularities.

C. Start work only after unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install switchboard in accordance with manufacturer's written instructions, and NEC.

3.03 FIELD QUALITY CONTROL

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

B. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's recommended torque values.

C. Test ground fault systems by operating push-to-test button.

3.04 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement per manufacturer's specifications.

B. Tighten bolted bus connections in accordance with manufacturer's instructions.

C. Adjust circuit breaker trip and time delay settings to values as instructed by the Architect/Engineer.

3.05 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION 16426

DIVISION 16 - ELECTRICAL

SECTION 16450 - GROUNDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.
G. Section 16010 – “Basic Electrical Requirements”.
H. Section 16110 - “Raceways”.
I. Section 16120 - “Wires and Cables”.
J. Section 16950 - “Testing”.

1.02 WORK INCLUDES

A. Provide system grounding for service to this addition.

B. Provide equipment grounding.

1.03 SUBMITTALS

A. Test data. Comply with Division 16 Section 16010 - “SUBMITTALS”.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with National Electrical Code, Latest Edition.

2. Comply with Public Authorities having jurisdiction.

1.05 SYSTEM DESCRIPTION

A. Ground electrical service neutral at service entrance equipment to the electrode system.

B. Ground raceways and electrical equipment.

C. Bond together system neutrals, service entrance enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors and plumbing systems.

1.06 REFERENCES

A. Specified references, or cited portions thereof, current at date of bidding documents unless otherwise specified, govern the work.

B. National Fire Protection Association (NFPA): NFPA 70 National Electrical Code (NEC), Latest Edition.

C. Underwriters' Laboratories, Inc. (UL): All products UL listed and labeled.

D. Manufacturers' Catalogs: Specification manufacturers' catalogs are incorporated by reference to same force and effect as if repeated herein in full.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reference 16120 "Wires and Cables".

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide a system ground and equipment grounding provisions as shown on plans and as specified in this section. Comply with NEC Article 250.

B. Equipment grounding provisions shall consist of the following:

1. Exposed, noncurrent-carrying metal parts of fixed equipment likely to become energized, including the following, shall be grounded (bonded):

   a. Electrical distribution and control equipment enclosures, frames, cabinets, and cutout boxes.

   b. Metal raceways and boxes.

   c. Wiring devices.

   d. Motor frames and enclosures.

2. Cord and plug connected equipment, except for double insulated appliances and other exceptions allowed by the National Electrical Code, shall be grounded.

C. Equipment grounding conductors shall comply with the following requirements:

1. An equipment grounding conductor shall be installed in all branch circuit and feed raceways.

2. Ground wires shall be run inside the same raceways as the circuit conductors and shall have green insulation of the same type as the circuit conductors. Ground wires shall be bonded to all boxes and equipment enclosures through which they pass and at each end of metal raceways by means of grounding bushings.

3.02 FIELD QUALITY CONTROL

A. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 10 ohms. When resistance exceeds 10 ohms drive and bond an additional ground rod, one rod length away. Ground resistance test shall be made a minimum of 48 hours after rainfall.

END OF SECTION 16450

DIVISION 16 - ELECTRICAL

SECTION 16480 - MOTOR CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.
G. Section 16010 – “Basic Electrical Requirements”.
H. Section 16110 - “Raceways”.
I. Section 16120 - “Wires and Cables”.
J. Section 16195 - “Electrical Identification”.
K. Section 16400 - “Electrical Equipment”.
L. Section 16950 - “Testing”.

1.02 WORK INCLUDES

A. Provide starters specified and shown on electrical drawings.

1.03 SUBMITTALS

A. Product data in accord with Division 1, and Division 16 Section 16010 “SUBMITTALS”.

1. Provide catalog cut sheets showing voltage, controller size, ratings and size of switching and over-current protection devices, short circuit ratings, dimensions, and enclosure details.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements

1. Power & Control Wiring in accord with N.E.C.

2. NEMA ICS-2, NEMA KS1.

PART 2 - PRODUCTS

2.01 MOTOR CONTROLLERS

A. Manual Motor Controller

1. NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller with overload element, red pilot light, auxiliary contact, where noted, and push button operator.

B. Fractional Horsepower Manual Motor Controller

1. NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and toggle operator.

C. Motor Starting Switches

1. NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, without thermal overload unit, with red pilot light where shown, and toggle operator.

D. Magnetic Motor Controllers - Non-reversing

1. NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower with 120 volt encapsulate coil, poles and size as scheduled or as indicated.

2. Contacts: Totally enclosed, double-break, silver-cadmium-oxide power contacts. Contact inspection and replacement shall be possible without disturbing line or load wiring.

3. Wiring: Straight-through wiring with all terminals clearly marked.

4. Overload Relay: NEMA ICS; with one-piece thermal unit construction. Thermal units shall be interchangeable. Overload relay control circuit contact shall be replaceable. Thermal units shall be required for starter to operate.

5. Auxiliary contacts, pilot devices and other options as scheduled or as indicated.

6. All controller enclosures shall be as scheduled or indicated.

E. Disconnect Switch Type Combination Magnetic Motor Controllers - Non-reversing

1. Combine magnetic motor controllers with fusible switch disconnect in common enclosure. Switch shall have a color coded externally operated handle. Operating handle shall give positive visual indication of ON-OFF with red and black color coding.

a. Fusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate Class R fuses and visible blades. Operating handle shall give positive visual indication of ON-OFF with a color coded operating handle.

2. NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower with 120 volt encapsulate coil, poles and size as scheduled or as indicated.

3. Contacts: Totally enclosed, double-break, silver-cadmium-oxide power contacts. Contact inspection and replacement shall be possible without disturbing line or load wiring.

4. Wiring: Straight-through wiring with all terminals clearly marked.

5. Overload Relay: NEMA ICS; with one-piece thermal unit construction. Thermal units shall be interchangeable. Overload relay control circuit contact shall be replaceable. Thermal units shall be required for starter to operate.

6. Auxiliary contacts, pilot devices and other options as scheduled or as indicated.

7. All controller enclosures shall be as scheduled or indicated.

2.02 ACCEPTABLE MANUFACTURERS

A. Eaton.
B. General Electric.
C. Siemens.
D. Square D.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.

B. Install enclosed controllers plumb with 5' AFF to operating handle.

C. Install fuses in fusible switches under provisions of fuses section.

D. Select and install overload heater elements in motor controllers to match installed motor characteristics.

E. Provide engraved plastic nameplates under the provisions of Section 16195 - "ELECTRICAL IDENTIFICATION".

F. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

END OF SECTION 16480

DIVISION 16 - ELECTRICAL

SECTION 16500 - LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.
G. Section 16010 – "Basic Electrical Requirements".

1.02 WORK INCLUDES

A. Provide lighting fixtures.

B. Provide lamps.

C. Provide required fixture supports.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 16010 - "BASIC ELECTRICAL REQUIREMENTS."

1.04 QUALITY ASSURANCE

A. Regulatory requirements.

1. NEMA Std. Pub. Nos. SH5 and TT1 for pole construction, materials, and hardware.

2. Building lighting fixtures:

a. Applicable sections of NEC, Latest Edition.

b. ANSI 132.1

c. UL 57, 676, 1570, 1571, and 1572.

d. Fluorescent ballasts shall be CBM labeled.

e. NEMA Std. Pub. Nos. FA1. LE1 and LE2.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver equipment in time to maintain approved construction schedule.

B. Store in safe, dry location. Protect from dust, moisture, weather and extreme temperatures.

C. Follow manufacturer's recommendation for transportation, handling and storage.

PART 2 - PRODUCTS

2.01 FIXTURES

A. Specified on plans.

2.02 BALLASTS

A. All ballasts shall be rated for the circuit voltage shown on plans.

B. All fluorescent ballasts shall be electronic.

C. Ballasts for exterior lighting fixtures shall be suitable for use at temperatures -20°F. and above.

D. Unless otherwise noted, fluorescent ballasts shall be solid state electronic type for use with T8 (Octron or equal) fluorescent lamps. Electronic ballasts shall have a total harmonic distortion of 10% or less.

2.03 LAMPS

A. Provide lamps for all light fixtures as scheduled on drawings.

2.04 ACCEPTABLE MANUFACTURERS

A. Electronic ballasts

1. Advance.
2. Lutron.
3. Motorola.
4. Triad.
5. Valmont.

B. Lamps

1. General Electric.
2. Sylvania.
3. Venture

PART 3 - EXECUTION

3.01 LIGHTING FIXTURES

A. Provide all plaster frames, angles, channel, hangers and supports required to support lighting fixtures. Fixtures shall be supported independently of ceiling.

B. Exit signs in suspended ceiling areas shall be located in the center of the ceiling tile and oriented so as to provide maximum visibility to escape paths.

C. Remove all dirt, paint, and foreign matter from fixture lenses and frames between substantial completion and final acceptance of the building.

END OF SECTION 16500

DIVISION 16 – ELECTRICAL

SECTION 16721 - FIRE ALARM/MASS NOTIFICATION SYSTEM

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.
B. General Provisions of the Contract.
C. Solicitation Documents.
D. General Conditions.
E. Supplementary Conditions.
F. Division 1.
G. Section 16010 – "Basic Electrical Requirements"
H. Section 16110 – "Raceways".

1.02 SUBMITTALS :

A. Submit shop drawings in accordance with Section 16010 - "BASIC ELECTRICAL REQUIREMENTS."

1.03 DESCRIPTION:

A. This section of the specification includes the furnishing, installation, connection and testing of a microprocessor controlled intelligent reporting fire alarm system in combination with components for a Mass Notification System required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), autonomous control unit (ACU), Monaco transceiver, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

1.04 SCOPE:

A. Fire Alarm and Mass Notification

1. Design and install the fire/mass notification system in accordance with NFPA 72, 70, 101, and UFC 4-021-01 (dated September 2006), 4-010-01 (dated January 2007), 3-600-01 (dated 26 September 2006), and Unified Facilities Guide Specification 28-31-76 (dated April 2006) for all facilities, except as modified herein.

a. The components of a combination system includes addressable control panel (FACP), autonomous control unit (ACU), local operation consoles (LOC), notification appliance network (strobes and speakers), water flow switches, valve tamper switches, supervisory devices, monitor and control modules, duct detectors, heat detectors, smoke detectors,

combination heat and smoke detectors, Monaco transceiver, and other equipment as required by code or Fort Bragg.

b. Provide a complete addressable microprocessor-based fire alarm and mass notification system.

c. The Signal Line Circuit (SLC) shall be Class A, Style 6 and the performance capabilities under abnormal conditions in accordance with NFPA 72 table 6.6.1.

d. The Notification Appliance Circuit (NAC) shall be Class A, Style Z and the performance capabilities under abnormal conditions in accordance with NFPA 72 table 6.7.

e. The fire alarm panel shall provide the ability to access fire alarm control panel data using the Internet Explorer 5.0+ web browser in conjunction with a Win 98, ME, NT, or 2000 operating system. The ability to send e-mail messages for prioritized event notification and scheduled e-mail of dirty/excessively dirty detector status information. It shall have the ability to e-mail reports and historical logs on demand or to a set schedule.

f. **The fire alarm/mass notification system shall have the ability and means to provide up to 60 zone points to the Monaco transmitter. Programming shall be determined by Fort Bragg Fire Department Fire Prevention Section.**

g. **It is the contractor responsibility to coordinate fire alarm and mass notification system zone points programming with Fort Bragg Fire Department Fire Prevention Section.**

h. All administrative areas shall have both strobes and speakers with a minimum audio level of 70-dba or 15-dba above the normal ambient sound level or 5-dba above the peak sound level; **whichever is greater**; with a CIS equal to or greater than 0.80. All measurements are collected with all doors closed.

i. All components of the fire alarm, mass notification, and force communication shall be located near the facility main entrance. When the fire alarm panel and or panels associated with mass notification are installed in a remote area (electrical room), the system is required to have remote fire panel annunciator and local operator console located near the facility main entrance and other entrances as deemed necessary by post fire department.

j. All fire/mass notification conductors shall be housed in “red” conduit. Junction (pull) boxes and covers shall be “red” in color.

k. Conductors shall go from device to device and appliance to appliance without splices.

l. All panels and associated equipment shall operate on the secondary power source for 72-hours in the non-alarm (supervisory) state and 15-minutes in alarm status.

m. Smoke detectors shall be addressable photoelectric type.

n. Smoke detectors shall be connected to the building fire alarm panel via the SLC loop.

o. Locate smoke detectors a minimum of five feet away from air intake or diffusers.

p. Supervise all panels A/C, battery power, opens, shorts, grounds, and or combination thereof. All troubles conditions shall generate a unique trouble condition to the fire alarm panel and transmit the trouble condition to central receiving station.

B. Mass Notification System Functionality Specifications

1. The Autonomous Control Unit (ACU) is used to monitor and control the notification appliances network. At the ACU personnel in the building can initiate delivery of pre-recorded voice messages, provide live voice messages and instructions, and initiate visual strobe appliances. Actions taken at the ACU take precedence over actions taken at any other location including the LOC.

2. The ACU shall be integrated with the building fire alarm control panel (FACP) to form a combined system that performs both functions. All three functions, mass notification, fire alarm and PA, are provided by one building system. These control panels may be co-located in the same enclosure or may be physically separated.

3. The Local Operating Console (LOC) is a unit designed to allow emergency response forces and building occupants to operate the Individual Building MNS, including initiating delivery of pre-recorded voice messages, providing live voice messages and instructions, initiating visual strobe notification appliances, override external voice announcements, and terminate mass notification functions. LOC shall be contained in a small, wall-mounted enclosure. Not all functions that are performed at the ACU are required at a LOC.

4. A notification appliance network consists of a set of audio speakers and strobes to alert occupants and provide intelligible voice.

5. The following are the functionality specifications concerning the Autonomous Control Unit (ACU).

a. Non-emergency use, local microphone:

1). The ACU shall be able to function independently.

2). Use for general paging or other non-emergency messages without the activation of strobes.

3). Interrupt public address system announcements and to silence building background music while delivering voice messages.

4). Switch between Mass Notification System (MNS) and fire alarm notification functions without generation of trouble alarms in either systems.

5). Microphone for delivering live voice messages.

b. Emergency Use:

1). Able to activate strobes during a fire alarm or mass notification system event. When live voice microphones is used for emergency messages, strobe activation maybe achieve by mechanical means (switch).

2). Capacity for eight pre-recorded messages. At the present time, only seven pre-recorded messages are required.

3). Deliver messages quickly.

4). Automatically repeat pre-recorded messages until terminated.

5). Microphone for delivering live voice messages.

6). Adequate discrete outputs to initiate strobes.

7). Provide a method to activate the MNS pre-recorded messages on-site. Provide signage to allow rapid recognition of means of initiation of the pre-recorded messages.

8). Interfaces to Local Operating Console (LOC) for initiating recorded messages and delivering live voice messages from locations in the building other than at the ACU.

9). The MNS to temporarily override fire alarm audible messages and provide intelligible voice commands during simultaneous fire and terrorist events. All other features of the fire alarm system, including the transmission of signals to the fire department shall function properly. MNS messages shall take priority and continue to override fire alarm audible messages for the sooner of ten-minutes or until the MNS messages is manually ended.

10). Provide a supervisory signal when MNS override fire alarm audible messages during simultaneous fire and terrorist events. The supervisory signal shall be annunciated at the FACP and any remote fire alarm annunciator, and be transmitted to the fire department. This supervisory signal is separate from other fire alarm system supervisory signals.

11). Provide a supervisory signal when MNS functions have been temporarily disabled during simultaneous fire and terrorist events. The supervisory signal shall be annunciated at the FACP and any remote fire alarm annunciator LOC and be transmitted to the fire department. The visual annunciation of the separate supervisory signal shall be distinctly labeled or otherwise clearly identified.

12). Provide a signal switch or operating mechanism capable of shutdown all heating, ventilating, air conditioning (HVAC) equipment in the facility.

13). Have the means to interface with the installation Wide Area MNS (Giant Voice).

14). The latest Fort Bragg Mass Notification Requirements shall apply.

C. Mass Notification Messages

1. Provide pre-programmed messages as required by Fort Bragg.

D. Transmitter/Receiver

1. Provide transmitter/receivers compatible with Fort Bragg’s fire alarms and MNN Systems.

2. The fire alarm/mass notification system shall have the ability and means to provide up to 60 zone points to the transmitter. Programming shall be determined by Fort Bragg Fire Department Fire Prevention Section.

5. **It is the contractor responsibility to coordinate fire alarm and mass notification system zone points programming with Fort Bragg Fire Department Fire Prevention Section.**

6. The transceiver(s) shall operate for a minimum of 72-hours plus 15-minutes or on secondary (battery) power source.

1.05 REFERENCES:

A. Includes, however; not limited to:

1. NFPA 1, 2006, Uniform Fire Code

2. NFPA 10, 2007, Standard for Portable Fire Extinguishers

3. NFPA 13, 2007, Standard for the Installation of Sprinklers Systems

4. NFPA 14, 2007, Standard for the Installation of Standpipe and Hose Systems

5. NFPA 17A, 2002, Standard for Wet Chemical Extinguisher System

6. NFPA 20, 2007, Standard for the Installation of Stationary Pumps for Fire Protection

7. NFPA 24, 2007, Standard for the Installation of Private Fire Service Mains and Their Appurtenances

8. NFPA 25, 2002, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

9. NFPA 70, 2005, National Electrical Code

10. NFPA 72, 2007, National Fire Alarm Code

11. NFPA 80, 2007, Standard for Fire Doors and Fire Windows

12. NFPA 90A/B, 2006, Standard for the Installation of Air-Conditioning, Warm Air Heating, and Ventilating Systems

13. NFPA 96, 2004, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

14. NFPA 101, 2006, Life Safety Code

15. NFPA 170, 2006, Standard for Fire Safety and Emergency Symbols

16. NFPA 2001, 2004, Standard on Clean Agent Fire Extinguishing Systems

17. NFPA 5000, 2006, Building Construction and Safety Code

18. UFC 3-600-01, 26 September 2006, Design: Fire Protection Engineering for Facilities

19. UFC 4-010-01, 8 October 2003, DoD Minimum Antiterrorism Standards for Buildings

20. UFC 4-021-01, 20 September 2006 (draft), Design and O & M: Mass Notification Systems

21. International Building Code, 2003

22. Uniform mechanical Code, 2003

23. UFGS 28-31-76 (13859), April 2006, Unified Facilities Guide Specifications

24. Manufacturer's Recommendations and Specifications

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Gamewell.
B. Simplex.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D. Manual pull stations shall be suitable for surface mounting or semi flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

END OF SECTION 16721

DIVISION 16 - ELECTRICAL

SECTION 16724 - SECURITY SYSTEM
INTRUSION DETECTION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. Provide a complete conduit system including all outlet, junction and pull boxes required for the Base provided security system. Provide a pull wire in all conduits. Coordinate all work with the Base.

1.03 RELATED WORK

A. Division 1 Section - “SUBMITTALS”.

B. Section 16110 - “RACEWAYS”.

C. Section 16130 - “BOXES”.

D. Section 16195 - “ELECTRICAL IDENTIFICATION”.

1.04 SYSTEM DESCRIPTION-Base provided

END OF SECTION 16724

DIVISION 16 - ELECTRICAL

SECTION 16740 - TELEPHONE SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The following shall apply to this Section:

1. Drawings.
2. General Provisions of the Contract.
3. Solicitation Documents.
4. General Conditions.
5. Supplementary Conditions.
6. Division 1.

1.02 WORK INCLUDES

A. This Section generally describes the work and equipment required to furnish and install a complete pre-wired commercial telephone conduit and cable system with power requirements, boxes, pull tapes, cables, outlets, and connecting blocks, in accordance with these specifications. In addition the contractor shall provide a service cable for the Post telephone system.

1.03 RELATED WORK

A. Section 16110 - “RACEWAYS”.

B. Section 16130 - “BOXES”.

C. Section 16150 - “WIRING DEVICES”.

1.04 SUBMITTALS

A. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for each type of product specified.

1.05 QUALITY ASSURANCE

A. Codes and Standards

1. NFPA-70-NEC, Latest Edition.

2. Facility (Post/Base) Communications Agency.

3. AFM-88-15, Chapter 17.

4. REA PE-39, service cable.

5. EIA/TIA for Category 5 cable.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All outlet boxes telephone terminal board, conduits, pull tapes, coverplates, telephone cables and grounding shall be in accordance with these specifications and the applicable sections of this Division 16 and other Divisions of the work.

B. Telephone station cable shall be single jacketed, plenum fire rated, 24 AWG solid copper insulated conductors, 4 pair, color coded unshielded. Must comply with TIA/EIA standards for category 5 cable.

C. Outlets and coverplates shall be modular RJ11 type.

D. Underground cable shall meet or exceed the requirements of REA Specifications covering underground cables. Cables shall be AWG 22 gauge, solid copper color coded, polyethylene jacketed, filled cable.

E. Building entrance terminal shall be of a type designed to provide electrical protection on exposed cables through the use of plug in type protector modules. These protected type terminals shall be of a type listed under the Underwriters' Laboratories (UL) for indoor installation in general purpose building space. The terminal shall be metal enclosed with pre-wired components and equipped with plug in units with maximum protection for high voltage. The terminals shall be equipped with PVC insulated and fire retardant cable stubs. All protected terminals shall be grounded to the nearest acceptable ground.

F. Provide individual telephone station cable from the TTB terminal blocks to each telephone outlet.

G. Provide outlet boxes with coverplates at all locations shown on the Drawings.

H. Provide a terminal block on the TTB for specific installation.

I. All splicing materials used shall be "Amphenol" as required by the Engineer. Filled type splice cases shall be used on all filled core to filled core cable splices. The splices shall be encapsulated using the re-enterable encapsulating compound provided by the manufacturer of the splice enclosure being used. Electrical Contractor shall ensure that all splices are clear and visually inspectable.

PART 3 - EXECUTION

3.01 GROUNDING

A. All exposed non-current carrying metallic parts of telephone equipment, cable sheaths, cable splices and terminals shall be grounded.

B. Inside type protected terminals shall be grounded using a #6 AWG insulated solid copper wire.

The protector and/or protected terminal ground, building power ground and interior metallic water system must be bonded together.

The shields of all exposed entrance cables and all riser cables must be bonded together at the main entrance terminal.

3.02 INSTALLATION

A. Furnish and install all conduit, outlet boxes, outlets (devices), cabinets, cables, ply-wood required for the installation and operation of a complete commercial telephone system.

B. Coordinate all work with the local phone company.

C. Contact the local phone company to coordinate the exact telephone service entrance location and requirements prior to running conduits and cable.

3.03 OUTSIDE PLANT CABLES

A. Cables shall be installed, terminated, and spliced as required. The electrical contractor shall complete all splices, furnish all splicing material and associated hardware, tag all cables and stencil all terminals and connecting blocks installed. The electrical contractor shall terminate all cables installed. All equipment power wiring and grounding shall conform to the National Electrical Code. Inside terminals shall be grounded. Prior to commencement of construction, the electrical contractor shall coordinate with the Engineer on all communications interfacing requirements.

B. Cables shall be handled and placed in such a manner as to avoid kinks and other sheath deformities. Minimum bending radius of all cables shall be 10 times the diameter of the cable. Cable kinked or flattened shall not be used. The cable shields at all cable terminations shall be bonded together with bonding harnesses to assure shields continuity is maintained. Maintain minimum 36" spacing between telephone and high voltage cables.

END OF SECTION 16740

DIVISION 16 - ELECTRICAL

SECTION 16950 - TESTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings.

B. General Provisions of the Contract.

C. Solicitation Documents.

D. General Conditions.

E. Supplementary Conditions.

F. Division 1.

G. Section 16010 – “Basic Electrical Requirements”.

1.02 WORK INCLUDES

A. Provide testing of electrical components and systems:

1. Insulation resistance test.
2. Grounding electrode test.
3. Continuity test.
4. Voltage test.
5. Phase relationship verification.
6. Fire alarm /Mass Notification system acceptance test

B. Provide test reports.

C. Provide correction of defective components or systems.

D. Provide retest of corrected components, systems.

1.03 SUBMITTALS

A. Submit test reports in accordance with Section 16010 - “BASIC ELECTRICAL REQUIREMENTS.”

1. Type each test report on 8½" x 11" paper. Include:

a. Project Number.

b. Project title and location.

c. Test performed.

d. Date performed.

e. Test equipment used.

f. Contractor’s name, address and telephone number.

g. Testing firm’s name, address and telephone number if other than Contractor.

h. Name(s) and title(s) of person(s):

1) Performing test.

2) Observing test.

i. Statement verifying each test.

j. Nameplate data from each equipment item tested.

k. Test results.

l. Retest results after correction of defective components, systems.

2. For each copy, assemble all test reports and bind them in a folder. Label each folder, “Electrical Test Reports”.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Furnish all equipment, manpower and casual labor to perform specified testing.

PART 3 - EXECUTION

3.01 PREPARATION

A. When temporary electrical service is used for testing, do not energize any equipment or portion of permanent system that exceeds capacity of temporary service.

B. Ensure that all electrical work is complete and ready for testing.

C. Disconnect all devices or equipment that might be damaged by application of test voltages, voltage of reversed phase sequence or other test procedures.

3.02 TESTING

A. Conduct tests and adjust equipment to verify compliance with specified performance.

3.03 INSULATION RESISTANCE TESTS

A. Resistance measured; line-to-ground.

B. Perform testing on the following items:

	Item Tested	Voltage of Test	Min. Acceptance Resistance in Megohms
1.	No. 2 & larger cables (600 v.)	1000 v.	50
2.	Panelboard Buses	1000 v.	25

3.04 GROUNDING ELECTRODE TEST

A. Measure and record ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Maximum acceptable resistance: 10 ohms. When resistance exceeds 10 ohms drive and bond another ground rod, one ground rod length away and repeat test.

3.05 CONTINUITY TESTS

A. Test branch circuits and control circuits to determine continuity of wiring and connections.

3.06 VOLTAGE TESTS

A. Make and record voltage tests and recorded at the following listed points. Conduct tests under normal load conditions.

1. Service entrance at main switchboard.

3.07 PHASE RELATIONSHIP

A. Examine connections to equipment for proper phase relationships. Verify proper motor rotation.

3.08 FIRE ALARM ACCEPTANCE TEST

A. Have the fire alarm acceptance test performed by the Alarm Company Representative and installing Contractor in the presence of the local fire chief's representative.

B. In addition to the following tests the contractor shall perform and record all test of the fire alarm system and mass notification system required by Ft. Bragg.

C. Acceptance Test Procedures:

	PANEL	EXPECTED INDICATION ON PREMISES & REMOTE STATION
1.	Normal Power to Panel	(Normal)
2.	Disconnect Power to Panel	(Trouble)
3.	Activate Detection Device	(Alarm)
4.	Silence Alarm Signaling Devices	(Trouble)
5.	Return Normal Power to Panel & Reset Panel	(Normal)
6.	Place Each Function Switch in an Abnormal	(Trouble)
7.	Remove supervised Devices from System (During this portion of testing, ensure proper wire has been used and devices are properly installed.	
8.	Return Supervised Device to System.	(Normal)
9.	Disconnect Normal Power to Panel.	(Trouble)
10.	Activate Detector(s) for each Zone.	(Alarm)
11.	Inspect all Horns Zone Indication, and Auxiliary	(Working List)
12.	Silence Horns.	(Alarm/Trouble)
13.	Reset System.	(Trouble)
14.	Return Normal Power to System	(Normal)
15.	Place Panel in Alarm Condition. Disconnect Primary Power Source for a Minimum of 15 Seconds and Return to Normal Power. (The above transfer procedure shall not cause a loss of an alarm condition at Receiving Station.)	

3.09 CORRECTION OF DEFECTS

A. When tests disclose any unsatisfactory workmanship or equipment furnished under this Contract, correct defects and retest. Repeat tests until satisfactory results are obtained.

B. When any wiring or equipment is damaged by tests, repair or replace such wiring or equipment. Test repaired items to ensure satisfactory operation.

END OF SECTION 16950

APPENDIX A

GEOTECHNICAL ENGINEERING REPORT

Information To Build On

Engineering • Consulting • Testing

GEOTECHNICAL ENGINEERING SERVICES REPORT

PROPOSED 82ND AIRBORNE SHOPPETTE
Fort Bragg
Fayetteville, North Carolina

PSI Project No.: 0511176

Prepared For:

Morris & Associates Engineers, Inc.
9520 Telge Road
Houston, TX 77095
Phone (281) 855-6433

Prepared By:

David McKee, PE
Principal Consultant

NORTH CAROLINA PROFESSIONAL SEAL 35881 ENGINEER GUY H. RABENS

9/3/2010

G
uy H. Rabens, M.S., P.E.
Department Manager
Geotechnical Services
NC License No. 35881

PROFESSIONAL SERVICES INDUSTRIES, INC.
5021 West W.T. Harris Boulevard
Charlotte, North Carolina 28269

September 3, 2010

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"ter.Try Build On
Engineering • Consulting • Testing

Email: John(morrisassoc.com

September 3, 2010

Mr. John Linton, AIA, LEED AP
Morris & Associates Engineers, Inc.
9520 Telge Road
Houston, TX 77095

Subject: Report of Geotechnical Engineering Services
AAFES 82nd Airborne Shoppette
Fort Bragg
Fayetteville, North Carolina
PSI Project No: 0511176

Dear Mr. Linton:

Professional Service Industries, Inc. (PSI) has completed the subsurface exploration and engineering evaluation for the proposed 82nd Airborne Shoppette expansion at Fort Bragg located in Fayetteville, North Carolina. The objective of this study was to acquire information about the general subsurface conditions, provide recommendations regarding site preparation and foundation design, and provide information to assist you during project planning.

This report contains a brief description of the project information provided to us, a brief discussion of the general subsurface conditions revealed during our geotechnical exploration, the laboratory test results, and our recommendations for the proposed construction.

Conditions observed on site during construction may vary from those encountered at discrete test locations during the field exploration. To account for this variability, professional observation, monitoring, and testing of actual subsurface conditions encountered during construction should be provided as an extension of our engineering services. Because of our unique position to understand the intent of the geotechnical engineering recommendations provided herein, retaining PSI to perform these services will allow you the opportunity to receive consistent service throughout the project construction. If you will advise us of an appropriate time to discuss these additional engineering services, we will be pleased to meet with you at your convenience.

Thank you for the opportunity to provide to you our professional geotechnical services during this phase of the project. If you need further information, or if we can provide additional service, please feel free to contact the undersigned (Mr. Rabens at 704-598-2234 ext 214) at your convenience. We look forward to working with you during the successful completion of this project.

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, INC.

Guy Rabens, P.E.
Department Manager -
Geotechnical Services

Zachary D. Scarboro, E.I.
Staff Engineer

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Boring Location Plan
Soil Classification Chart
Boring Logs

1.0 GENERAL INFORMATION

1.1 PROJECT AUTHORIZATION

This report presents the results of the geotechnical engineering evaluation performed by PSI for the Proposed 82nd Airborne Shoppette at Fort Bragg, in Fayetteville, North Carolina. Our services were authorized by Mr. William Morris with Morris & Associates Engineers, Inc., on July 27, 2010, and were performed in accordance with PSI Proposal No. 15125, dated July 27, 2010, PSI General Conditions contained therein.

1.2 PROJECT INFORMATION

We understand this project is located on a 6.6 acre parcel on Fort Bragg. The project entails construction of a new "shoppette" with a new gas station canopy where the existing Airborne Mini Mall is located. The existing Airborne Mini Mall structure is a one-story, stucco and wood framed building. We assume the new "shoppette" will be of similar construction.

We were provided with a copy of the proposed site plan prepared by Morris & Associates Engineers, Inc. in an email dated August 6, 2010. We have not been provided with structural loading information at this time. For the purposes of this report, we have assumed that maximum wall loads for the proposed structure will not exceed 2 kips per linear foot and maximum interior column loads will not exceed 100 kips for the structure.

Site grading information was not provided to PSI at the time of this report preparation. However, we have assumed the proposed construction will occur near existing site grades with cut/fills on the order of 1 foot or less.

The information presented in this section was used in the evaluation. Estimated loads and corresponding foundation sizes have a direct affect on the recommendations, including the type of foundation, the allowable bearing pressure, and the estimated settlement. In addition, estimated subgrade elevations and cut/fill quantities can have a direct affect on the provided recommendations. If any of the noted information is incorrect or has changed, please inform PSI so that we may amend the recommendations presented in this report, if appropriate. If PSI is not retained to perform this function, PSI can not be responsible for the impact of the changes on the performance of the project.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to obtain information regarding the general subsurface conditions within the proposed construction area, to assess the engineering characteristics of the subsurface materials, and to provide general design recommendations regarding the geotechnical aspects of the proposed construction.

To accomplish this, PSI performed a site reconnaissance, drilled four soil test borings within the areas of proposed site improvements, conducted laboratory classification testing and prepared this report summarizing the findings, as well as our conclusions and recommendations.

The scope of our services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, groundwater, or air, on or below or around this site. Any statement in this report or on the boring logs regarding odors, colors, unusual or suspicious items, or conditions are strictly for the information of our client.

PSI did not provide nor was it requested to provide any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same. Client acknowledges that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Client further acknowledges that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or recurrence of mold amplification.

2.0 EXPLORATION PROCEDURES

2.1 FIELD SERVICES

As requested, PSI advanced four soil test borings (Borings B-1 through B-4) within the proposed building footprint to termination depths of 20 feet. Representatives of Morris & Associates Engineers, Inc. determined the number, depth and approximate location of the borings. The borings were located in the field by PSI using the provided site plan and measuring from existing site features. The approximate location of each boring is presented on the Boring Location Diagram included in the Appendix of this report.

Soil test borings were advanced at this site utilizing a truck-mounted CME 55 drilling rig using hollow-stemmed, continuous-flight augers. All boring and sampling operations were conducted in general compliance with ASTM D 1586. At regular intervals, soil samples were obtained with a standard 2-inch O.D. split-barrel sampler. The sampler was rested on the bottom of the borehole and driven to a penetration of 18 inches with blows of an automated 140-pound hammer falling 30 inches. The first 6 inches of sampler penetration is considered seating, and the sum of the second and third 6-inch increments of penetration (or fraction thereof) is termed the Standard Penetration Resistance (N-values).

The recovered soil samples were transported to our laboratory where they were visually classified by a Geotechnical Engineer. A "Boring Log" was prepared for each boring and the 'togs" are included in the Appendix of the report. The logs were prepared using the observations made in the field by the driller, as well as the classifications in the laboratory and the laboratory test results. Strata descriptions, presented on the logs, were based on visual-manual evaluations by our engineer and include the classifications in general accordance with the Unified Soil Classification System (USCS). The "Soil Classification Chart", included in the Appendix, illustrates the USCS legend depicted on the logs.

Groundwater level measurements and caved depths were measured in the boreholes at the time of boring and upon completion of daily drilling activities. The results of the readings are included on the soil test boring logs. We did not perform "stabilized" ground water readings (i.e., 24-hour or greater readings) for this study since the borings were backfilled immediately upon completion using the soil cuttings and then asphalt patched, if necessary, for safety considerations.

2.2 LABORATORY TESTING PROGRAM

Representative soil samples collected during the field exploration were selected for laboratory testing to determine their index properties. The laboratory-testing program included: natural

moisture content determination tests (ASTM D2216), Atterberg Limits tests (ASTM D4318), and Grain Size Analysis with Wash #200 (ASTM D1140). The laboratory test results are presented further within the

report. Laboratory testing was performed in general accordance with ASTM procedures. Unless otherwise informed, the soil samples will be discarded 60 days from the issuance of the report.

3.0 SUBSURFACE CONDITIONS

3.1 SITE GEOLOGY

Fayetteville, North Carolina is located in the Coastal Plain Physiographic Province. The Coastal Plain consists mainly of marine sediments which were deposited during successive periods of fluctuating sea level and moving shoreline. The formations dip slightly seaward, and several are exposed at the surface in bands approximately parallel to the coast.

Review of the Geologic Map of North Carolina (compiled by the North Carolina Geological Survey, 1985) indicates that the subject site is underlain by the Cretaceous age Middendorf Formation, consisting of sands, clayey sands, sandstone and mudstone.

3.2 SUBSURFACE CONDITIONS

General subsurface conditions encountered during our subsurface exploration are described below. For more detailed soil descriptions and stratifications at the boring locations, the Boring Logs should be reviewed. The Boring Logs represent our interpretation of the subsurface conditions based on a review of the field logs and an engineering examination of the samples. The horizontal stratification lines designating the interface between various strata represent approximate boundaries. Transition between different strata in the field may be gradual in both the horizontal and vertical directions. Groundwater, or lack thereof, encountered in the borings and noted on the "Boring Records" represents conditions only at the time of the exploration.

3.3 SURFACE

The existing pavement surface at test boring location B-2 consisted of a layer of asphalt underlain by crusher run stone to a depth of 1 foot below the existing ground surface.

3.4 COASTAL PLAIN SOILS

Undisturbed coastal plain soil deposits were encountered beneath the surface at the test boring locations, The coastal plain soils consisted of very loose to very dense Silty SAND (SM), soft to very stiff sandy lean CLAY (CL) and stiff sandy fat CLAY (CH). These soils were sampled with N-values ranging from 2 to 52 blows per foot (bpf). The Coastal Plain soils extended to boring termination depths of 20 feet.

3.5 GROUNDWATER INFORMATION

Groundwater infiltration was not encountered at the test boring locations within a depth of about 20 feet below existing grade at the time of drilling. Subsurface water levels within this region tend to fluctuate with seasonal and climatic changes, as well as with some types of construction operations. Generally, the highest groundwater levels occur in late winter and early spring; and the lowest levels in late summer and early fall. Therefore, water may be encountered during construction at depths not indicated during this study.

Additionally, perched groundwater conditions can develop over low permeability soil or partially weathered rock following periods of heavy or prolonged precipitation. Groundwater may be encountered during construction at depths not indicated during this exploration.

3.6 LABORATORY TEST RESULTS

The laboratory test results are summarized in the table below.

Sample Location	Sample Depth (ft)	Moisture Content %)	Percent Fines (70	ATTERBERG LIMITS			USCS Soil Classification
				LL	PL	PI	
B-1	3,5 — 5	11.5	61	36	18	18	CL
B-2	3.5 — 5	12.9	48	37	21	16	CL
B-3	3.5 — 5	9.4	19	32	17	15	CL
B-3	6 — 7,5	1.8	80	71	25	46	CH*

Notes: * denotes materials that do not meet recommended criteria for structural fill material

4.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

4.1 GENERAL DISCUSSION

The evaluation and recommendations presented in this report are based on the data obtained from the field exploration and laboratory testing program, information regarding the proposed construction, and our experience with similar projects and subsurface conditions. If the structural loading, structure locations, or grading plans change from those discussed previously, we request the opportunity to review and possibly amend our recommendations with respect to those changes. Additionally, if subsurface conditions are encountered during construction that was not found in the borings, report those conditions immediately to us for observation and recommendations.

The results of our geotechnical exploration program identified the presence of near surface Sandy Lean CLAY (CL) and Sandy Fat CLAY (CH) coastal plain soils at three of the test boring locations (B2 through B-4) performed at the project site. These soils generally exhibit moderately to highly elastic properties. They are compressible, will lose most of their strength when wet, and are typically susceptible to changes in volume with even slight changes in moisture content (i.e. shrink/swell behavior). Representative soil samples selected for laboratory testing had in-situ moisture contents well below the plastic limit. The tested soils are in a relatively dry state and would be expected to exhibit swelling potential upon hydration depending upon the soil composition and mineralogy. Please note it was beyond PSI's scope to perform swell testing on this project, so this assessment has been made on the basis of the Atterberg limits test results, and our experience.

A notable finding was a very loose to soft surficial soil deposit found at test boring location B-3 from existing grade to a depth of about 5.5 feet. We anticipate soft surficial soils may be found in the general vicinity of B-3. These soils will necessitate improvement either through surficial compaction operations and/or over-excavation and re-compaction to improve strength and compressibility characteristics. The level of improvement will depend upon the proposed site improvements (i.e. pavement versus structure) in this area of the site.

4.2 SITE PREPARATION AND EARTHWORK CONSIDERATIONS

The upper strata of the subsurface encountered in our test borings revealed shallow fine-grained coastal plain soils including, sandy lean CLAYS (CL) and fat CLAYS (CH) that are typically sensitive to moisture. When such moisture sensitive soils are exposed to construction traffic, a loss of soil strength may result. After disturbance and when wet, these fine-grained soils may rut and deflect significantly and do not provide adequate subgrade support and require remediation or moisture conditioning. It is not uncommon for construction equipment to severely disturb the upper several feet of the subgrade during initial phases of site earthwork operations, especially if site preparation work is performed while the soils are wet. This may result in the need for either undercutting and replacement of the disturbed soils or drying and re-compaction of the affected soils. Alternatively, it may be desirable to place a protective layer of aggregate base material in the building and pavement areas to serve as a working surface.

Pavements, soft and wet soils, topsoil, organics, and other unsuitable materials should be stripped from an area extending at least 10 feet beyond the outline of the proposed structure and 5 feet beyond pavement areas. Depressions or low areas resulting from stripping, grubbing, or tree removal should be backfilled with compacted structural fill in accordance with the recommendations presented in this report.

After stripping, removal of unsuitable surface soils, and rough excavation grading, we recommend that areas to provide support for the floor slabs and/or structural fill be evaluated carefully for the presence of soft, surficial soils, and/or plastic soils, by inspection, probing, and proof-rolling.

The proof roll should be performed using a loaded tandem axle dump truck, or similar rubber-tired equipment, weighing between 15 and 20 tons. The vehicle should make at least four passes over each location, with the last two passes perpendicular to the first two. Areas that wave, rut, or deflect significantly and continue to do so after several passes of the proof-roller should be undercut to firmer soils. Undercut areas should be backfilled in thin lifts with approved, compacted fill materials. Proof-roll operations should be monitored carefully by PSI's Project Geotechnical Engineer.

Drying soils for re-use as structural fill is often considered a routine aspect of typical grading operations and is not considered a pay item. If unit prices for earthwork operations are established, they should be examined closely before the contract is executed. If undercutting is a pay item, then undercut volumes should be determined by field measurement. Methods such as counting trucks should not be used for determination of undercut volume, as they are less accurate.

Recommended criteria for soil fill characteristics (both on-site and imported materials, if necessary) and compaction procedures are listed below. The project design documents should include the following recommendations to address proper placement and compaction of project fill materials. Earthwork operations should not begin until representative samples are collected and tested. The maximum dry density, optimum moisture content, and index properties should be determined.

4.2.1 EARTH FILL MATERIALS

- Material satisfactory for structural fill should include clean soil material with USCS classifications of (GW, GM, SW, SP, SM, SC, CL or ML). The fill material should have a Standard Proctor (ASTM D698) Maximum Dry Density of at least 95 pcf, a maximum Liquid Limit of 40 and a Plasticity Index of 20 or less.

- Organic content or other foreign matter (debris) should be no greater than 3 percent by weight, and no large roots (greater than $^{1}/4$ inch in diameter) should be allowed.

- Material utilized as fill should not contain rocks greater that 3 inches in diameter or greater than 30 percent retained on the $^{3}/4$-inch sieve.

4.2.2 COMPACTION RECOMMENDATIONS

Maximum loose lift thickness — 8 inches, mass fill. Loose lifts of 4 to 6 inches in trenches and other confined spaces where hand operated equipment is used.

- Compaction requirements — 95 percent of the maximum dry density and 98 percent within the upper 12 inches as determined by the standard Proctor (ASTM D698) compaction test.
- Soil moisture content at time of compaction — within ±2 percent of the optimum moisture content.

4.2.3 TEST CRITERIA TO EVALUATE FILL AND COMPACTION

One standard Proctor compaction test and one Atterberg limits test for each soil type used as project fill. Gradation tests may be necessary and should be performed at the geotechnical engineers discretion.

- One density test every 2,500 square feet for each lift or two tests per lift, whichever is greater (for preliminary planning only; the test frequency should be determined by our engineering staff.
- Trench fill areas — one density test every 75 linear feet at vertical intervals of 2 feet or less.

It will be important to maintain positive site drainage throughout construction. Storm water runoff should be diverted around the building and pavement areas. The site should be graded at all times such that water is not allowed to pond. The surface should be sealed with a smooth drum roller to enhance drainage if precipitation is expected. Subgrades damaged by construction equipment should be repaired immediately to avoid further degradation in adjacent areas and to help prevent water ponding.

Should there be a significant time lag or period of inclement weather between site grading and the fine grading of the slab prior to the placement of stone or concrete, the Geotechnical Engineer of Record or qualified representative should assess the condition of the prepared subgrade. The subgrade may require scarification and recompaction or other remedial measures to provide a firm and unyielding subgrade prior to final slab or pavement construction.

4.3 FOUNDATION RECOMMENDATIONS

Based on the results of the geotechnical exploration, we recommend that the proposed structure be supported on conventional shallow spread footings. We recommend that footings be designed for a maximum net allowable soil bearing pressure of 2,500 pounds per square foot or less. We recommend continuous wall and isolated column footings with minimum widths of at least 18 inches and 24 inches, respectively regardless of the actual resulting bearing pressure.

Due to the presence of expansive soils on site, all foundations should bear at a minimum depth of 36 inches below the lowest adjacent final ground surface for frost penetration, protective embedment, and resistance to moisture changes which can lead to shrink/swell behavior of expansive soils.

We estimate that foundations designed and constructed in accordance with the recommendations herein will experience post-construction total settlements generally less than 1-inch with differential settlement along a 40-foot long portion of a continuous footing, or similarly spaced column footings generally less than $^{1}/2$-inch. Total and differential settlements of these magnitudes are usually considered tolerable for the anticipated construction. However, the tolerance of the proposed structure to the predicted total and differential settlements should be confirmed by the structural engineer.

Foundation concrete should be placed as soon as possible after excavation. If foundation excavations must be left open overnight, or exposed to inclement weather, the base of the excavation should be protected with a mat a couple of inches of lean concrete. Footing excavations should be protected from surface water run-off and freezing. If water is allowed to accumulate within a footing excavation and soften the bearing soils, or if the bearing soils are allowed to freeze, the deficient soils should be removed from the excavation prior to concrete placement.

Footing excavations should be evaluated by the Geotechnical Engineer or Record, or his representative to determine that soils capable of supporting the recommended design bearing pressures are present at and immediately below the bearing level. We recommend that the bearing soils at the bottom of and below the footing excavations be checked with a dynamic cone penetrometer to assess the suitability of the soils. Footing evaluations should be performed prior to reinforcement and concrete placement. If unsuitable bearing soils are encountered, these soils will need to be removed. The foundations can then be established at the new, lower bearing elevation, or the unsuitable material replaced with properly compacted fill, flowable fill, or lean concrete. If compacted structural fill is used as backfill, the undercut excavations to remove unsuitable materials should be centered beneath the footing and widened 1 foot for each foot of undercut depth. If lean concrete or flowable fill is used as backfill, the foundation excavation need not be widened.

Please note foundations bearing on high plasticity soils (some ML, MH, some CL, and CH) may necessitate additional over-excavation and replacement with properly compacted fill, flowable fill, or lean concrete if deemed to be unsuitable for bearing as determined by the dynamic cone penetrometer test.

4.4 FLOOR SLAB RECOMMENDATIONS

Near surface Fat CLAY (CH) coastal plain sails were encountered in the test borings 8-3 and B-4 at depths of about 3 to 8 feet below grade and may be encountered at shallower depths at the project site. These soil types generally exhibit moderately to highly elastic properties and are typically susceptible to changes in volume with even slight changes in moisture content (i.e. shrink/swell behavior). Therefore, these materials are considered unsuitable materials for slab-on-grade support. We recommend providing a 24 inch cushion between the bottom of the floor slab and the top of potentially expansive soils. This can be accomplished by either filling the site or by performing an over-excavation of the expansive soils to at least 24 inches below the floor slab areas and replacing these materials with properly placed and compacted low plasticity structural fill (SM, SC, CL or ML). Based upon the findings of the test borings, the recommended minimum 24 inch separation should be met provided the site is not cut more than 1 foot below existing grades.

Where concrete slabs are designed as beams on an elastic foundation, the soils that will comprise the subgrade soils should be assumed to have a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci). This value is estimated based on the expected results of a plate load test using a nominal 30-inch plate.

In order to provide uniform support beneath any proposed floor slab-on-grade, we recommend that floor slabs be underlain by a minimum of 4 inches of compacted aggregate base course material. The aggregate base course material should be compacted to at least 98 percent of its standard Proctor maximum dry density. Open-graded crushed stone, such as No. 57 stone may also be used; however, it is our experience that open graded crushed stone can collect water during periods of rain and cause saturation and softening of the subgrade soils prior to placement of the floor slab concrete. Therefore, construction sequencing/timing, and the season in which the stone is placed, should be taken into consideration.

The crushed rock is intended to provide a capillary break to limit migration of moisture through the slab. If additional protection against moisture vapor is desired, a vapor retarding membrane may also be incorporated into the design; however, there are no specific conditions that mandate its use. Factors such as cost, special considerations for construction, and the floor coverings suggest that decisions on the use of vapor retarding membranes be made by the architect and owner. Based on the subsurface materials and the intended use of the structure, we recommend the use of a vapor retarding membrane. Vapor retarders, if used, should be installed in accordance with ACI 302.1, Chapter 3.

The precautions listed below should be closely followed for construction of slabs-on-grade. These details will not prevent the amount of slab movement, but are intended to reduce potential damage should some settlement of the supporting subgrade take place.

- Cracking of slabs-on-grade is normal and should be expected. Cracking can occur not only as a result of heaving or compression of the supporting soil, but also as a result of concrete curing stresses. The occurrence of concrete shrinkage cracks, and problems associated with concrete curing may be reduced and/or controlled by limiting the water to cement ratio of the concrete, proper concrete placement, finishing, ishing, and curing, and by the placement of crack control joints at frequent intervals, particularly, where re-entrant slab corners occur. The American Concrete Institute (ACI) recommends a maximum panel size (in feet) equal to approximately three times the thickness of the slab (in inches) in both directions. For example, joints are recommended at a maximum spacing of 12 feet assuming a four-inch thick slab. We also recommend that control joints be scored three feet in from and parallel to all foundation walls. Using fiber reinforcement in the concrete can also control shrinkage cracking.

- Some increase in moisture content is inevitable as a result of development and associated landscaping; however, extreme moisture content increases can be largely controlled by proper and responsible site drainage, building maintenance and irrigation practices.

- All backfill in areas supporting slabs should be moisture conditioned and compacted as described earlier in this report. Backfill in all interior and exterior utility line trenches should be carefully compacted.

- Exterior slabs should be isolated from the building. These slabs should be reinforced to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.

4.5 LATERAL EARTH PRESSURES

Retaining walls must be capable of resisting the lateral earth pressures that will be imposed on them. Shear strength testing was not performed on the soils sampled during this exploration. However, based on the material types and our experience, the earth pressure coefficients detailed below are

recommended. Walls that will be laterally restrained and not free to deflect or rotate (i.e., basement walls or loading dock walls tied into existing slabs on grade) should be designed using the "at-rest" (Ko) earth pressure condition. Walls that are not restrained (retaining walls) should be designed using the "active" (Ka) earth pressure condition. A third condition, the "passive state" (Kp) represents the maximum possible pressure when a structure is pushed against the soil and is used in wall foundation design to help resist "active" or "at-rest" pressures. The earth pressure coefficients used in the design will depend upon the type of backfill used.

Imported No. 57 stone or approved free draining granular soil typically is suitable for use as backfill within the "active" zone behind walls. Plastic soils (PI>10) should not be used for backfill behind the walls. Additionally, soils with high mica content should not be considered for use as backfill behind the walls. The active zone is typically modeled by an area extending rearward one foot from the base of the wall footing and then extending upward toward the ground surface at an inclination of 45 degrees plus one-half of the internal angle of friction (45° + 0/2). Often, designers of segmental block walls prefer to have free-draining material (clean stone or sandy material) within the entire "reinforced" (geogrid) zone. If not, we recommend that a chimney drain, consisting of No. 57 stone, be installed at the end of the geogrid, at the face of the "retained" soil. Based on the results of our geotechnical exploration, we recommend the following lateral earth pressure parameters be used for design purposes:

Lateral Earth Pressure Parameters

Material Group Symbol	Internal Friction Angle 41	Moist Unit Weight, γ (pcf)	Earth Pressure Coefficients		
			Active (K_a)	At-Rest (K_o)	Passive KO
Silty sands (SM) —Very loose or greater	28	115	0.36	0.53	2.77
No 57 Stone	36	120	0.26	0.41	3.85

Passive earth pressure of the soil adjacent to the footing, as well as soil friction at the footing base, may be used to resist sliding. Because significant wall movements are required to develop the "passive" earth pressure, the total calculated "passive" pressure may be reduced by one-half to two-thirds for design purposes. A coefficient of 0.25 could be reasonably assumed for evaluating allowable frictional resistance to sliding at the foundation (concrete)-soil contact. The design bearing pressure for the retaining wall foundations should correspond to the value provided earlier in this report.

The recommended earth pressure coefficients assume that constantly functioning drainage systems are installed between walls and soil backfill to prevent the build-up of hydrostatic pressures and lateral stresses in excess of those stated. Even though groundwater was not encountered, wall drainage is very important. If a sufficient drainage system is not installed, the lateral earth pressures should be computed using the buoyant weight of the soil and the hydrostatic pressure due to the water must be added to the earth pressure to estimate the lateral earth pressure for design. A water collection system consisting of 4-inch diameter, slotted, corrugated polyethylene tubing per ASTM F405, surrounded by at least 6 inches of No. 57 stone can be used. Wrap the aggregate with drainage geotextile such as Mira(?) 140N or equivalent. These pipes should then discharge by gravity to a lower lying area of the site beyond the building and pavement limits, or to a sump with a pump.

Special care should be taken while compacting the backfill behind retaining walls. Over-compaction of backfill behind retaining walls may result in the buildup of excessive lateral pressures, and potential structural distress. To avoid over-compaction of the backfill behind walls, we recommend that the backfill within 5 feet of the wall be compacted with small hand operated equipment to at least 95

percent of the maximum dry density of the standard Proctor as determined by ASTM D698. Heavy compactors and large pieces of construction equipment should not operate within 5 feet of the embedded wall to avoid the buildup of excessive lateral pressures unless the walls have been designed to accommodate these forces.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 GROUNDWATER

Groundwater infiltration was not found within the limited geotechnical exploration. If encountered, we recommend that the groundwater table be lowered and maintained at a depth of at least 2 feet below bearing levels and excavation bottoms during construction. Adequate control of groundwater could likely be accomplished by means of gravity ditches and pumping from gravel-lined, cased sumps. The contractor should be prepared to remove promptly surface water from the general construction area by similar methods. If groundwater is encountered during trenching or foundation installation, PSI should be notified so that we might determine whether there is a need for underslab drainage, perimeter drains, or other recommendations for dewatering.

5.2 EXCAVATION AND SAFETY

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P". This document was issued to better allow for the safety of workers entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the Contractor could be liable for substantial penalties.

The Contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The Contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the Contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in all local, state, and federal safety regulations.

We are providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the Contractor's or other parties' compliance with local, state, and federal safety or other regulations.

6.0 REPORT LIMITATIONS

The recommendations submitted are based on the available soil information obtained by PSI and design details furnished by *Morris & Associates Engineers, Inc.* and their design team for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation, or other, recommendations are required. If PSI is not retained to perform these functions, PSI cannot be responsible for the impact of those conditions on the performance of the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area at the time of this report. No other warranties are implied or expressed.

After the plans and specifications are more complete, the Project Geotechnical Engineer should be provided the opportunity to review the final design plans and specifications to assure our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of ***Morris & Associates Engineers, Inc,*** and their design team for the specific application of the proposed 82nd Airborne Shoppette located on Fort Bragg in Fayetteville, North Carolina.

APPENDIX

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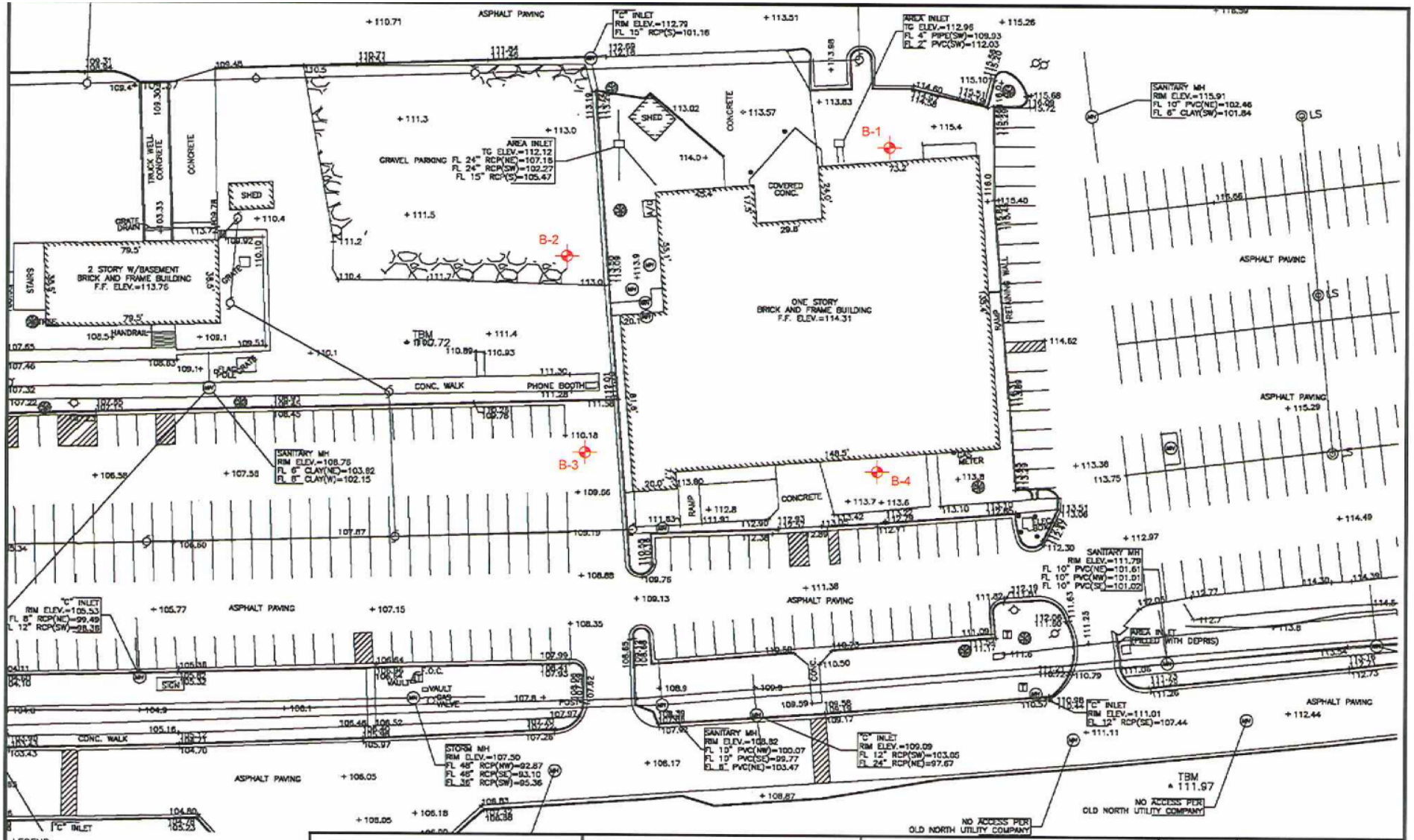
Boring Location Plan



LEGEND:

B-1 SOIL BORING LOCATION

SCALE: 1" = 40'

ALL LOCATIONS ARE APPROXIMATE

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Geotechnical Services

5021 West W.T. Harris Blvd.
Charlotte, North Carolina 28269
(704) 598-2234 (704) 598-2236 fax

Soil Boring Location Map

Morris & Associates Engineers, Inc.
Proposed 82nd Airborne Shoppette

Checked:	Scale:	Date:	Figure:
Z. Scarbore	1" = 40'	9-1-10	1
Drawn: C. Moran (0511-176.dwg)	Project Number: 0511176		

Soil Classification Chart

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS: GRAPH	SYMBOLS: LETTER	DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVEL MIXTURES, GRAVEL-SAND-SILT MIXT
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES '
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	Pv!III-JunirS, SAND - SILT
				SC	CrolfuERYESSANDS, SAND - CLAY
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE gn&WCNEKSFAZ SILTY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

PSI Project Number: 0511176

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Information To Build On

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PSI Project No,: **0511176**

Client: Morris & Associates Engineers	Remarks: Refer to Boring Location Plan	Driller: SOS	Boring No: **B-1** (Page 1 of 1)
Project: Proposed 82nd Airborne Shoppett	TZ1: 20.0 feet [Elevation: ± 115 feet	Groundwater Observations	**Caved Denths**
Location: Fort Bragg	Started: 8/13/2010 Finished: 8/13/2010	Initial: a NE	Initial: hi 9.9 feet
Equipment: CME 55 Method: SPT	Hammer : A utohannner	Delayed: T NE	Delayed: 4.1

Approx. Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	Sample Blows*	Sample No.	Sample Depth	SPT N-VALUE (bpf)	N
		COASTAL PLAIN • dense yellow brown to red brown silty SAND (SM).			1.0		
				SS-1			36
112.4	3.0	COASTAL PLAIN - stiff light gray to red brown sandy lean CLAY (CL),			2.5		
					3.5		
				SS-2			15
109.9	5.5				5.0		
		COASTAL PLAIN - medium dense yellow red to light brown silty medium to fine SAND (SM).			6.0		
				SS-3			25
					7.5		
				SS4	8.5		16
					10.0		
				S S - 5	13.5		11
98.4	17.0						
		COASTAL PLAIN dense yellow red to light brown light gray siltymedium to line SAND (SM) with clay pockets.					
95.4	20.0		13-17-22	SS6	18.5		39
		Boring terminated at 20 feet.					

This record is a reasonable interpretation of subsurface conditions at the discrete exploration location. Subsurface condition. at other locations and at other times troy differ Depths are rim" approximations only and should not be used for cut and fill quantities.

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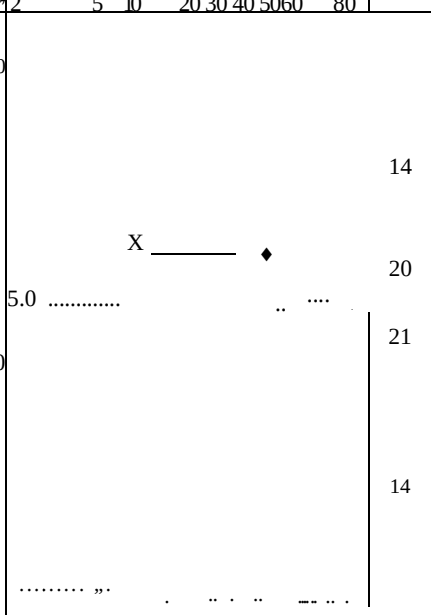
Information To Build On

Engineering Consulting - Testing

PSI Project NO.: 0511176

Client: Morris & Associates Engineers	Remarks: Refer to Boring Location Plan	Driller: SDS	Boring No: B-2 (Page 1 of 1)
Project: Proposed 82nd Airborne Sim pett	ME 20.0 feet / !Elevation: ± 113 feet	Groundwater Observations	Caved Dentin;
Location: Fort Bragg	Started: /2010 / !Finished: 8/1212010	Initial: V NE	Initial: _ 8.9 feet
Equipment: CME 55 / Method: SFr	Hammer Type: Autoitammer	Delayed: NE	Delayed: lil

Approx. Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	Sample Blows. (Fee.	Sample No.	Depth	N
		COASTAL. PLAIN - stiff to very miff yvilow red to red brown micaceous sandy lean CLAY (CO.			1.0	
			5-6-8	SS-1	2.5	14
			6.10-10	SS-2	3.5	20
			6-10.11	SS-3	6.0	21
105.0	8.0				7.5	14
		COASTAL PLAIN - medium dense to dense yellow red to !woven silty SAND (Seri).	5-6-8	SS-4	8.5	
					10.0	
					13.5	
			11-16-17	SS-5	15.0	33
					18.5	
93.0	20.0		6.10-15	SS-6		25
		Boring terminated at 20 feet.			20.0	



This record is a reasonable intentretatMo of subsurface conditions at the discrete exploration location. Subsurface conditions at other locations and M other times may differ. Limbs arc **ViSlka.** approximations only and should limbo used For cut and fill quantities.

This record is a reasonable interpretation of subsurface conditions at the discrete exploration location. Subsurface condition. at other locations and at other times troy differ Depths are rim" approximations only and should not be used for cut and fill quantities.

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Client: Morris & Associates Engineers	Remarks: Refer to Boring Location Plan	Driller: SDS	'Boring No: **B.3** (Page 1 of I)

BORING LOG

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PSI Project No.: 0511176

Project: Proposed 82nd Airborne Shoppette	to : 20.0 feet	'Elevation: ± 110 feet		Groundwater Observations	Caved Depths
Location: Fort Bragg	Started: 8/12/2010	Finished: 8/12/2010		Initial: g NE	Initial: 111 11.2 feet
Equipment: CME 55	Method; SPT	Hamner Type: Autohammer		Delayed: 3 *NE*	Delayed: lei

Approx. Elevation	Depth	cri SI	DESCRIPTION OF MATERIALS (Classification)	" 1...	Sample Blows'	Sample No.	Samp Dm+ (Fee'	11111 SPIN-VALUn(bpi) P; %MC % Ofn amts - N206Sir 1.11 2 5 10 20 30 40 5060 80	N
			COASTAL PLAIN - very loose red brown silty SAND (SM) with weathered rock fragments and plastic clay pockets.	I .0	3.1-I	SS-1	2.5		2
107.0			COASTAL PLAIN - soft light brown to gray sandy lean CLAY (CL).		3-1-2	SS-2	3.5	X 1.--I	3
104.5			COASTAL PLAIN - still' light brown to gray sandy fat CLAY (CH).		3-6-9	SS-3	5.0 6.0	1 1 •	15
102.0_			COASTAL PLAIN -medium dense red to yellow brown silty SAND (SM).		7-12-14	SS-4	7.5 8.5	.... 10.0	26
	Id.								
	3.0 5. 5 8, 0			X	7-8-9	SS-5	13.5	.....15.0 X	17
90.0	20.0				8.12-15	SS-6	18.5 20,0		27
			Boring Terminated at 20 feet,						

his record is a reasonable intennetation of subsurface conditions at the discrete extdoration Subsurface conditions at other locations and at *othcr* times not differ. Denths are visua approximations only and should not be used for cut and fill quantities.

Client: Morris & Associates Engineers	Remarks: Refer to Boring Location Plan	Driller: SOS	1Boring No: B-4 (Page 1 of 1)
Project: Proposed 82nd Airborne Shop	20.0 feet / Elevation: ± 114 feet	Groundwater Observations	Caved Depths
Location: Fort Bragg	Started: 8/12/2010 / IFinished; 8/1212010	Initial: V NE	Initial: il 12.7 feet
Equipment: CME 55 / Method: SPT	Hammer Type: Autobammer	Delayed: T NE	Delayed: -kg.

Approx. Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	Sample Blows'	Sample No.	Sample Depth (Feet)	SPT N-VALUE (hist)	N
	3.0	COASTAL PLAIN very dense red brown silty SAND (SM) with weathered rock (rags.					52
			16.22-30	SS-1			
	6.5	COASTAL PLAIN -stiff light brown to gray sandy lht CLAY (CH).					14
110.7			X 16-8-6	SS-2	1.0		
					2.5	10.0 / 15.0	
					3.5		
		COASTAL PLAIN -medium dense to dense yellow red to light brown silty SAND (SM).	8-12-14	SS-3	5.0		26
					6.0		
			12-15-19	SS-4	7.5		34
107.2					8.5		
			X 9-12-15	SS-5	13.5		27
93.7							
	20.0				18.5		36
			12-16-20	S5-6	200		
		Boring Terminated at 20 feet.					

approximations only and sl said not be used for cut and fill quantities.

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PSI Project No.: 0511176

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