EVERGREEN ARCHITECTS

SPECIFICATIONS

North Post Exchange Image Upgrade

Fort Bragg, North Carolina

AAFES Project: 0530-09-000014

Outdoor Living Area

June 28, 2012

STATE OF OHIO
EVERGREEN ARCHITECTS
TODD D. MARTIN
10108
REGISTERED ARCHITECT

STATE OF OHIO
MATTHEW B. YANNEY
E-60542
REGISTERED PROFESSIONAL ENGINEER

EXCHANGE
ARMY & AIR FORCE EXCHANGE SERVICE

SPECIFICATIONS INDEX

NORTH POST EXCHANGE IMAGE UPGRADE
OUTDOOR LIVING AREA
FORT BRAGG, NORTH CAROLINA
AAFES PROJECT #0530-09-000014

EverGreen Architects, Inc.
Architects / Interior Designers
168 West Franklin Street
Centerville, OH 45459

Building Systems Engineering, Ltd.
Plumbing / Mechanical / Electrical Engineers
4738 Gateway Circle, Suite A110
Kettering, OH 45440

END OF SPECIFICATIONS INDEX

SECTION 00404 - PRODUCT SUBSTITUTION

PART 1 - GENERAL

1.1 CONTRACTING OFFICER'S APPROVAL

A. The Contract is based on materials and methods described in the Contract Documents.

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. All request for product substitution must be submitted to the Contracting Officer no later than ten (10) calendar days prior to Solicitation due date.

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

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 no later than 10 days prior to Solicitation due date.

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 AAFES.

D. Substitutions may be considered by the Contracting Officer when a Product becomes unavailable through no fault of the Contractor.

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

END OF SECTION

SECTION 01100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 STATEMENT OF WORK

A. Scope:
The work covered by these specifications consists of furnishing all plant, supervision, labor, equipment, licenses, permits, and materials necessary to perform all operations required to renovate the Outdoor Living Area to include demolition of the existing wall enclosing the covered area, extending the covered area, installing the provided sun shade structure, and constructing new masonry screen wall in accordance with these specifications and the applicable drawings, and subject to the terms and conditions of the contract.

B. Location
1. The work to be performed is located at Fort Bragg, North Carolina.

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

1.2 SPECIAL REQUIREMENTS OF THE INSTALLATION

A. No streets shall be blocked without Installation headquarters approval.

B. Contractor shall immediately clean up any debris tracked on to the Installation's streets resulting from this construction operation.

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

D. No burning is permitted on the Installation.

E. For additional information, see SECTION 01150 - SPECIAL REQUIREMENTS OF INSTALLATION.

1.3 DRAWINGS AND SPECIFICATIONS

A. The General Contractor will be provided with 1 copy of the drawings, specifications, and CD for use for obtaining permits, field use, office file, and distribution to subcontractors and material suppliers.

B. Additional drawings and specifications may be purchased by the General Contractor for the cost of reproduction. No refund will be made for purchased drawings and/or specifications.

1.4 LAYING OUT WORK

A. Layout
1. Dimensions and elevations indicated in layout of work shall be verified by the General Contractor. Discrepancies between Drawings, Specifications, and Existing 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 Civil, Gasoline Dispensing, Architectural, Structural, Mechanical, and Electrical drawings, each with the other, that in any way affect the locations or elevation of the work to be executed by the Contractor, and should any discrepancy be found, the Contractor 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. Field Dimensions
1. 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 and 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 approved on an individual utility and occurrence basis. 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 fifteen (15) 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.

B. See SECTION 01150 - SPECIAL REQUIREMENTS OF THE INSTALLATION for additional Excavation Work Procedural Requirements.

1.7 EXCAVATION

A. Prior to commencing any excavation work the Contractor shall obtain a valid Public Works Dig Permit. It shall be the Contractor's responsibility to obtain the necessary signatures and coordination for the permit. Allow a minimum of fifteen (15) days for permit approval. After the permit is received, the Contractor shall notify Public Works 48 hours prior to starting excavation work.

B. See SECTION 01150 - SPECIAL REQUIREMENTS OF THE INSTALLATION for additional Excavation Work Procedural Requirements.

1.8 WELDING PERMIT

A. Prior to commencing any welding, the Contractor shall obtain a welding permit from Fire Department. Allow a minimum of thirty (30) days for permit approval.

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 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 of 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 Installation 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. The Contractor shall provide a fire extinguisher at each location where cutting and/or 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.

D. When temporary heating devices are used, a watchman shall be present to cover all periods when other workmen are not on the premises.

E. The Contractor shall provide fire extinguishers in accordance with the recommendations of NFPA Nos. 10 and 241. However, in all cases a minimum of four (4) fire extinguishers shall be available for each building.

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

1.12 WORK BY OTHERS

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 AAFES.

1.13 EQUIPMENT

A. See specification SECTION 01120: AAFES FURNISHED CONTRACTOR INSTALLED EQUIPMENT and Drawings for (AF/CI).

B. Refer to the Army & Air Force Exchange Service General Provisions: Other Contracts, AAFES - Furnished Property.

1.14 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 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.

B. 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 Architect to determine the most satisfactory arrangement.

C. The Contractor shall establish center lines for all trades.

1.15 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 AAFES.

1.16 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. In no case shall this clearance be less than 7'-0" without written consent from the Contracting Officer.

B. 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.

1.17 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 Architect and of authorities having jurisdiction thereover.

1.18 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.

B. When job conditions prohibit installation of equipment, piping, ductwork, etc. in location shown, it shall be brought to the Contracting Officer's attention immediately and the relocation determined in a joint conference.
   1. The Contractor will be held responsible for the relocation of any items installed without first obtaining the Contracting Officer's approval.
   2. The Contractor shall remove and relocate non-approved items at his own expense if so directed by the Contracting Officer.

1.19 OVERLOADING

A. The Contractor shall be held responsible if overloading occurs to any part or parts of structures beyond their safe calculated carrying capacities by placing of materials, equipment, tools, machinery, or any other item thereon.

B. No loads shall be placed on floors or roofs before they have attained their permanent and safe strength.

1.20 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.

1.21 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.

B. Certificates of Conformance shall be furnished to the Contracting Officer for all items so specified.

1.22 OCCUPANCY BY AAFES

A. AAFES shall reserve the right and privilege of partial occupancy during and prior to the absolute completion of the total work.

B. Access shall be allowed at all times to AAFES and its own Contractors in the endeavor.

1.23 REFERENCES

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

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. Wherever the term “Not in Mechanical Contract” (NIMC) or the term “Not in Electrical Contract” (NIEC) is used in the specifications and on the drawings, it shall be interpreted to mean that the work is not a part of the particular sub-trade but is included under some other trade of the Contract.

D. Wherever the term “Not in Contract” (NIC) is used, it shall be interpreted to mean that the item of work is not a part of the Contract, except as may be otherwise noted.

E. Definitions:

1. Vendor: Person or persons selling any material item.
2. Installation: The Base, Post, or facility on which the structure is being built.
3. Architect-Engineer: The person or firm responsible for preparing the working drawings and specifications.
4. AAFES: Army and Air Force Exchange Service.
5. Inspection Agency: Project Inspector contracted by AAFES.
6. CO: Contracting Officer.
7. GC: General Contractor.

1.24 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 stop work and notify the Contracting Officer.

1.25 ORDER OF PRECEDENCE

A. In the event of inconsistencies within or between the Contract Documents, the Contractor shall furnish and install the better quality or greater quantity of work, and shall comply with the more strict requirement.

B. Should there appear to be any discrepancy between the scale and detail drawings, or between the scale of the drawings and the figures on same, the latter in each case is to be followed.

END OF SECTION

SECTION 01120 - 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 indicated on the drawings.

C. Contractor's Duties:
1. Designate required delivery date for each product in Progress Chart.
2. Notify the Contracting Officer in writing at least sixty (60) days in advance of the date that AAFES furnished equipment and furnishings will be needed.
3. Shop drawings indicating dimensional locations of all plumbing and electrical rough-ins will be furnished by AAFES.
4. 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 affect receipted transfer of custody of the equipment to the Contractor.
5. 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.
6. 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.
7. Repair or replace items damaged as a result of Contractor's operations.
8. Apply finish indicated, if any.
9. The installation shall be complete in all respects, including mechanical and electrical hook ups, and put into good operating condition.
10. Equipment shall be installed by installers approved by the manufacturer.

D. AAFES Duties:
1. Deliver all AAFES furnished items to the job site.
2. Schedule delivery date with supplier in accordance with Contractor prepared Progress Chart.
3. Provide Contractor with installation drawings and instructions.
4. Provide Contractor with shop drawings indicating dimensional locations of all plumbing and electrical rough-ins.

1.2 DELIVERY DATE CHANGES:

A. Requests by Contractor to change designated delivery dates shall be made in writing at least sixty (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.

END OF SECTION

SECTION 01150 - SPECIAL REQUIREMENTS OF THE INSTALLATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Permits.

B. Work Week.

C. Interruption of Utility Services.

D. Close Out Submittals and Work Sheets.

E. Contractor Post Identification Credentials.

1.2 PERMITS

A. Excavation Notification: Prior to excavating contact Public Works to obtain a Public Works Dig Permit.
   1. Contractor is required to have an approved dig permit prior to beginning any excavation on Fort Bragg. Dig permit shall be coordinated with DPW Service Orders, 910-396-0321. A copy of the dig permit will be maintained on the job site for the duration of the project.

B. Prior to cutting or welding (open flame) contact Fire Department.

C. The contractor shall obtain any other permits and licenses necessary for work on this project.

1.3 WORK WEEK

A. The regular work week observed by Public Works is 8:00 a.m. to 5:00 p.m., Monday through Friday, with Federal Holidays excluded. Due to the unique nature and aggressive schedule of this particular project, the contractor may likely be required to work 24 hours a day / 7 days a week. Many items of work can only be performed at night once the Exchange is closed to customers. The contractor shall coordinate his work schedule closely with the AAFES store manager and notify the installation Military Police prior to performing work after normal duty hours.

1.4 INTERRUPTION OF UTILITY SERVICES

A. Planned interruptions of utility services electrical power, water, natural gas, sanitary and storm sewer shall be detailed and coordinated by the contractor. Requests for interruptions which involve Post facilities other than in this contract shall be submitted in writing by the contractor to the contracting officer at least ten (10) working days before the planned outage. If the outage affects only the facility in this contract, the request shall be submitted at least five (5) working days before the planned outage. The contractor shall not interrupt service(s) until approval has been granted. Requests shall include facility/facilities affected, date of scheduled outage, and duration. Requests for interruption of service(s) will not be approved until all equipment and materials required for that particular phase of work are on the job site.

1.5 CLOSEOUT SUBMITTAL:

A. Prior to or in conjunction with the Final Inspection, the Contractor shall submit the following:
   1. Record Work Documents. One set of the contract drawings which record any: filed changes of dimensions and details that may have occurred; changes by contract modifications and change orders; and details not on the original contract drawings. One set of specifications with each section marked to record; the manufacturer, trade name, catalog number and supplier of products which were actually installed. These documents are one of the requirements for final payment.
   2. Operation and Maintenance Data: Four sets bound in 8-1/2” x 11” three-ring slide binders with durable plastic covers.
      a. Provide a separate volume for each system, with a table of contents and index tabs for each volume.
      b. Part 1. Directory: listing names, addresses, and telephone numbers of Prime Contractor and Subcontractors.
      c. Part 2. Operation and Maintenance instructions, arranged by system. For each system, give names, addresses, and telephone numbers of subcontractors and suppliers. List:

(1). Major equipment items.
(2). Parts list.
(3). Operating instructions.
(4). Equipment maintenance instructions.
(5). Shop drawings and product data.
(6). Warranties/Guarantees.

B. Time of Submittals. For equipment of component parts of equipment put into service during progress of construction:
1. Submit documents within 10 days after inspection and acceptance.
2. Otherwise, make submittals within 10 days after date of Final Inspection, prior to request for final payment.

C. For items of work, where acceptance is delayed materially beyond date of Final Inspection, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.6 CONTRACTOR POST IDENTIFICATION CREDENTIALS

A. The procedure for obtaining Post identification passes for contractor personnel to work on any Army Post shall be as follows:
1. Contractor shall submit a written request on company letterhead stationary, if available, to the Authority having jurisdiction specifying:
a. Contract number.
b. Location of work site.
c. Date entry to the Installation must begin and contemplated termination date of entry.
d. Names of contractor and subcontractor employee requiring access to the Post.
e. The name of the individual who will submit the Request of Identification Credentials for each employee for whom identification credentials are needed.
2. The Authority having jurisdiction shall:
a. Endorse the request.
b. Attach a copy of the contract cover page and any other pages that provide performance information, such as the need for and duration of access to the work site.
c. Forward this request to the Military Police, Pass and Identification Office of the Post where the work is to be performed.
3. The Contractor will be required to complete and submit a Request for Identification Credentials, for each of the firm's employees and for each subcontractor employee who must have access to the Post.
4. The Contractor shall also request Visitor/Vehicle Pass or DD Form 2220, DoD Registered Vehicle, for the vehicle decals when the Request for Identification Credentials is submitted. To obtain the vehicle decal from the Military Police, Pass and Identification Office, the Contractor shall produce:
a. A valid driver's license.
b. Proof of financial responsibility or insurance.
c. Current vehicle registration.

B. Contractor employees, at all times while on a military installation, shall wear visible contractor-provided identification either as a part of, or attached to, their outer clothing. The identification shall clearly identify the individual as being a contractor employee.

C. During performance of the contract, the Contractor shall be responsible for obtaining required identification for newly assigned personnel, and for prompt return of credentials and vehicle registration decals to the Military Police, Pass and Identification Office, for any employee who no longer requires access to the work site.

D. At the termination or completion of the contract, or upon expiration of credentials (if any such expirations are specified), the Contractor must be sure that all Post identification credentials and vehicle registration decals for all Contractor and subcontractor employees are returned to the Military Police, Pass and Identification Office.

END OF SECTION

SECTION 01200 - PRICE & PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 GENERAL

A. All price and payment procedures shall be in accordance with AAFES General Provisions (Contract for Construction). Should there be a conflict between the requirements of this specification and the requirements of the General Provisions, the General Provisions shall govern.

1.2 SCHEDULE OF VALUES

A. Submit printed schedule on AIA Form G703 - Continuation Sheet for G702, unless other forms are authorized in writing by the Contracting Officer.

B. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section. Identify site mobilization and project closeout.

C. Revise schedule to list approved Change Orders (added to the contract by amendment) with each Application for Payment.

1.3 UNIT PRICING

A. Contractor shall provide unit prices for the following concrete slab repair items according to SECTION 03354 - INTERIOR CONCRETE SLAB REPAIRS & JOINT FILLER REPLACEMENT.
   1. Joint filler removal and replacement, with or without metal keyway. Contractor is to provide unit price per linear foot for joint filler removal and replacement.
   2. Spalled joint repair or joint with metal keyway (less than 3/4”). Contractor is to provide unit price per linear foot for keyway segment removal and filler installation.
   3. Spalled joint repair, joint with metal keyway or self-leveling compound removal (great than 3/4”). Contractor is to provide unit price per linear foot for keyway segment removal and repair material installation.
   4. Crack repair. Contractor is to provide unit price per linear foot for crack cleaning and filling.
   5. Surface defect repair, including pop-outs, spalls, and gouges. Contractor is to provide unit price per occurrence for pop-out and spall repair ¾” - 1 ½” diameter.
   6. Surface defect repair, including pop-outs, spalls, and gouges. Contractor is to provide unit price per occurrence for pop-out and spall repair 1 ½” - 3” diameter.
   7. Surface embed repair, including cleanouts, in-floor electrical outlets and Walker Duct access holes. Contractor is to provide unit price per occurrence for over-coring cleanouts, in-floor electrical outlets and Walker Duct access holes.
   8. Large area surface repair, existing underlayment removal and replacement. Contractor is to provide unit price per square foot for large area surface repair of rough surface, or removal and replacement of existing underlayment’s > 1/4" in thickness.
   9. Grout coat surface enhancement, including micro-pin holes, pitting and other shallow surface deficiencies. Contractor is to provide unit price per square foot for grout coat surface enhancement.
   10. Full grind, densify, dye and polish portions of the project not currently indicated on the drawings. Contractor is to provide unit price per square foot to provide a full grind, densify, dye and polish for portions of the project not currently indicated on the drawings.

1.4 APPLICATIONS FOR PAYMENT

A. Submit three copies of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702, unless other forms are authorized in writing by the Contracting Officer.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Payment Period: Contractor may submit no more than one request for progress payment each month.

D. Substantiating Data: Include the following with Application for Payment:
   1. Narrative of work performed during the time period covered by the application for payment.
   2. Current construction photographs
   3. Affidavits attesting to off-site stored products.
   4. Construction progress schedules, revised and current

1.5 CHANGE PROCEDURES

A. Refer to AAFES General Provisions for change procedures.

1.6 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Architect and the AAFES Project Manager, it is not practical to remove and replace the Work, the Contracting Officer will direct appropriate remedy or adjust payment.

C. The defective Work may remain, but the cost will be adjusted at discretion of the Contracting Officer.

D. Defective Work will be partially repaired to instructions of Architect, AAFES Project Manager and the cost will be adjusted at discretion of the Contracting Officer.

E. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.

F. Authority of the Contracting Officer, AAFES Project Manager, and Architect to assess defects and identify payment adjustments, is final.

G. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from transporting vehicle.
   4. Products placed beyond lines and levels of required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected products.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01300 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Project Management
   2. Project Meetings
   3. Project Coordination
   4. Progress Schedules
   5. Construction Photographs

1.2 PROJECT MANAGEMENT

A. Job Superintendent
   1. The General Contractor and each prime sub-contractor shall have a qualified and competent superintendent on the project at all times when work is being done. Immediately after the award of the contract, the General Contractor and each prime sub-contractor shall submit an outline experience record of his qualifications. The Contracting Officer (or designated representative) will notify each contractor of his approval or disapproval. Until completion and acceptance of the work, contractor shall not change or remove the approved Superintendent except with the consent of the Contracting Officer.
   2. If the Job Superintendent fails to perform to the satisfaction of the Contracting Officer (or designated representative), the Contractor shall replace him with a qualified superintendent.

1.3 PROJECT MEETINGS

A. Pre-Construction Meeting
   1. The Contracting Officer shall schedule and preside at the Pre-Construction Meeting.
   2. Attendance Required:
      a. Contracting Officer and other Headquarters AAFES representatives.
      b. Local and regional AAFES representatives.
      c. Installation representatives (Engineering, Fire Marshall, Security, etc.)
         1) Civil Engineering or DPW Representative.
         2) Fire Marshall.
         3) Base / Post Security Representative.
         4) Other Base / Post Representatives as required.
      d. General Contractor
      e. Major sub-contractors
   3. Agenda:
      a. Execute Notice to Proceed.
      b. Distribute Contract Documents.
      c. Submission of list of sub-contractors.
      d. Review AAFES Pre-Construction Checklist and contract requirements.
      e. Discuss Schedule.
      f. Discuss critical sequencing.
      g. Designation of responsible personnel.
      h. Explain procedures for processing field decisions and change orders.
      i. Explain procedures for submission of applications for payment.
      j. Explain shop drawing submittal procedure.
      k. Discuss procedures for maintaining record documents.
      l. Discuss fire and safety procedures.
      m. Discuss security procedures.
      n. Discuss accident prevention and reports.
      o. Discuss housekeeping procedures.
      p. Discuss the use of the Installation's property/premises.
         1) Identify construction office and storage trailer locations.
         2) Identify location of parking for construction personnel.
      q. Discuss major equipment deliveries.
      r. Discuss other issues pertinent to completing the contract.
   4. Meeting minutes:

a. Minutes will be taken by the Architect and distributed to AAFES, the Contractor, and the Installation's Point of Contact.

B. Monthly Progress Meetings
1. The Contracting Officer shall schedule the monthly progress meetings.
2. The Contractor shall preside at all monthly progress meetings.
3. The Contractor shall make all physical arrangements for the progress meetings, prepare an agenda, and distribute copies of the agenda to all of the participants.
4. The progress meetings shall be held at the construction office, or at another location as indicated in the meeting notice.
5. Attendance Required:
   a. Contractor's project manager.
   b. Contractor's superintendent.
   c. Major sub-contractors and suppliers (as pertinent to the agenda).
   d. AAFES representative (AAFES' option).
   e. Representatives of Governmental or other regulatory agencies (as pertinent to the agenda).
6. Agenda:
   a. Review minutes of previous meetings.
   b. Progress and Schedule
      1) Review progress schedule.
      2) Review progress of work.
      3) Review projected progress of work.
      4) Identify problems that impede planned progress.
      5) Review corrective measures required to regain projected schedules.
   c. Material and Equipment
      1) Review submittal schedule and status of submittals.
      2) Review off-site fabrication and delivery schedules.
   d. Deficiencies
      1) Review field observations, problems and decisions.
      2) Review maintenance of quality and work standards.
   e. Requests for Information
   f. Progress Payments/Applications
   g. Changes and Modifications
      1) Requests for Proposal
      2) Review the effect of proposed changes on progress schedule and coordination.
   h. Action Items
   i. Review other business relating to the Work.
7. Meeting Minutes:
   a. The Architect shall record the meeting minutes and distribute copies to the AAFES Contracting Officer in addition to all of the meeting participants. Meeting minutes shall be distributed within five (5) business days of the progress meeting.

C. Pre-Installation Meetings
1. When required in individual specification sections, the Contractor shall schedule and preside at a Pre-Installation Meeting at the project site prior to commencing work of the section.
2. Require attendance of parties directly affecting, or affected by, work of the specific section.
3. Notify Contracting Officer of the date, time, and location of the Pre-Installation Meeting.
4. Coordinate schedule of the Pre-Installation Meeting to coincide with the next monthly progress meeting date.
5. Contractor to prepare agenda and preside at meeting:
   a. Review conditions of installation, preparation and installation procedures.
   b. Review coordination with related work.
6. Contractor to record meeting minutes and distribute copies to the AAFES Contracting Officer and the Architect in addition to all of the participants and all parties affected by the decisions made at the meeting. Meeting minutes shall be distributed within five (5) business days after the Pre-Installation Meeting.

1.4 PROJECT COORDINATION

A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure

efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify that the utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements, supports, and installation of mechanical and electrical Work which are indicated diagrammatically on Contract Documents. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas conceal pipes, ducts, and wiring within the construction, except as otherwise indicated. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.

F. After AAFES' occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of AAFES' activities.

1.5 PROGRESS SCHEDULE

A. The contractor shall prepare Construction Progress Chart, using the Critical Path Method (CPM) to 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.

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

D. Format
1. Prepare schedules as a horizontal bar chart with a separate bar for each major portion of Work or operation, identifying first work day of each week.
2. The format shall be designed to enable the Contracting Officer to evaluate the reasonableness of the proposed schedule, and to determine if the actual construction is on schedule.
3. The unit of time shall be indicated in days.

E. Content
1. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
2. Identify each item by specification section number.
3. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
4. Indicate delivery dates for AAFES furnished products.
5. Indicate all activities of AAFES that will affect progress and contract completion dates. See Specification SECTION 01120 - AAFES FURNISHED AND CONTRACTOR INSTALLED EQUIPMENT.
6. Coordinate content of Progress Schedule with Schedule of Values.

F. Revisions to Schedules
1. Clearly indicate progress of each activity to date of submittal, and projected completion date of each activity.
2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes which could affect the schedule.
3. Provide narrative report, with each submittal, describing work accomplished during the previous period, the work scheduled for the next period and anticipated problem areas and delays, and impact on the Schedule. Report corrective action taken, or proposed.

G. Submittals
1. Submit, through the Contracting Officer, a preliminary schedule defining the contractor's proposed operations for the first sixty (60) days of the contract, within **TEN (10) DAYS AFTER DATE OF NOTICE TO PROCEED**. The Contractor's general approach for the balance of the project shall also be indicated. Cost of the activities expected to be completed or partially completed before submission and approval of the complete progress schedule shall be included.
2. Upon approval of the preliminary schedule by the Contracting Officer, and within **THIRTY (30) CALENDER DAYS AFTER THE NOTICE TO PROCEED**, the contractor shall submit the

complete Progress Schedule.

3. Submit revised Progress Schedules with each monthly Application for Payment.
4. Submit the number of opaque reproductions which Contractor requires, plus four (4) copies, which will be retained by Contracting Officer.
5. Application for Payment will not be considered complete until the Contracting Officer receives the updated Progress Schedule.

H. Distribution

1. Distribute copies of reviewed Progress Schedules to Project site file, Subcontractors, suppliers, and other concerned parties.
2. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

1.6 ADVERSE WEATHER

A. Information and Data

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

B. Contract Time Limits

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

C. Time Extensions for Unusually Severe Weather

1. 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 chart defines the monthly anticipated adverse weather for the contract period and is based on NOAA data for the geographic location of the project.

WEATHER TABLE FOR FORT BRAGG, NORTH CAROLINA

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MAX PRECIP IN INCHES	7.84	6.60	8.87	7.22	6.75	15.94	9.08	10.69	14.71	7.34	6.38	7.73
MIN PRECIP IN INCHES	.80	.87	1.47	.18	.54	.44	.60	1.12	.09	.03	.29	.85
MEAN NORMAL PRECIP IN INCHES	4.16	3.43	4.38	3.06	3.29	4.18	5.21	5.21	4.78	3.05	2.85	3.18
DAYS PRECIP 0.5" OR MORE	3	2	3	2	2	3	4	4	3	2	2	2
DAYS BELOW 32NF	2	1	0	0	0	0	0	0	0	0	0	1
DAYS ABOVE 90NF	0	0	0	1	3	12	19	14	5	0	0	0

2. This listing of anticipated adverse weather will constitute the base line monthly weather time evaluations.
3. Each month throughout the contract 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.
   a. The term "actual adverse weather days" shall include days impacted by actual adverse weather.
   b. The number of actual adverse weather days affecting exterior work shall be calculated chronologically from the first to the last day in each month.
   c. 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.
4. 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.

a. The Contracting Officer will convert any qualifying delays to calendar days and issue a modification in accordance with the contract.

1.7 CONSTRUCTION PHOTOGRAPHS

A. Provide photographs of the site and construction throughout the progress of Work.

B. Take photographs prior to each Application for Payment that illustrate the following:
1. Site clearing.
2. Excavations.
3. Foundations.
4. Structural framing.
5. Enclosure of building.
6. Final completion.
7. Work concealed from view between monthly inspections.

C. Digital Photographs
1. 1600 x 1200 x 24 bit true color minimum resolution in .jpg file format.
2. Quantity (at each monthly submittal):
a. Disks: Two CD's
3. Provide two sets of CD's of all digital photograph files at project closeout. Photographs shall be located in separate monthly folders.

D. Technique
1. Provide factual presentation.
2. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

E. Views
1. Provide photographs of the pertinent work and work that will be concealed from view or completed during the documentation period.
2. Provide non-aerial photographs from four cardinal views at each specified time until Date of Substantial Completion.
3. Provide photographs from four cardinal views of the interior of the building after the building is enclosed.
4. Consult with Architect and Contracting Officer for instructions on additional views required.

F. Submittals
1. Deliver two sets of prints inserted into plastic archival photograph sleeves with each Application for Payment.
a. Application for Payment will not be considered complete until the Contracting Officer has received the construction photographs.

PART 2 - PRODUCTS

(Not Used).

PART 3 - EXECUTION

(Not Used).

END OF SECTION

SECTION 01350 - SAFETY POLICIES AND PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Contractor required health and safety plan. See Corps of Engineers Example and Specification Section 01360: Environmental Protection.
2. Construction Hazard Plan.
3. Monthly Safety Meetings.
4. Accident Reporting and Record Keeping.
5. Life of Contract Requirements.
6. Head Protection (Hard Hats).
7. Sample Safety Plan.
8. Sample Construction Hazard Plan.

1.2 REFERENCES

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. U.S. Army Corps of Engineers Publication:
2. EM 385-1-1 Safety and Health Requirements Manual (1996)
3. OSHA 1910 R.E.G. - 29CFR, OSHA 1910.120

1.3 SUBMITTALS

A. The following items shall be submitted by the Contractor for AAFES approval:
1. Designation of Safety Representative: The Contractor shall designate in writing a qualified employee OSHA Trained under 1910.120 responsible for the overall supervision of all accident prevention activities. Duties shall include ensuring applicable safety requirements 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/certified in OSHA 1910.120 procedures. All other employees performing site work will meet OSHA 1910 training requirements for their job capacity.

B. The following items shall be Contractor certified and submitted to AAFES for information only.
1. Job Hazard Analysis:
a. Contractor shall develop a job hazard analysis for presentation at the Pre-construction conference.
b. 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. (See Sample at end of this Specification Section)
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. Minimum Requirements for the Job Safety and Health Plan are as follows:
1) Must be kept on site, and must be written.
2) Will contain a hazard analysis (safety and health risk) for each site task and operation (to be supplied by the installation).
3) Will include employee training (per paragraph (3) of 1910.120).
4) Will include personal protective equipment to be used by employees for each of the site tasks and operations (paragraph (g) (5) of 1910.120).
5) Will include provision for medical surveillance (paragraph (f) of 1910.120).
6) Will include the frequency and types of air monitoring, personal monitoring, environmental sampling techniques, instruments to be used (their maintenance and calibration).
7) Will include a site control program (per paragraph (d) of 1910.120) to be coordinated with the installation.
8) Will include a decontamination procedure (per paragraph (k) of 1910.120).

9) Will include an emergency response plan (per paragraph (1) of 1910.120).
10) Will include a confined space entry procedure (per 1910.146, 147 or program equivalent).
11) Will include provision for spill containment (per paragraph (j) of 1910.120).
12) Will include pre-entry briefings (prior to each site task activity) for all employees involved in the task, supervision, or emergency response.
13) Written verification of adherence to the "plan" by a Safety and Health Supervisor is required (the supervisor must meet the 1910.120 training requirements for supervisors).
14) Deficiencies will be corrected immediately upon discovery and after consultation with the AAFES Contracting Officer.

c. Hazard Response Plan:
1) The planned, unplanned, or non-predicted discovery of such hazards as transite pipe, contaminated soils, and other possible hazards will be addressed within an Emergency Response Plan (EMR) by all contractors.
2) The requirements will be coordinated through the Health and Safety Program of the military installation by the contractor (sample provided).
3) Material Safety Data Sheets will be maintained at the site for all hazardous materials in use.

1.4 MONTHLY SAFETY MEETINGS

A. The Contractor shall schedule monthly safety meetings with the subcontractor personnel.

B. Minutes of safety meetings shall be prepared and signed by the Contractor.

C. The original signed minutes shall be submitted to the Contracting Officer for inclusion in the contract file.

1.5 ACCIDENT REPORTING AND RECORD KEEPING

A. Accident reporting and record keeping shall be in accordance with Section 2, EM 385-1-1.

B. Telephonic reports of injuries or property damage will be made as soon as possible after the incident and will be followed by a copy of U.S. Army Investigation Accident Report (DA Form 285).

1.6 LIFE OF CONTRACT REQUIREMENTS

A. The Contractor shall comply with EM 385-1-1 and all provisions of this section during the life of the contract.

1.7 HEAD PROTECTION (HARD HATS)

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.

1.8 SAMPLE SAFETY PLAN

A. A sample Safety Plan is provided on the following pages.

1.9 SAMPLE CONSTRUCTION HAZARD PLAN

A. A sample Construction Hazard Plan is provided on the following pages.

PART 2 - PRODUCTS

(Not Used).

PART 3 - EXECUTION

(Not Used).

END OF SECTION

SAMPLE

SAFETY PLAN

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification and are referred to in the text by the basic designation only.

1.1 US ARMY CORPS OF ENGINEERS:

EM 385-1-1 U.S. Army Corps of Engineers Safety and Health Requirements Manual

1.2 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

NFPA 70-1993 National Electric Code (NEC)

1.3 SOCIETY OF AUTOMOTIVE ENGINEERS (SAE):

J 994-85 Alarm, Backup, Electric-Performance, Test, and Application, Recommended Practice.

2. GENERAL: Work safety is of paramount importance. The Contractor shall comply with the Contract Clause in the Solicitation entitled ACCIDENT PREVENTION, including the U.S. Army Corps of Engineers Safety and Health Requirements Manual referred to therein in addition to the provisions of this specification.

3. SAFETY PROGRAM: The U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, and all subsequent revisions referred to in the Contract Clause ACCIDENT PREVENTION of this contract, are hereby supplemented as follows:

a. The Contractor shall designate an employee responsible for overall supervision of accident prevention activities. Such duties shall include:

1. Assuring applicable safety requirements are incorporated in work methods
2. Inspecting the work to ensure that safety measure and instructions are actually applied.

The proposed safety supervisor's name and qualifications shall be submitted in writing for approval to the Contracting Officer's Representative. This individual must have prior experience as a safety engineer or be able to demonstrate his/her familiarity and understanding of the safety requirements over a prescribed trial period. The safety engineer shall have the authority to act on behalf of the Contractor's general management to take whatever action is necessary to assure compliance with safety requirements. The safety supervisor is required to be on the site when work is being performed.

b. Prior to commencement of any work at a job site, a preconstruction safety meeting shall be held between the Contractor and the Corps of Engineers Area/Resident Engineer to discuss the Contractor's safety program and in particular to review the following submittals:

1. Contracts Accident Prevention Plan: An acceptable accident prevention plan, written by the prime contractor for the specific work and implementing in detail the pertinent requirements of EM 385-1-1, shall be submitted for Government approval.

2. Activity Phase Hazard Analysis Plan: Prior to beginning each major phase of work, an activity hazard analysis (phase plan) shall be prepared by the Contractor for that phase of work and submitted to the Contracting Officer's Representative for approval. A phase is defined as an operation involving a type of work presenting hazards not experienced in previous operations or where a new subcontractor or work crew is to perform work. The analysis shall address the hazards for each activity performed in the phase and shall present the procedures and safeguards necessary to eliminate the hazards or reduce the risk to an acceptable level.

C. Subsequent jobsite safety meetings shall be held as follows:

1. A safety meeting shall be held at least once a month for all supervisors on the project to review past activities,

to plan ahead for new or changed operations and to establish safe working procedures to anticipated hazards. An outline report of each monthly meeting shall be submitted to the Contracting Officer's Representative.

2. At least one safety meeting shall be conducted weekly, or whenever new crews begin work, by the appropriate field supervisors or foreman for all workers. An outline report of the meeting giving date, time, attendance, subjects discussed and who conducted it shall be maintained and copies furnished the designated authority on request.

4. ACCIDENTS: Chargeable accidents are to be investigated by both Contractor personnel and the Contracting Officer.

4.1 ACCIDENT REPORTING, ENG FORM 3394: Section I, paragraph 01.D, of EM 385-1-1 and the Contract Clause entitled ACCIDENT PREVENTION are amended as follows: The prime Contractor shall report on Eng Form 3394, supplied by the Contracting Officer, all injuries to his employees or subcontractors that result in lost time and all damage to property and/or equipment in excess of $2,000 per incident. Verbal notification of such accident shall be made to the Contracting Officer within 24 hours. A written report on the above noted form shall be submitted to the Contracting Officer within 72 hours following such accidents. The written report shall include the following:

a. A description of the circumstances leading up to the accident, the cause of accident, and corrective measures taken to prevent recurrence.

b. A description of the injury and name and location of the medical facility giving examination and treatment.

c. A statement as to whether or not the employee was permitted to return to work after examination and treatment by the doctor, and if not, an estimate or statement of the number of days lost from work. If there have been days lost from work, state whether or not the employee has been re-examined and declared fit to resume work as of the date of the report.

4.2 OSHA Requirements:

4.2.1 OSHA Log: A copy of the Contractors' OSHA Log of Injuries shall be forwarded monthly to the Contracting Officer.

4.2.2 OSHA Inspections: Contractors shall immediately notify the Contracting Officer when an OSHA Compliance Official (Federal or State Representative) presents his/her credentials and informs the Contractor that the workplace will be inspected for OSHA compliance. Contractors shall also notify the Contracting Officer upon determination that an exit interview will take place upon completion of the OSHA inspection. (NABSA).

5. SUBMITTALS FOR GOVERNMENT APPROVAL: Submittals shall be in accordance with Section 01305 CONTRACTOR SUBMITTTAL PROCEDURES. All required submittals of items specified in this section shall be for information only, except for those items including, but not limited to, the following which shall be submitted for Government approval:

a. Written designation of safety representative.

b. Written project specific accident prevention plan.

c. Written activity phase hazard analysis plan.

END OF SAMPLE SAFETY PLAN

SAMPLE

CONSTRUCTION HAZARD PLAN

TO BE ACCOMPLISHED BY THE GENERAL CONTRACTOR FOR CONSTRUCTION
AND POSTED IN ALL CONSTRUCTION TRAILERS

SHOULD AN UNPREDICTED DISCOVERY OF A HAZARDOUS MATERIAL OR CONDITION BE MADE DURING CONSTRUCTION THE FOLLOWING SEQUENCE OF ACTIONS IS REQUIRED WHEN THERE IS NO IMMEDIATE THREAT TO LIFE OR PROPERTY

ITEM	FIRST ACTION	NOTIFY	TELEPHONE #
Transite Pipe	Cease Activity in area of discovery	1. BCE 2. AAFES Contracting Officer and/or CME 3. AAFES Environmental Engineer when Unable to Contact 1, 2	
Contaminated Soil	Cease Activity in area of discovery cover with plastic	Same as above	
Buried Munitions	Cease Activity	Same as above	
UST	Same as above	Same as above	
Other			

Should there be an immediate threat to life or property, the emergency response plan for the installation, which is to be on file at the construction site, is to be followed in every detail. An example of this procedure is the rupture of a fuel line, liquid or natural gas.

END OF SAMPLE CONSTRUCTION HAZARD PLAN

SECTION 01360 - 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 COMPLIANCE OBLIGATIONS.

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.

PART 2 - PERMITS

2.1 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.

2.2 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 3 - MATERIALS

3.1 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.

3.2 ASBESTOS

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

3.3 POLYCHLORINATED BIPHENYL'S (PCBs)

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

3.4 LEAD-BASED PAINT

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

3.5 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.

3.6 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 4 - EXECUTION (WORK PRACTICES)

4.1 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.

4.2 PROTECTION OF WATER RESOURCES

A. General: The General Contractor shall not pollute storm drainage, streams, lakes, or reservoirs with fuels, oils, bitumen, 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.

4.3 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 site clearing (Section 02111). 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.

4.4 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.

PART 5 - WASTE DISPOSAL

5.1 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.

5.2 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 debris, that debris must be certified by the installation to be free of contamination and of no value to the United States, and this certification must be provided to the Contracting Officer. To expedite work, this may be accomplished by a fax 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 form is provided at the end of this section and may be used. All construction debris removed from the installation must be covered by a certification. The contractor must arrange with the installation POC whether all

debris will be covered by 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.

PART 6 - UNEXPECTED SITE CONDITIONS

6.1 CONTAMINATED SOIL OR GROUNDWATER.

A. Unless otherwise specified elsewhere in this contract, site has been inspected and is, consistent with the best professional judgment, free of environmental contamination or pollution. However, unexpected conditions can always arise. 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.

6.2 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 01370 - EROSION & SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. The work includes the provision of temporary erosion control measures to prevent the pollution of air, water, and land within the project limits and in areas outside the project limits where work is accomplished in conjunction with the project.

B. Installation of temporary erosion control features shall be coordinated with the construction of permanent erosion control features to assure effective and continuous control of erosion and pollution.

C. Provide and maintain erosion control measures in accordance with the North Carolina Erosion and Sediment Control Handbook.

D. This work shall consist of complete ground preparation and establishment of a permanent over of grass on all open earth areas and all disturbed areas within the limits of construction. The work shall conform to this specification and shall be carefully coordinated with the site grading operations and erosion control work shown on the drawings and/or as covered in the specifications.

REGULATORY REQUIREMENTS

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

AGRICULTURAL MARKETING SERVICE (AMS)

AMS Seed Act (1995) Federal Seed Act Regulations Part 201

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 602 (1995a) Agricultural Liming Materials

ASTM D 977 (1998) Emulsified Asphalt

STATE OF NORTH CAROLINA

North Carolina Stormwater Management Act
North Carolina Erosion and Sediment Control Law
North Carolina Stormwater Management Handbook
North Carolina Erosion and Sediment Control Handbook
NCDOT Road and Bridge Standards
NCDOT Road and Bridge Specifications

1.3 REQUIRED DOCUMENTS:
The Contractor will be provided Erosion and Sediment Control Plan, and a Land Disturbance Activity Permit. Contact the Contracting Officer or Designated Representative for the additional installation requirements.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

A. Delivery

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

B. Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

C. Inspection

Seed shall be inspected upon arrival at the job site for conformity to species and quality. Seed that is wet, moldy, or bears a test date five months or older, shall be rejected. Other materials shall be inspected for compliance with specified requirements. Open soil amendment containers or wet soil amendments shall be rejected. Unacceptable materials shall be removed from the job site.

D. Storage

Materials shall be stored in designated areas. Seed, lime, and fertilizer shall be stored in cool, dry locations away from contaminants.

E. Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

F. Time Limitation

Hydroseeding time limitation for holding seed in the slurry shall be a maximum 24 hours.

1.5 QUALITY ASSURANCE

Perform work in accordance with the North Carolina Erosion and Sediment Control Handbook, latest edition.

PART 2 - PRODUCTS

2.1 SILT FENCE

A. POSTS
1. 4 inch by 4 inch seasoned wood posts or 1.33 pound per linear foot of steel posts in section in standard "T" or "U" section.
2. Posts shall be minimum 6 feet long.

B. FILTER FABRIC
1. A woven or nonwoven polypropylene, nylon, or polyester containing stabilizers and/or inhibitors to make the fabric resistant to deterioration from ultraviolet, for a minimum of 12 months and have the following properties:
   a. Minimum grab tensile strength (ASTM D4632): 200 pounds
   b. Maximum grab elongation (ASTM D4632): 50 %
   c. Minimum Mullen burst strength (ASTM D 3786): 230 psi
   d. E.O.S. (ASTM D 4751): 20-100
   e. Minimum of 12 months of expected usable construction life at a temperature range: 0-120 deg. F

2.2 DUST SUPPRESSORS

A. Clean Water.

2.3 CONSTRUCTION ENTRANCE

A. Provide a stabilized construction entrance at each point of vehicular access into the construction site.

2.4 TREE PROTECTION

A. Tree protection shall meet one of the following criteria:
1. Sand/Snow Fences: Standard forty (40) inch high snow fence shall be placed at the limits of clearing on standard steel posts set six (6) feet apart.
2. Wood Fence: Wood fencing consisting of four (4) inch square posts set securely in the ground and protruding at least four (4) feet above the ground shall be placed at the limits of clearing with a maximum of two horizontal boards between posts. If it is not practical to erect a fence at the drip line, construct a triangular fence nearer to the trunk. The limits of clearing will still be located at the drip line, since the root zone within the drip line will still require protection.
3. Post and Wire Fence: Posts with a minimum size of four (4) inches square set securely in the ground and protruding at least four (4) feet above the ground shall be placed at the limits of clearing with two rows of wire ¼-inch or thicker at least two (2) feet apart running between

posts with strips of colored surveyor's flagging tied securely to the string at intervals no greater than three (3) feet.

4. Plastic Safety Fence: Forty (40) inch high "International Orange" plastic (polyethylene) web fencing secured to conventional metal "T" or "U" posts driven to a minimum depth of eighteen (18) inches on six (6) foot minimum centers shall be installed at the limits of clearing. The fence should have the following physical qualities:
   a. Tensile yields (ASTM D 638) - Average 2,000 lbs. per 4-foot width.
   b. Ultimate tensile yields (ASTM D 638) - Average 2,900 lbs. per 4-foot width.
   c. Elongation at break (ASTM D 638) - Greater than 1000%.
   d. Chemical resistance - Inert to most chemicals and acids.

2.5 SAFETY FENCE

A. Provide Temporary Construction Fence as specified in paragraph 2.05.4

2.6 SEED

A. Provide certified seed of the latest season's crop. Seed shall be Bermuda.

2.7 SOIL AMENDMENTS

Soil amendments shall consist of lime and fertilizer meeting the following requirements.

2.8 LIME

Lime shall be agricultural grade, dolomitic limestone meeting requirements of ASTM C 602.

2.9 FERTILIZER

Fertilizer shall be commercial grade, free flowing, uniform in composition and shall conform to applicable state regulations. Granular fertilizer shall bear the manufacturer's guaranteed statement of analysis. Granular fertilizer shall contain a minimum percentage by weight of 10 percent nitrogen, 20 percent phosphoric acid, and 20 percent potash. When slow release nitrogen forms are used in the fertilizer mixture, they shall be derived from sulfur-coated urea, urea formaldehyde, plastic or polymer-coated prills, or isobutylene diurea. Upon approval by the Contracting Officer or Designated Representative, a different analysis of fertilizer may be used, provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis.

2.10 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region.

2.11 STRAW

Straw shall be stalks from oats, wheat, rye, barley, or rice, furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

2.12 HAY

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

2.13 WOOD CELLULOSE FIBER

Wood cellulose fiber mulch shall be used only in hydroseeding applications. It shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate placement during application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 4.5 to 6.0.

2.14 ASPHALT ADHESIVE

Asphalt adhesive shall conform to the following: Emulsified asphalt, conforming to ASTM D 977, Grade SS-1.

2.15 WATER

Water shall be the responsibility of the Contractor, unless otherwise noted. Water shall not contain elements toxic to plant life.

2.16 SURFACE EROSION CONTROL MATERIAL

Surface erosion control material shall conform to the following:

2.17 SURFACE EROSION CONTROL STRAW OR EXCELSIOR BLANKET

A. Straw Net Blanket

Straw blanket material manufactured for erosion control purposes. It shall be produced of 100% agriculture straw. It shall have a consistent thickness with the straw evenly distributed over the entire area of the mat. The top and bottom sides shall be covered with lightweight photodegradable polypropylene netting having an approximate 1/2 inch x 1/2 inch mesh. The blanket shall be sewn together with cotton thread. Each blanket roll shall be 6.5 feet in width, and 83.5 feet in length and weight 30 pounds (+ or - 10%)

B. EXCELSIOR BLANKET

Blanket shall be machine produced mat of wood excelsior formed from a web of interlocking wood fibers; covered on one side with either knitted straw blanket-like mat construction; covered with biodegradable plastic mesh; or interwoven biodegradable thread, plastic netting, or twisted kraft paper cord netting.

C. SURFACE EROSION CONTROL COCONUT FIBER BLANKET

Coconut fiber erosion control blanket material manufactured for erosion control purposes. It shall be produced of 100% coconut fiber. It shall have a consistent thickness with the straw evenly distributed over the entire area of the mat. The top and bottom sides shall be covered with lightweight photodegradable polypropylene netting having an approximate 1/2 inch x 1/2 inch mesh. The blanket shall be sewn together with cotton thread. Each blanket roll shall be 6.5 feet in width, and 83.5 feet in length and weight 30 pounds (+ or - 10%)

D. Erosion Control Material Anchors

Erosion control anchors shall be as recommended by the manufacturer.

PART 3 - EXECUTION

3.1 SILT FENCE

A. Install posts at the spacing indicated, and at an angle between 2 degrees and 20 degrees towards the potential silt load area.

Do not attach filter fabric to existing trees.

Secure fabric to the post as indicated

Embed the filter fabric into the ground.

Splice filter fabric at joints.

3.2 INSTALLING SEED TIME AND CONDITIONS

A. Seeding Time

Seed shall be installed from March 1 through August 31 for summer establishment; and from September 1 through February 28 for winter establishment, in accordance with paragraph SEED.

B. Seeding Conditions

Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the seeding operations, proposed alternate times shall be submitted for approval.

3.3 SITE PREPARATION

A. Finished Grade

The Contractor shall verify that finished grades are as indicated on drawings, and that smooth grading and compaction requirements have been completed prior to the commencement of the seeding operation.

B. Application of Soil Amendments

1. Applying Fertilizer
   The application rate shall be 425 pounds per acre, or 10 pounds per 1000 square feet. Fertilizer shall be incorporated into the soil to a minimum of 2 inches and a maximum of 4 inches or may be incorporated as part of the tillage or hydroseeding operation. An additional 425 pounds per acre, or 10 pounds per 1000 square feet, shall be applied when permanent grass is one inch tall. When slow release nitrogen forms are used in the fertilizer mixture, a single application of 850 pounds per acre may be incorporated into the soil to a maximum 4-inch depth or may be incorporated as part of the tillage or hydroseeding operation.

C. Tillage

Soil on slopes up to a maximum 3-horizontal-to-1-vertical shall be tilled to a minimum 4-inch depth. On slopes 3-horizontal-to-1-vertical and steeper, the soil shall be tilled to a minimum 2-inch depth by scarifying with heavy rakes, or other method. Rototillers shall be used where soil conditions and length of slope permit. Drainage patterns shall be maintained as indicated on drawings. Areas compacted by construction operations shall be completely pulverized by tillage. Existing dirt trails and open areas which are to be planted with pines shall be tilled for the top 12 inches. Lime and fertilizer may be applied during this procedure.

D. Prepared Surface

1. Preparation
   The prepared surface shall be a maximum 1-inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be completed with a light raking to remove debris.
2. Turf Area Debris
   Debris and stones over a minimum 5/8 inch in any dimension shall be removed from the surface.
3. Erosion Control Area Debris
   Debris and stones over a minimum 3 inches in any dimension shall be removed from the surface.
4. Protection
   Areas with the prepared surface shall be protected from compaction or damage by vehicular or pedestrian traffic and surface erosion.

3.4 INSTALLATION

Prior to installing seed, any previously prepared surface compacted or damaged shall be reworked to meet the requirements of paragraph SITE PREPARATION. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

A. Installing Seed

Seeding method shall be Broadcast Seeding, and Drill Seeding. Seeding procedure shall ensure even coverage. Gravity feed applicators, which drop seed directly from a hopper onto the prepared soil, shall not be used because of the difficulty in achieving even coverage, unless otherwise approved. If used, absorbent polymer powder shall be mixed with the dry seed at the rate recommended by the manufacturer.

1. Broadcast Seeding
   Seed shall be uniformly broadcast at the rate shown in paragraph SEED, using broadcast seeders. Seed shall not be broadcast by hand. Half the total rate of seed application shall be broadcast in 1 direction, with the remainder of the seed rate broadcast at 90 degrees from the first direction. Seed shall be covered a maximum 1/4 inch depth by disk harrow, cultipacker, or other approved device.
2. Drill Seeding
   Seed shall be uniformly drilled to a maximum 1/4 inch depth and at the rate shown in paragraph SEED, using equipment having drills a maximum 5 inches distance apart. Row

markers shall be used with the drill seeder. Half the total rate of seed application shall be drilled in 1 direction, with the remainder of the seed rate drilled at 90 degrees from the first direction. The drilling equipment shall be maintained with half full seed boxes during the seeding operations.

B. Hydroseeding

Seed shall be mixed to ensure broadcast at the rates shown in paragraph SEED. Seed and fertilizer shall be added to water and thoroughly mixed to meet the rates specified, or fertilizer may be applied separately in accordance with paragraph SITE PREPARATION. The time period for the seed to be held in the slurry shall be a maximum 24 hours. After the seed, fertilizer, and water have been thoroughly mixed to produce a homogeneous slurry, one third of the wood cellulose and tackifier, at the rates recommended by the manufacturer, shall be added to two thirds of the seed, fertilizer and water slurry and applied. The remaining two thirds of the mulch and tackifier shall be mixed with the remaining one third of the seed slurry and applied in a second application. Slurry shall be uniformly applied under pressure over the entire area. The hydroseeded area shall not be rolled. Lime shall not be applied with a hydroseeder, but only in accordance with paragraph LIME.

C. Mulching

1. Hay or Straw Mulch
   Straw mulch shall be spread uniformly at the rate of 2 tons per acre. Hay mulch shall be spread uniformly at the rate of 3 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes and continued uniformly until the area is covered. The mulch shall not be bunched or clumped. Sunlight shall not be completely excluded from penetrating to the ground surface, with no bare spot larger than a quarter. All areas installed with seed shall be mulched on the same day as the seeding. Mulch shall be anchored immediately following spreading.
2. Mechanical Anchor
   Mechanical anchor shall be a V-type-wheel land packer; a scalloped-disk land packer designed to force mulch into the soil surface; or other suitable equipment.
3. Asphalt Adhesive Tackifier
   Asphalt adhesive tackifier shall be uniformly sprayed at a rate between 10 to 13 gallons per 1000 square feet. Sunlight shall not be completely excluded from penetrating to the ground surface.
4. Wood Cellulose Fiber
   Wood cellulose fiber shall be applied as part of the hydroseeding operation. The mulch shall be mixed and applied in accordance with the manufacturer's recommendations or 2000 pounds per acre, whichever is greater.

D. Watering Seed

Watering shall be started immediately after completing the seeding of an area. Water shall be applied to supplement rainfall at a rate sufficient to ensure moist soil conditions to a minimum 1-inch depth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

3.5 SURFACE EROSION CONTROL

A. Surface Erosion Control Material

Where indicated or as directed, surface erosion control material shall be installed in accordance with manufacturer's instructions. Placement of the material shall be accomplished without damage to installed material or without deviation to finished grade.

B. Temporary Seeding

Bare or disturbed areas that will be left over 15 days, or areas where directed during contract delays affecting the seeding operation, shall be seeded in accordance with temporary seed species and rates listed under paragraph SEED.

3.6 RESTORATION AND CLEAN UP

A. Restoration

Existing turf areas, pavements, and facilities that have been damaged from the seeding operation shall be restored to original condition at Contractor's expense.

B. Clean Up

Excess and waste material shall be removed from the seeded areas and shall be disposed offsite. Adjacent paved areas shall be cleaned.

3.7 PROTECTION OF INSTALLED AREAS

Immediately upon completion of the seeding operation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed.

3.8 SEED ESTABLISHMENT PERIOD

A. Quality Control

During construction, an established system of quality control shall be maintained. To assure compliance with contract requirements and the maintenance of records of all materials, equipment, and construction operations, quality control shall include but not be limited to the following:
Seeding -- Specified species planted at proper rates; preparation of planting bed as to thoroughness of tillage, leveling and depth of planting.
Mulching -- Types and rates of application.
Satisfactory stand of grass -- Coverage of the planted species at the end of the specified growth period, and the maintenance procedures, including supplemental fertilization.
A copy of all records and test data required herein, and the records of corrective action taken, shall be furnished the Contracting Officer or Designated Representative.

B. Satisfactory Stand of Grass Plants, Turf or Erosion Control Area

A stand of turf is considered acceptable when the new growing sprouts of permanent grass are visible at the surface showing not less than 40 seedlings of permanent grass at least 2 inches long in each square foot, where no gaps larger than 2 inches in diameter occur anywhere in the seeded area, and where the total bare spots do not exceed 2 percent of the total seeded area. Permanent grass is defined as Common Bermuda or Centipede.

C. Maintenance During Establishment Period

Maintenance of the seeded areas shall include protecting embankments and ditches from surface erosion; maintaining erosion control materials and mulch; protecting installed areas from traffic; mowing; watering; and post-fertilization.

1. Mowing
   a. Turf Areas: Turf areas shall be mowed to a minimum 3-inch height when the turf is a maximum 4 inches high. Clippings shall be removed when the amount cut prevents sunlight from reaching the ground surface.
   b. Erosion Control Areas: Erosion control areas shall be mowed to a minimum 4 inch height when the plants are a maximum 8 inches high. Clippings shall be removed when the amount cut prevents sunlight from reaching the ground surface.
2. Post-Fertilization
   After the permanent grass has been accepted, and between the dates of April 15 and October 15, apply 425 pounds of fertilizer per acre.
3. Repair or Reinstall
   Unsatisfactory stand of grass plants and mulch shall be repaired or reinstalled, and eroded areas shall be repaired in accordance with paragraph SITE PREPARATION.
4. Warranty
   There is no 1-year warranty for maintenance after acceptance of grass.

END OF SECTION

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Quality Assurance - Control of Installation.
   2. Tolerances
   3. References and Standards.
   4. Mock-up.
   5. Testing Services.
   6. Manufacturers' Field Services.

1.2 QUALITY ASSURANCE - CONTROL OF INSTALLATION

A. The Contractor shall monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. If the manufacturer's instructions conflict with Contract Documents, request clarification from Contracting Officer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. If manufacturers' tolerances conflict with Contract Documents, request clarification from Contracting Officer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES AND STANDARDS

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Notice to Proceed, except where a specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. Neither contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Contracting Officer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.5 MOCK-UP

A. Accepted mock-ups shall be a comparison standard for the remaining Work. Review the individual Sections for specific mock-up requirements.

B. Where a mock-up has been accepted by the Contracting Officer (or designated representative) and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by the Contracting Officer (or designated representative).

1.6 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to the Contracting Officer thirty (30) days in advance of required observations.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

PART 2 - PRODUCTS

(Not Used).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01410 - TESTING SERVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section includes the following:
   1. Selection and Payment.
   2. Qualification of Testing Agency.
   3. Testing Agency Responsibilities.
   4. Limitations of Authority of the Testing Agency.
   5. Contractor's Responsibilities.
   6. Schedule of Tests.

1.2 SELECTION AND PAYMENT

A. The General Contractor shall employ directly independent firm(s) to perform field and laboratory tests. The Contractor shall cooperate fully with and furnish materials, facilities, and attendants in the field to such firm(s) for the said services. The Contracting Officer reserves the right to include any additional field and/or laboratory testing(s) of any kind, not specified in the said program but deemed necessary.

B. Testing Agency shall review the drawings and specifications and shall work with the General Contractor to prepare a schedule of testing for this project. Testing work shall not begin until this schedule has been approved by the Contracting Officer (or designated representative).

1.3 QUALIFICATION OF TESTING AGENCY

A. Testing Agency shall meet the basic requirements of ASTM E329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as used in Construction."

B. Laboratory and staff shall be authorized to operate in State in which the project is located.

1.4 TESTING AGENCY RESPONSIBILITIES

A. Test samples of mixes submitted by the Contractor.

B. Provide qualified personnel at site.

C. Cooperate with Architect and Contractor in performance of services.

D. Perform specified sampling and testing of materials and methods of construction in accordance with specified standards.

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

F. Promptly notify the Architect and Contractor of observed irregularities, deficiencies, or non-conformance of work or materials.

G. Perform additional tests required by the Architect.

H. Promptly provide the AAFES Project Manager with one (1) copy of each written test report, the Architect with one (1) copy of each written test report, and the Contractor with one (1) copy of each test report. Each report shall include:
   1. Date issued.
   2. Project title and AAFES project 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 at the time of sampling.
   7. Date of test.
   8. Identification of product and specification section for which the test was performed.
   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.

1.5 LIMITATIONS OF AUTHORITY OF THE TESTING AGENCY

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

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

C. Testing Agency or laboratory may not perform any duties of the Contractor.

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

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Secure and deliver to the testing agency or laboratory at designated location, adequate quantities of representative samples of materials proposed to be used which require testing.

B. Provide the testing agency with the preliminary design mix proposed to be used for concrete and other products that require control by the testing laboratory.

C. Contractor shall work with the Testing Agency to prepare a schedule of testing required for this project. Schedule shall be submitted to the Architect for approval prior to the starting of any testing work.

D. Provide copies of product test reports as required.

E. Cooperate with the Testing Agency laboratory personnel and provide access to the Work and to manufacturers' facilities.

F. 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 the source of the products to be tested.
   3. To facilitate inspections and tests.
   4. To provide storage and curing of test samples.

G. Notify testing agency sufficiently in advance of operations to allow for agency assignment of personnel and scheduling of tests.

H. The contractor shall demolish and reconstruct and/or repair any portion(s) of the completed building structure where testing results indicate substandard construction and/or non-compliance with any requirement(s) of this contract, to the extent deemed necessary and in the manner as may be directed by the Contracting Officer (or designated representative). Such remedial work shall be executed at the expense of the contractor and to the satisfaction of the Contracting Officer (or designated representative).

I. The General Contractor shall employ and pay for the services of an independent qualified testing agency to perform additional sampling and testing required by the Contractor beyond the approved testing schedule. This includes the following conditions:
   1. For the Contractor's convenience.
   2. When initial tests indicate work does not comply with the Contract Documents.
   3. When, in the opinion of the Contracting Officer and Architect, 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. Re-tests 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 requirements of the Contract Documents.

1.7 SCHEDULE OF TESTS

A. The following list is given for the Contractor's convenience only. Refer to individual specifications for specific requirements.
   1. SECTION 02750 PORTLAND CEMENT CONCRETE PAVING
   2. SECTION 03300 CAST-IN-PLACE CONCRETE
   3. SECTION 05120 STRUCTURAL STEEL

END OF SECTION

SECTION 01500 - TEMPORARY FACILITIES, BARRIERS, & CONTROLS

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.

1.2 SUMMARY

A. Section includes requirements for support and protection facilities.If needed, insert use-charge requirements for other utilities needed for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
   1. Locations of dust-control partitions at each phase of the work.
   2. HVAC system isolation schematic drawing.
   3. Location of proposed air filtration system discharge.
   4. Other dust-control measures.
   5. Waste management plan.

1.4 QUALITY ASSURANCE

A. Accessible Temporary Egress: Comply with applicable provisions in ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Polyethylene Sheet: Reinforced, fire-resistive sheet, 6 mils minimum thickness, with flame-spread rating of 15 or less per ASTM E 84.

B. Dust Barrier Tape: Pressure sensitive tape of type recommended by polyethylene sheet manufacturer for sealing joints and penetrations.

C. Dust Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).

D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

E. Spring-Loaded Poles, Ceiling/Wall Rails and Side Wall Clamps: Zipwall Barrier Products for fast set-up and break-down dust barrier system that consists of spring-loaded support poles that extend from 4 feet 7 inches to 12 feet that hold plastic sheeting in position as a curtain-barrier. Zipwall, 37 Broadway, Arlington MA 02474. Phone: 1-800-718-2255, website: www.zipwall.com. Also available are longer poles that adjust from 6 foot 9 inches to approximately 21 feet with spring loaded jacks.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Until Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   3. Permanent HVAC System: Not allowed in areas where Polished Concrete Floor Finish operations are in progress.

C. Air Filtration Units: HEPA primary and secondary filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
1. Locate facilities to limit site disturbance as specified in Division 1 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
1. Maintain support facilities until Contracting Officer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

E. Waste Disposal Facilities: Comply with requirements specified in Division 1 Section "Safety Regulations and Codes" and "Waste Disposal."

F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
1. Extent of Fence: As indicated on Drawings.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

B. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

C. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

D. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

E. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.
1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.

F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather-tight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

G. Temporary Barriers: Provide floor-to-ceiling dustproof barriers to limit dust and dirt migration and to separate areas occupied by AAFES and tenants from fumes and noise.
   1. Dust Barrier: Where dust barriers are required, provide a single layer of 6 mil fire resistant clear polyethylene fiberglass reinforced sheet as manufactured by Griffolyn, or equal. Tape all joints and provide fire resistive treated 2 x 4 wood or metal stud top and bottom runners and verticals 4 foot o.c. with polyethylene sheet wrapped and taped to the runners.
      a. Contractor Option: Zipwall temporary barrier system.
      b. Seal Joints and Perimeter: Equip partitions with gasketed dustproof doors and security locks where openings are required. Where practical, locate doors in or towards back of house areas to avoid tracking dust in areas open to the public.
   2. Opaque Dust Barrier: Where dust barriers are required and where indicated for long duration separation of construction operations from AAFES and tenant spaces, provide braced metal stud framing covered on construction side with 6 mil fire resistant clear polyethylene fiberglass reinforced sheet as manufactured by Griffolyn, or equal. Tape all joints and perimeter. Provide ½ inch gypsum board, fire taped on the AAFES/tenant side from floor to ceiling. Provide R-11 batt insulation for thermal separation from unconditioned construction areas and noise reduction adjacent to sales, food service or office areas.
      a. Seal Joints and Perimeter: Equip partitions with gasketed dustproof doors and security locks where openings are required. Where practical, locate doors in or towards back of house areas to avoid tracking dust in areas open to the public.
   3. Security Weather-tight Barrier: Where a secure weather-tight barrier is required and where a temporary exit enclosure through surrounding and overhead construction is indicated, provide braced metal stud framing covered on construction side with ½ inch plywood. Provide ½ inch gypsum board, fire-taped on the AAFES/public side on entire enclosure. Provide R-11 batt insulation for thermal separation from the exterior, unconditioned construction areas and noise reduction adjacent to sales, food service or office areas. Panelize framing for ease of removal and relocation.
      a. Construct vestibule at each access through the barrier with 1-3/4 inch solid core wood doors with ¾" wood frames spaced not less than 6 feet apart. Doors shall be hinged with latches and provided with double high security padlocks in accordance with AAFES security. Maintain water dampened or adhesive surfaced foot mats in vestibules.
      b. At temporary exits, provide individual 1-3/4 inch solid core wood doors with ¾ inch wood frames at each end of the enclosure swinging in the direction of exit. Provide hinges, exit devices and closers. Exit devices to always be operable in the direction of exiting and locked on the opposite side.

H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
   1. Prohibit smoking in construction areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.4 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.

4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48hours are considered defective.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section "Closeout Procedures."

END OF SECTION

SECTION 01570 - CONSTRUCTION & DEMOLITION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section shall include the following:
   1. Salvaging, recycling and disposing of non-hazardous construction waste.
   2. Salvaging, recycling and disposing of construction waste.

B. It is the goal for this project to divert a minimum of 50% of total project waste from landfills including the following materials:
   1. Demolition Waste:
      a. Asphaltic concrete paving.
      b. Concrete and concrete reinforcing steel.
      c. Brick and concrete masonry units.
      d. Wood studs, wood joists, plywood, oriented strand board, paneling and trim.
      e. Casework and cabinetry.
      f. Structural steel, miscellaneous steel and rough hardware.
      g. Roofing.
      h. Insulation.
      i. Doors, door frames and door hardware.
      j. Windows and glazing.
      k. Metal studs.
      l. Gypsum board (new unpainted scrap).
      m. Acoustical tile and panels.
      n. Carpet and carpet pad.
      o. Demountable partitions.
      p. Equipment.
      q. Plumbing fixtures, piping, supports, hangers, valves and sprinklers.
      r. Mechanical equipment and refrigerants.
      s. Electrical conduit, copper wiring, lighting fixtures, lamps, and ballasts.
      t. Electrical devices, switchgear, panelboards and transformers.
   2. Construction Waste:
      a. Site-clearing waste.
      b. Concrete and concrete reinforcing steel.
      c. Masonry and CMU.
      d. Lumber, wood sheet materials and wood trim.
      e. Metals.
      f. Roofing.
      g. Insulation.
      h. Carpet and pad.
      i. Gypsum board.
      j. Piping.
      k. Wire and cable
      l. Electrical conduit.
      m. Packaging: 100 percent of the following uncontaminated packaging materials: Paper, cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates, plastic pails.

1.2 REFERENCES

A. U. S. Army Corps of Engineers
   1. Sustainable Project Rating Tool (SPiRiT) Version 1.4.1.

1.3 DEFINITIONS

A. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waster or debris.

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

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

D. 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.

E. Recycle: Diversion of demolition and construction waste from the landfill for reuse.

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

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

1.4 MANAGEMENT

A. The Contractor shall take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling shall accrue to the Contractor. Firms and facilities used for recycling, reuse, and disposal shall be appropriately permitted for the intended use to the extent required by federal, state, and local regulations.

1.5 PLAN

A. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris. The plan shall include schedules for disposal. The Contractor shall identify any subcontractors responsible for the transportation and disposal of solid waste. Licenses or permits shall be submitted for solid waste disposal sites that are not a commercial operating facility. Evidence of the disposal facility's acceptance of the solid waste shall be attached to this plan during the construction. The Contractor shall attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. The report shall be submitted on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and shall be for the previous quarter (e.g. the first working day of January, April, July, and October). The report shall indicate the total amount of waste generated and total amount of waste diverted in cubic yards or tons along with the percent that was diverted.

B. A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resource. The plan shall detail the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.

C. The plan shall include the following:
   1. Name of individuals on the Contractor's staff responsible for waste prevention and management.
   2. Actions that will be taken to reduce solid waste generation.
   3. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas and equipment to be used for processing, sorting, and temporary storage of wastes.
   4. Characterization, including estimated types and quantities, of the waste to be generated.
   5. Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.
   6. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity.
   7. List of specific waste materials that will be salvaged for resale, salvaged and reused, or recycled. Recycling facilities that will be used shall be identified.

8. Identification of materials that cannot be recycled/reused with an explanation or justification.
9. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

1.6 RECORDS

A. Records shall be maintained to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. The records shall be made available to the Contracting Officer during construction, and a copy of the records shall be delivered to the Contracting Officer upon completion of the construction.

1.7 COLLECTION

A. The necessary containers, bins and storage areas to facilitate effective waste management shall be provided and shall be clearly and appropriately identified. Recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials and separated by one of the following methods:
   1. Source Separated Method.
      a. Waste products and materials that are recyclable shall be separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing.
   2. Co-Mingled Method.
      a. Waste products and recyclable materials shall be placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed.
   3. Other Methods.
      a. Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.8 DISPOSAL

A. Except as otherwise specified in other sections of the specifications, disposal shall be in accordance with the following:
   1. Reuse
      a. First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project.
   2. Recycle
      a. Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible.
   3. Waste
      a. Materials with no practical use or economic benefit shall be disposed at a landfill or incinerator.

PART 2 - PRODUCTS

(Not Used).

PART 3 - EXECUTION

(Not Used).

END OF SECTION

SECTION 01600 - MATERIAL & EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Products.
   2. Transportation and Handling.
   3. Storage and Protection.
   4. Product Options.
   5. Substitutions.
   6. Recycled/Recovered Materials

1.2 REFERENCES

A. Environmental Protection Agency
   1. Comprehensive Procurement Guidelines

B. United States Army Environmental Center
   1. Affirmative Procurement Program

C. The Air Force Center for Environmental Excellence
   1. Air Force Sustainable Facilities Guide

D. U. S. National Archives and Records Administration
   1. 40 CFR 247 Comprehensive Procurement Guideline for Products Containing Recovered Materials.

1.3 PRODUCTS

A. Do not use materials and equipment removed from existing Government premises, except as specifically permitted or directed by the Contract Documents.

1.4 TRANSPORTATION AND HANDLING

A. Transport, handle, and store Products in accordance with the Product manufacturer's instructions.

B. Promptly inspect shipments to ensure that the Products comply with the specified requirements, that the quantities are correct, and that the Products are undamaged.

C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.5 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive Products in weather tight, climate controlled, enclosures in an environment favorable to the Product.

D. For exterior storage of fabricated products, place on sloped supports above the ground.

E. Provide bonded off-site storage and protection when the site does not permit on-site storage or protection. Provide the Contracting Officer with access to the off-site storage areas for inspection of the stored materials.

F. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.

G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are

undamaged and are maintained in acceptable condition.

J. Pipe and conduit stored on site shall be stored in racks or blocked to prevent rolling.

1.6 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description and approved by the Contracting Officer.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions permitted.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.7 SUBSTITUTIONS

A. Product substitutions will be considered up to 10 days prior to the award of the contract.

B. Product substitutions shall comply with the following provisions:
1. Substitution requests shall be made at least 10 days prior to award of the contract.
2. If the proposed substitution is rejected by the Contracting Officer, no additional cost will be permitted to furnish the original specified item.

C. Substitutions may be considered by the Contracting Officer when a Product becomes unavailable through no fault of the Contractor.

D. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

E. A request constitutes a representation that the Bidder:
1. Has investigated the proposed Product and determined that it meets or exceeds the quality level of the specified Product.
2. Will provide the same warranty for the substitute product as for the specified Product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to AAFES.
4. Waives claims for additional costs or time extension which may subsequently become apparent.

F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without prior separate written request and approval.

G. Do not substitute materials or equipment unless such substitution has been specifically approved for this Work by the Contracting Officer (or designated representative).

H. Substitution Submittal Procedure:
1. Submit three (3) copies of request for Substitution for consideration to the Contracting Officer. Limit each request to one proposed Substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on the proposer.
3. The Contracting Officer will notify the Contractor in writing of decision to accept or reject the request prior to the bid due date.
4. The decision of the Contracting Officer regarding all substitutions shall be final.

1.8 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing supplier's employees to undue hazards from recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range or recovered or recycled materials. The Contractor shall make all reasonable efforts to use recycled and recovered materials in providing EPA designated products and otherwise utilizing recycled and recovered materials in the execution of the work.

B. To the greatest extent possible, provide environmentally preferable products and materials that have a lesser or reduced effect on the environment considering raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, and/or disposal of the product

C. Provide products listed on the EPA Comprehensive Procurement Guidelines to the greatest extent practicable. Refer to individual specification sections for specific recycled content requirements.

D. The following “Affirmative Procurement Reporting Form” shall be submitted with project closeout documents.

PART 2 - PRODUCTS

(Not Used).

PART 3 - EXECUTION

(Not Used).

END OF SECTION

AFFIRMATIVE PROCUREMENT REPORTING FORM

Project Name: _____ Project Number: _____

Contractor Name: _____ License Number: _____

Contractor Address: _____

Product	Total $ value provided	Total $ value w/ recycled content Pre-consumer	Total $ value w/ recycled content Post-consumer	Total $ value w/ biobased content	Exempted indicate 1,2,3,4	Comments
Hydraulic Mulch (paper based)						
Hydraulic Mulch (wood based)						
Compost						
Parking Stops (Concrete w/ fly ash, slag cement or low cement content)						
Parking Stops (Plastic/Rubber)						
Patio Blocks/Rubber						
Patio Blocks/Plastic						
Playground Surfaces						
Concrete w/ fly ash						
Concrete w/ slag cement						
Concrete w/ low cement content						
Plastic lumber						
Building Insulation						
Rock Wool						
Fiberglass						
Loose Fill/Spray On						
Perlite Comp Board						
Plastic Rigid Foam						
Glass Fiber Reinf Foam						
Phenolic Rigid Foam						
Ceramic tile						
Resilient flooring						
Floor Tiles/Rubber						
Floor Tiles/Plastic						
Running Tracks						
Carpet (PET)						
Paint						
Reprocessed Latex Paint White & Light Colors						
Reprocessed Latex Dark Colors						
Consolidated Latex Paint						
Toilet/shower partitions (plastic)						
Other						

CERTIFICATION

I hereby certify the information provided herein is accurate and that the requisition/procurement of all materials listed on this form comply with current EPA standards for recycled/recovered materials content.

The following exemptions may apply to the non-procurement of recycled/recovered content materials:

1) The product does not meet appropriate performance standards
2) The product is not available within a reasonable time frame
3) The product is not available competitively (from two or more sources)
4) The product is only available at an unreasonable price (compared with a comparable non-recycled content product.)

Signature: _____ Date: _____

SECTION 01710 - CUTTING & PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes the following:
   1. Requirements and limitations for cutting and patching of Work.

B. Division 15: Mechanical

C. Division 16: Electrical

1.2 SUBMITTALS

A. Submit written request to the Contracting Officer in advance of cutting or alteration which affects:
   1. Structural integrity of any element of the Project.
   2. Integrity of weather exposed or moisture resistant elements.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of AAFES or separate contractor.

B. Include in request:
   1. Identification of Project Name and Project Number.
   2. Location and description of affected Work.
   3. Necessity for cutting or alteration.
   4. Description of proposed Work and Products to be used.
      a. Scope of cutting and patching.
      b. Trades to execute work.
      c. Products proposed to be used.
      d. Extent of refinishing
   5. Alternatives to cutting and patching.
   6. Effect on other work.
   7. Effect on structural integrity of the project.
   8. Effect on work of AAFES or separate contractor.
   9. Written permission of affected separate contractor.
   10. Date and time work will be executed.

C. Submit cost estimate prior to the start of work for cutting and patching requested by the Contracting Officer that is beyond the contract requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Primary Products: Those required for the original installation.

B. Product substitution: For any proposed change in materials, submit request for substitution under provisions of specification SECTION 01600 - MATERIAL & EQUIPMENT.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

B. After uncovering existing Work, assess conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering work.

C. Maintain excavations free of water.

3.3 CUTTING

A. Execute cutting and fitting including excavation and fill to complete the work.

B. Uncover work to install improperly sequenced work.

C. Remove and replace defective or non-conforming work.

D. Remove samples of installed work for testing when specified or requested by the Contracting Officer.

E. Provide openings in the work for penetration of mechanical and electrical work.

F. Remove work to provide for alteration of work.

G. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

H. Cut rigid materials using masonry saw or core drill. Use of pneumatic tools must be approved.

I. Do not endanger any work by cutting or altering work or any part of the work.

J. Do not cut or alter work of another contractor without written consent of the Contracting Officer.

K. Upon receipt of written instructions from the Contracting Officer, uncover work to provide for Contracting Officer's observation of covered work. All costs associated with cutting/patching to uncover work shall be borne by the Contractor.

3.4 PATCHING

A. Execute patching to complement adjacent Work.

B. Fit products together to integrate with other Work.

C. Work shall be executed utilizing methods that avoid damage to other Work. Provide appropriate surfaces to receive patching and finishing.

D. The original installer shall perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.

E. All patching shall be completed utilizing new products. Refer to the appropriate specification sections for product requirements.

F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. After cutting and/or patching, refinish surfaces to match adjacent finish. For continuous surfaces, refinish to the nearest intersection or natural break point. For an assembly, refinish the entire unit.

END OF SECTION

SECTION 01710 - CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes the following:
   1. Safety Requirements.
   2. Progress Cleaning and Waste Removal.
   3. Final Cleaning.

1.2 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 Army & Air Force Exchange Service General Provisions, Paragraph: Accident Prevention.

B. OSHA Standards:
   1. The Contractor shall be required to comply with OSHA Standards. 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.

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 installation.
   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.
   4. Do not dispose of wastes in AAFES' or the Installation's dumpsters.

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 AND WASTE REMOVAL

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. Collect and remove waste materials, debris, and rubbish from the site in a timely manner and legally dispose of at public or private dumping areas off of Government property.

E. Broom and vacuum clean interior areas prior to the start of surface finishing. 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.

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

H. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

I. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

3.2 FINAL CLEANING

A. Employ professional cleaners for final cleaning.

B. In preparation for substantial completion or occupancy by AAFES, 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 substances 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. Clean site; broom clean paved areas; rake clean landscaped surfaces.

G. Clean all exterior and interior glass.

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

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

J. Replace filters of equipment operated during construction.

K. Remove waste and surplus materials, rubbish, construction facilities, tools, equipment, and machinery from the site.

L. Maintain cleaning until project, or portion thereof, is occupied by AAFES under the Substantial Completion provisions of Specification SECTION 01750 - PROJECT CLOSEOUT.

END OF SECTION

SECTION 01750 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes the following:
1. Substantial Completion.
2. Final Inspections.
3. Project Record Documents.
4. Operation and Maintenance Data.
5. Operation and Maintenance Instruction.
6. Preparation of DD Form 1354 “Transfer and Acceptance of Military Real Property”.
7. Warranty and Extended Warranties.

1.2 SUBSTANTIAL COMPLETION

A. Contractor’s Responsibility:
1. Submit written certification to the Contracting Officer that Contract Documents have been reviewed and that Work is complete in accordance with the Contract Documents and the project, or designated portion of the 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 Contractor’s certification.

C. Should the Contracting Officer consider that the Work is substantially complete:
1. The Contractor shall prepare, and submit to the Contracting Officer, a list of items to be completed or corrected, as determined by the inspection.
2. The Contracting Officer will prepare and issue a Certificate of Substantial Completion, containing:
a. Date of Substantial Completion.
b. The Contractor's list of items to be completed. The Contractor’s list shall be corrected, verified, and amended by the Contracting Officer.
c. The time within which the Contractor shall complete or correct the 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:
1) Utilities.
2) Operation of mechanical, electrical, and other systems.
3) Maintenance and cleaning.
4) Security.
f. Signatures of:
1) Contracting Officer.
2) Contractor.
3. AAFES occupancy of project or designated portion of project:
a. Contractor shall:
1) Perform final cleaning in accordance with Specification SECTION 01720 - CLEANING.
b. AAFES will occupy project, under provisions stated in Certificate of Substantial Completion.
4. Contractor shall complete work listed for completion or correction, within designated time.

D. Should the Contracting Officer consider that the Work is not substantially complete:
1. The Contracting Officer shall immediately notify the Contractor, in writing, stating reasons.
2. The Contractor shall complete work, and send second written notice to the Contracting Officer, certifying that the project, or designated portion of the project, is substantially complete.
3. The Contracting Officer will reinspect the work.

1.3 FINAL INSPECTION

A. Prior to final inspection, the Contractor shall submit written certification that:
1. The Contract Documents have been reviewed by the Contractor.
2. The project has been inspected for compliance with the Contract Documents.
3. The Work has been completed in accordance with the Contract Documents.
4. The equipment and systems have been tested in the presence of AAFES, and the Installation’s

Representatives, and are fully operational.

5. The 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, the Contracting Officer shall request that the Contractor complete the project closeout submittals.

D. Should the Contracting Officer consider that work is not finally complete:
   1. The Contracting Officer shall notify the Contractor, in writing, stating the reasons.
   2. The 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 the work after receipt of certification.

1.4 PROJECT RECORD DOCUMENTS

A. Project Record Documents: Specified requirements of SECTION 01760 - PROJECT RECORD DOCUMENTS.

1.5 PREPARATION OF DD FORM 1354 “TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY”

A. At the conclusion of the project the Contractor shall compile and furnish to the Contracting Officer certain costs and quantity data of materials and systems furnished and installed.

B. A list of items for which the costs and quantity data are required will be furnished to the Contractor by the Contracting Officer.

C. A Completed DD Form 1354 shall be returned to the Contracting Officer within ten (10) days from the receipt of the list of items.

D. A completed and approved DD Form 1354 must be submitted to the Contracting Officer prior to final payment.

1.6 WARRANTY AND EXTENDED WARRANTIES:

A. Upon completion of project, prior to final payment, guarantees required by technical divisions of the Specifications shall be properly executed in six (6) copies by subcontractors and submitted to the Contracting Officer. Delivery of guarantees shall not relieve the Contractor from any obligation assumed under contract.

B. Submit guarantee covering entire project for one year.

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 or neglect by AAFES, or their successor(s) in interest.

PART 2 - PRODUCTS

(Not Used).

PART 3 - EXECUTION

(Not Used).

END OF SECTION

SECTION 01760 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes the following:
   1. Project Record Document Maintenance Procedures.
   2. Project Record Document Submittal Procedures.

1.2 MAINTENANCE OF DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the work:
   1. Contract Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders, Field Orders, Requests for Information, Clarifications, and other modifications to the Contract.
   5. Reviewed Shop Drawings, Product Data and Samples.
   6. Manufacturer's Instructions for assembly, installation, and adjusting.
   7. Field Test Records.

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

C. Provide files and racks for storage of documents.

D. File documents in accordance with the 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 the Contracting Officer.

1.3 MARKING DEVICES

A. Provide red colored pencils for all marking.

1.4 RECORDING

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

B. Record information concurrent with construction progress.

C. Ensure entries are complete and accurate, enabling future reference by AAFES.

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

E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundation in relation to finish floor datum.
   2. Measured Horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.
   3. Measured locations 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, Field Order, Requests for Information, or Clarifications.
   6. Details not on original contract drawings.

F. Specifications: Legibly mark and record at each Product Section description of actual products installed including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda, Change Order, Field Orders, Requests for Information, Clarification, and other modifications.

1.5 PROJECT RECORD DOCUMENT SUBMITTAL PROCEDURES

A. At completion of project, deliver record documents to the 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.

PART 2 - PRODUCTS

(Not Used).

PART 3 - EXECUTION

(Not Used).

END OF SECTION

SECTION 02111 - SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal of surface debris.

B. Removal of asphalt paving, concrete paving, curbs, and curb and gutter.

C. Removal of existing utilities, as indicated on the drawings.

D. Removal of existing fence.

E. Provisions for protection, removal, replacement and disposal.

1.2 REGULATORY REQUIREMENTS/REFERENCES

A. Contractor is required to have an approved dig permit prior to beginning any excavation on Fort Bragg. Dig permit shall be coordinated with DPW Service Orders, 910-396-0321. A copy of the dig permit will be maintained on the job site for the duration of the project.

B. Streets, roads, trees, adjacent property, and other works to remain shall be protected throughout the work by the General Contractor.

C. Maintain all bench marks, monuments, and other reference points. If disturbed or destroyed, replace as directed by the Contracting Officer. Contractor shall contact contracting officer if additional bench mark information is required.

1.3 GENERAL

A. Underground Utilities:
   1. Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location, identification and elevation of the existing utilities indicated prior to starting construction.

B. Protection and Removal of Utility Lines
   1. Existing utility lines that are shown on the plans or the locations of which are made known to the Contractor prior to excavation and that are to be retained, as well as utility lines constructed during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor at no expense to AAFES. In the event that the Contractor damages existing utility lines that are not shown on the plans, or the locations of which have not been known to the Contractor, report of such damage shall be made immediately to the Contracting Officer. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall notify the Contracting Officer in ample time for the necessary measures to be taken to prevent interruption of the service.
   2. The contractor shall be required to hand excavate adjacent to active utilities. Any damages to existing utilities shall be repaired by the Contractor at no cost to AAFES.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Equipment shall be at the Contractor's option.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Prior to commencement of work, the contractor shall identify the proper area for placing removed materials.

3.2 PROTECTION

A. Where pedestrian and driver safety is endangered, use traffic barricades with flashing lights.

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

C. Protect benchmarks, survey control points, pavements to remain, existing structures, and all existing facilities which remain from damage or displacement.

D. Provide contractor design shoring, bracing and protection systems as required to prevent damage or displacement to new work and existing facilities.

3.3 REMOVAL / DEMOLITION

A. Remove asphalt paving, concrete paving, curbs, and curb and gutter in their entirety as indicated on the drawings. Neatly saw cut edges at right angle to surface.

B. Remove existing utilities, utility piping, utility poles and all structures in their entirety as indicated on the drawings.

C. Remove existing fence, including pickets, line posts, and concrete foundations in there entirety as indicated on the drawings.

3.4 REPLACEMENT OF DAMAGED AREAS

A. Contractor shall repair or replace at no additional cost to the AAFES any damage resulting from, or incidental to, construction.
   1. Replacement or repair of seeded areas, sod, bituminous pavement and concrete pavement, structures, shrubbery, trees, drives, walks, and/or fences damaged by construction work, or work incidental thereto, shall be preformed by the Contractor as soon as is practical.
   2. Replacement shall include existing trees and shrubs not scheduled for removal, that do not show definite signs of life and/or satisfactory growth during the growing period following construction.

B. Where removals leave holes and damage surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces.

3.5 DISPOSAL

A. Removing From Construction Site:
   1. All concrete, asphalt pavement, excavated materials, below grade utilities and structures, and demolition debris not required for construction shall be removed from Government property and disposed of at a State approved location.
   2. The General Contractor shall be responsible for contacting the DPW Point of Contact, prior to the start of excavation and disposal of materials.
   3. Burning shall not be permitted.

3.6 DRAINAGE / DEWATERING

A. See specification SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS for requirements.

3.7 QUALITY CONTROL

A. The Contractor shall establish and maintain quality control for operations under this section to ensure compliance with contract requirements and maintain records of his quality control for all materials, equipment, and construction operations, including but not limited to the following:
   1. Clear areas flush or below original ground surface.
   2. Disposal of cleared and grubbed materials.

B. A copy of these records and Contractor tests, as well as the records of corrective action taken, shall be furnished to Base Engineering as directed by the Contracting Officer.

END OF SECTION

SECTION 02750 – SITE CONCRETE WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this section includes the following:
   1. Concrete Pavement
   2. Curbs
   3. Sidewalks
   4. Jointing Materials

1.2 REFERENCES

A. American Concrete Institute (ACI)
   1. ACI 318 Building Code Requirements for Reinforced Concrete.

B. ASTM International
   1. ASTM A 185 - Welded Steel Wire Fabric for Concrete Reinforcement
   2. ASTM A 615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement, Grade 60
   3. ASTM C 33 - Concrete Aggregate
   4. ASTM C 94 - Ready-Mixed Concrete
   5. ASTM C 143 - Slump of Hydraulic Cement Concrete
   6. ASTM C 150 - Portland Cement
   7. ASTM C 171 - Sheet Materials for Curing Concrete
   8. ASTM C 172 -Sampling Freshly Mixed Concrete
   9. ASTM C 173 - Air Content of Freshly Mixed Concrete by the Volumetric Method
   10. ASTM C 309 - Liquid Membrane-Forminf Compounds for Curing Concrete
   11. ASTM D 422 - Particle-Size Analysis of Soils
   12. ASTM D 1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

C. Federal Specifications (FS)
   1. FS SS-S-1401 - (Rev. C) Sealants, Joint, Non-Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Asphalt Concrete pavements.

D. North Carolina, Department of Transportation (NCDOT)
   1. Standard Specifications for Construction.
      a. The provisions therein for method of measurement and payment do not apply. References to “Engineer” and “State” shall be interpreted to mean “Contracting Officer” and “Federal Government” respectively.

1.3 PERFORMANCE REQUIREMENTS

A. Paving: Designed for parking, light duty commercial vehicles, and movement of trucks up to 60,000 lbs

1.4 QUALITY ASSURANCE

A. Except as modified herein or as indicated, work and materials shall be performed in accordance with the NCDOT Standard Specifications for Construction.

1.5 JOB CONDITIONS

A. Weather Limitations
   1. The temperature of the concrete as deposited in the forms shall not be less than 50 degrees F nor more than 85 degrees F.
   2. Concrete shall not be placed when the ambient atmospheric temperature is less than 40 degrees F, nor when the concrete is likely to be subject to freezing weather before final curing unless specifically authorized by the contracting officer. When authorized, heating of concrete will be required and all methods and equipment for heating shall be subject to approval.
   3. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE COURSE:

A. Sub Base material shall have a minimum California bearing ratio (CBR) of 10.

2.2 FORMWORK

A. Form Materials: Conform to ACI 301.

B. Forms shall be of steel, except that wood forms may be used on curves having a radius of 150 feet or less, and for fillets.

C. Forms shall be equal in depth to the edge thickness of the slab as shown on the drawings.

D. Forms shall be in one piece for the full depth required except where the drawings require several different slab thicknesses, forms may be built-up with metal or wood to provide an increase in depth of not more than 26 percent.

1. Steel forms shall be furnished in sections not less than 10 feet in length, except that on curves having a radius of 150 feet or less, the length of the sections shall be 5 feet unless the sections are flexible or curved to the proper radius. Each 10-foot length of form shall be provided with at least three form braces and pin sockets so spaced that the form will be rigidly braced throughout its length. Lock joints between form sections shall be free from play or movement. Forms shall be free of warps, bends, or kinks. The top surface of a form shall not vary more than 1/8 inch in 10 feet from a true line. The face of the form shall not vary more than 1/4 inch in 10 feet from a true plane. Forms with battered top surfaces or distorted faces or bases shall be removed from the project.
2. Wood forms for curves and fillets shall be made of well-seasoned, surfaced plank or plywood, straight, and free from warp or bend. Wood forms shall be adequate in strength and rigidly braced.

2.3 REINFORCEMENT

A. Reinforcing Steel: ASTM A615; 60 ksi yield grade; deformed billet steel bars; unfinished finish.

B. Welded Steel Wire Fabric: Plain type, ASTM A185; in flat sheets; unfinished.

C. Dowels: ASTM A615; 60 ksi yield grade, plain steel, unfinished finish.

2.4 CONCRETE MATERIALS

A. Portland Cement
1. ASTM C150, Type I or II, at the contractor's option.
2. Temperature of cement shall not be over 140 degrees F when delivered to the batching plant.

B. Aggregates:
1. Fine Aggregate - ASTM C33, Clean and graded from 1/4 inch to fines.
2. Coarse Aggregate - ASTM C33, clean and graded in conformance with size No. 57.

C. Air Entraining Admixture:
1. The admixture shall be free of chlorides with formulation being adjusted to provide the recommended percentage of free air.

D. Water:
1. Clean and Potable, free of impurities detrimental to concrete.

E. Curing Materials:
1. The use of covering material that contains or becomes contaminated with sugar in any form, tannic acid or any other substance detrimental to Portland Cement concrete will not be permitted.
   a. Polyethylene Sheeting shall be white, opaque, free of visible defects, uniform in appearance, and shall be not less than 0.004 inch thick. Polyethylene sheeting shall conform to the water retention requirements of ASTM C171.
   b. Waterproof paper shall conform to ASTM C171. The top side of the waterproof paper shall be white.

2.5 JOINT FILLER

A. For expansion joints.
   1. Shall conform to Section 1028 “Joint Materials" of the NCDOT Standard Specifications for Roads and Structures, 1995, for the type specified on the plans or in the Contract.

B. Sealant, Joint, Non Fuel Resistant, Hot Applied
   1. FS SS-S-1401, for Portland Cement and Asphalt Concrete Pavements.

2.6 CONCRETE MIX DESIGNS:

A. General:
   1. For additional requirements see paragraph herein entitled “Inspection and Testing”.
   2. Laboratory test reports shall be identified with project location and submitted to the Architect for approval.
   3. The contractor shall be responsible to coordinate testing procedures with the laboratory and be responsible for incorporating into the paving concrete of the minimum strengths specified.

B. Concrete Mix Design:
   1. Strength and Slump: 4000 PSI at 28 days
   2. Air Entrainment: 5 to 7%
   3. Slump: 3 to 5 inches
   4. The water content of the concrete will be the minimum necessary to obtain the workability required for the specific conditions and methods of placement.

PART 3 - EXECUTION

3.1 INSTALLATION OF BASE COURSE

A. No work shall proceed on pavement course until the base has been satisfactorily installed and inspected.

3.2 FORM SETTING

A. The forms shall be set in firm soil cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire length and base width.

B. The form sections shall be staked into position and tightly locked together.

C. The length of pins and quantity provided in each section shall be sufficient to hold the form at the correct line and grade.

D. When tested by a 10 foot straightedge the top of the form shall conform to the requirements specified for the finished surface of the concrete, and the longitudinal axis of the upstanding leg shall not vary more than 1/4 inch from the straightedge.

E. Conformity to the alignment and grade elevations shown on the drawings shall be checked, and necessary corrections shall be made immediately prior to placing the concrete.

F. The forms shall be cleaned and coated with non-staining form oil before being set in place.

3.3 PLACING CONCRETE

A. Place concrete in accordance with NCDOT Section 03300 Portland Cement Concrete Pavement.

B. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

C. Items to be embedded in the concrete shall be positioned accurately before placing concrete and held securely in position.

D. No concrete shall be placed until preparatory work (forms, reinforcement, subgrade, etc) has been approved by the project inspector. Each time the contractor intends to place concrete he shall notify the inspector and obtain approval. The contractor shall notify the inspector at least 24 hours before the intended time for placement.

E. Prior to placement of concrete the forms and subgrade shall be free of debris, ice, snow, extraneous oil, or other harmful substances or coatings. Any oil on the reinforcing steel or other surfaces required

to be bonded to the concrete shall be removed. Rock surfaces shall be cleaned by wire brush scrubbing, as necessary, and shall be wetted immediately prior to placement of concrete. Placement of concrete on mud, dried earth, uncompacted fill or frozen subgrade will not be permitted.

F. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

G. Concrete shall be distributed so that when consolidated and finished, the grade, surface elevation, and dimensions at all points are as required.

H. All edges that will be exposed to view when the structure is completed shall be given a 3/4 inch chamfer unless the edge is indicated to be rounded by a finishing tool. Chamfers shall be made by placing suitable forming strips inside the forms.

I. Concrete shall be deposited in the forms as closely as possible to its final position. Concrete shall not be dropped from higher than 2 feet above the surface where it is being deposited. Chutes, pipes or "elephant trunks" will be used where required to distribute the concrete and to avoid dropping the concrete. Concrete shall be thoroughly distributed and worked into corners and around reinforcement as required to prevent formation of voids in the concrete.

J. Concrete shall be thoroughly consolidated by vibrating, rodding, or tamping. Mechanical vibrators shall be used wherever possible. Vibration shall not be applied directly to the reinforcing steel or to the forms.

K. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete damaged in form removal shall be repaired promptly by the contractor at no cost to AAFES.

L. After removal of forms, formed surfaces shall be patched as follows: Remove loose material, cut back unsound concrete, and voids fill holes with a stiff Portland cement mortar mix. Make patching mortar using some white cement with the regular cement and sand. Mix patching mortar to match surrounding concrete.

3.4 JOINTS

A. Joints shall conform to the details indicated and shall be perpendicular to the finished grade of the pavement.

B. Transverse expansion and contraction joints shall be straight and continuous from edge of the pavement.

C. Expansion Joints shall be formed of preformed filler material. The filler shall be securely held in position by means of approved metal supports which shall remain in the pavement. A removable metal channel cap bar shall be used to hold the parts of the joint in proper position and protect the filler from damage during concreting operations. The cap bar shall be removable without damage to the pavement to provide a space for sealing of the joint. Adjacent sections of filler shall be fitted tightly together and the filler shall extend across the full width of the paving lane in order to prevent entrance of concrete into the expansion space. Expansion joints shall be formed about structures and features that project through, into, and against the pavement, using joint filler of the type, thickness, and width indicated, and installed in such a manner as to form a complete, uniform separation between the structure and pavement.

D. Construction Joints: Provide if an emergency stop occurs. Remove the concrete back to indicated location of expansion joint and install dowelled construction joint as shown.

E. Sealing Joints: Joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit, as directed. Crimping or sawing of filler-type joints shall be accomplished immediately before sealing of the joints.

F. Grooving and Sealing Cracks: Random cracks, except those specifically excluded by the Architect, that occur in the pavement during construction shall be grooved and sealed. The top of the crack shall be grooved to a depth of 3/4 inch and to a width not less than 3/8 inch nor more than 5/8 inch by means of an approved mechanical grooving machine. The grooving tool shall be capable of following closely the path of the crack and of widening the top of the crack to the required section without damaging the concrete. Loose material shall be removed and the groove shall be completely sealed with an approved type of joint sealing material.

3.5 FINISHING

A. Formed Surfaces: Fins and loose material shall be removed. Unsound concrete and voids shall be cut back to solid concrete, reamed, brushed-coated with cement grout, and filled solid with a stiff Portland-cement-sand mortar mix. Patchwork shall finish flush with adjoining concrete surfaces and, where exposed, shall match adjoining surfaces in texture and color. Patchwork shall be cured for 72 hours. White Portland cement shall be used as needed to attain color match.

B. Unformed Surfaces: Surfaces shall be finished to a true plane with no deviation exceeding 5/16 inch when tested with a 10-foot straightedge. Surfaces shall be pitched to drains. Surfaces shall be screeded and floated to the required level with no coarse aggregate visible before finishing as specified below.
   1. Monolithic Finish: Monolithic finish shall be given to slabs unless otherwise specified. After the surface moisture has disappeared, floated-surfaces shall be steel-troweled to a smooth, even, dense finish free from blemish including trowel marks.
   2. Nonslip Finish: Nonslip finish shall be given to stair treads, landings, exterior building entrances, vestibules, and sidewalks so indicated by brooming with a fiber-bristle brush in a direction transverse to that of main traffic.

3.6 PATCHING

A. Patch to match material, color and texture of surrounding area.

B. Replace defective work if patching is not acceptable to Contracting Officer.

3.7 CURING AND PROTECTION

A. Curing:
   1. Immediately after the finishing operations, the exposed concrete surface shall be cured.
   2. Immediately after finishing the concrete, the exposed surfaces shall be coated with a membrane-forming curing compound. The compound shall be applied in 2 coats by hand-operated pressure sprayers at coverage of approximately 200 square feet per gallon for each coat. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above at no additional cost to the Government. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected for seven days from pedestrian and vehicular traffic and from any other action which might disrupt the continuity of the membrane.

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.

3.8 CONCRETE INSPECTION AND TESTING

A. The Contractor will employ and pay for concrete testing services as follow:
   1. Perform concrete inspection and tests as listed in “Methods and sampling and Testing”, ASTM C94 latest edition, ACI 301, Chapter 16; and as specified, all in accordance with specification Section 01410 – Testing Services. The more stringent requirements shall be followed.

B. Concrete Test:
   1. Air content test shall be made in accordance with ASTM C 173. Test for determining air content shall be made each time test beams are fabricated.
   2. Slump test of concrete shall be made in accordance with ASTM C 143. At least one slump test shall be made each time test beams are fabricated.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section shall include the following:
   1. Formwork for cast-in place concrete, bracing and anchorage.
   2. Form accessories.
   3. Cast-in-place Concrete Foundation Walls.
   4. Floors and Slabs on Grade.
   5. Control, Expansion and Contraction Joints Associated with Concrete Work.
   6. Vapor Barrier.
   7. Concrete Sealer.

1.2 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Concrete:
   1. The provisions of ACI-306 shall be followed for all concrete placed or cured when the average daily temperature is below 40° F. The methods of protection used for cold weather concreting shall be submitted in writing to the Architect for review at least one week prior to cold weather placement.
   2. Plan construction schedule and obtain needed materials and equipment on the job site in advance of cold weather.
   3. All reinforcement, formwork and subgrades shall be clear of ice and snow, and be above 40° F. at time of placement of concrete.
   4. The concrete temperature as discharged shall not be less than 50° F. nor greater than 70° F. The temperature of the concrete being discharged shall be tested by the testing agency whenever cylinders are cast, and hourly by the Contractor. The Contractor shall maintain and submit same to the Architect weekly

B. Hot Weather Concrete:
   1. The provisions of ACI-305 shall be followed for all concrete placed when the air and/or form temperature is greater than 90° F. NOTE: Concrete protection during windy conditions combined with hot and/or low humidity shall also conform to ACI-305. The methods of protection used for hot weather concreting shall be submitted in writing to the Architect for review at least one week prior to hot weather placement.
   2. Plan construction schedule and obtain needed materials and equipment on the job site in advance of hot weather.
   3. The Contractor and ready-mix supplier shall review concrete mixes for use in hot weather with respect to placing requirements, strength and durability.
   4. Concrete temperatures as discharged from the truck shall not exceed 80° F. Ice, if used, shall be considered part of the total mix water (50 lbs. ice = 6 gallons of water).
   5. Cool and moisten formwork and subgrade by sprinkling with water prior to placing concrete.
   6. Placement and Finishing:
      a. Concrete shall be discharged from truck a maximum of one hour after the introduction of mix water to cement and aggregates.
      b. Strike off and screed slabs immediately. Protect slab's surface against moisture loss prior to final finishing.
      c. Thoroughly vibrate through all wall and column lift lines and adjacent slab placements, to prevent cold joints.
   7. Finishing operations should be started as soon as concrete is ready. Should plastic shrinkage cracking occur, fog sprays should be available.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Acquire cement and aggregate from same source for all work.

PART 2 - PRODUCTS

2.1 FORMWORK

A. Preformed Steel Forms: Minimum 16 gage 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.

C. Earth Forms: Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

D. Formwork Accessories:
1. Form Ties: Snap-off type, plastic, fixed length, cone type free of defects.
2. 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.
3. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

2.2 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars.

B. Welded Steel Wire Fabric: ASTM A185 Plain Type; in flat sheets or coiled rolls; unfinished.

C. Tie Wire: Minimum 16 gage annealed type.

D. Chairs, Bolsters, Bar Supports, 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.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal.

B. Cementitious Material:
1. Use 40% less Portland cement than a traditional concrete by using less cement, or substituting 40% of the cementitious material with slag cement or other recycled cementitious material. If fly ash is used as a replacement for Portland cement at the 40% level, provide test data demonstrating compatibility and performance satisfactory to Architect.

C. Fly Ash: Comply with ASTM C618, Type C. Report the chemical analysis of the fly ash in accordance with ASTM C311. Evaluate and classify fly ash in accordance with ASTM D5759.
1. Recycled Content: Minimum 20 percent pre-consumer recycled content at contractor’s option.

D. Slag Cement: Comply with ASTM C989.
1. Recycled Content: Minimum 20 percent pre-consumer recycled content at contractor’s option.

E. Fine and Coarse Aggregates: ASTM C33.

F. Water: Clean, potable, and not detrimental to concrete.

2.4 ADMIXTURES

A. Air Entrainment: ASTM C260.

2.5 ACCESSORIES

A. Vapor Barrier under all concrete slabs.
1. Vapor barrier shall be an approximate 12 mil thick reinforced polyethylene membrane. Membrane shall have a water permeance less than .03 perms.
2. Manufacturer:
a. Fortifiber Corp. - Moistop
b. Raven Industries - Duraskrim 12 BBR
c. Approved Equal
3. Joints shall be sealed with moisture resistant self-adhesive tape.

B. Curing Membrane:
1. All curing membranes shall be sheet plastic of 6 mil weight.

2. A combination sheet plastic and paper or equal conforming to ASTM C-171.

C. Non-Shrink Grout:
1. Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.6 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler Type A: ASTM D994; Asphalt impregnated fiberboard or felt, 1/4 inch thick.

B. Construction Joint Devices: Integral extruded plastic; formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches; ribbed steel spikes with tongue to fit top screed edge; manufactured by Vinyex or approved equal.

2.7 CURING COMPOUND

A. Membrane curing compound shall be a water-based, dissipating resin type complying with ASTM C309 Type 1 Class B resin type, clear and translucent, VOC compliant.

B. Curing compound shall be one of the following:
1. Day-Chem Rez Cure (J-11-W) - Dayton Superior Chemical Operation
2. Kurez DR - Euclid Chemical Co.
3. 1100-Clear - W.R. Meadows
4. Approved Equal

C. Water: Clear, potable, and not detrimental to concrete.

2.8 CONCRETE SEALER

A. Floor sealer shall be a siloxane-based, anti-spalling penetrating sealer conforming to ASTM C-957. Floor sealer shall be compatible with the curing compound.

B. Subject to compliance with requirements, products that will be incorporated into the work included, but are not limited to the following:
1. As indicated on Finish Plan (CS-1)
a. Euclid Chemical Company, Euco-Guard VOX Siloxane
b. Approved Equal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions prior to the start of the work.

B. Verify requirements for concrete cover over reinforcement.

C. 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 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with the manufacturer's instructions.

B. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

3.3 FORMWORK

A. Erect formwork and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping.

D. Keep form joints to a minimum.

E. Forms for “Smooth Finish” Concrete:
   1. Use steel, plywood or lined board forms.
   2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
   3. Install form lining with close-fitting square joints between separate sheets without springing into place.
   4. Use full size sheets of form lines and plywood wherever possible.
   5. Tape joints to prevent protrusions in concrete.
   6. Use care in forming and stripping wood forms to protect corners and edges.
   7. Level and continue horizontal joints.
   8. Keep wood forms wet until stripped.

F. Apply form release agent on formwork in accordance with manufacturer's recommendations.

G. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight.

H. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

I. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

3.4 REINFORCEMENT 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.

3.5 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

C. Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by taping edges and ends. Tape and seal all penetrations such as conduit and plumbing pipes.

D. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

E. Separate slabs on grade from vertical surfaces with 1/4 inch thick joint filler.

F. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

G. Extend joint filler from bottom of slab to within ½ inch of finished slab surface. Conform to requirements of Specification SECTION 07900 - JOINT SEALERS.

H. Install joint devices in accordance with the manufacturer's installation instructions.

I. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

J. Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor finish.

K. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

L. Place concrete continuously between predetermined expansion, control, and construction joints.

M. Do not interrupt successive placement; do not permit cold joints to occur.

N. Place floor slabs in checkerboard or saw cut pattern.

O. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab

thickness or as indicated on the Contract Documents.

P. Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 feet.

3.6 CONCRETE FINISHING

A. Rough form finish shall be used on all surfaces not exposed to view.

B. Smooth form finish shall be used where membrane waterproofing is applied to foundation wall.

C. Provide formed exposed concrete walls with smooth rubbed finish. Finish shall be applied no later than the day after form removal. Rub surface with abrasive until a uniform color and texture is achieved. No grout should be used other than the cement paste that is drawn from the concrete by the rubbing process.

D. Troweled finish shall be used for all interior floor slabs. Where required by ceramic floor tile setting material manufacturer, provide wood float or steel trowel with light broom finish. Coordinate with tile contractor.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal or as indicated on the Contract Documents.

3.7 CURING AND PROTECTION

A. Concrete floors shall be cured by resin based chemical curing compound, by wet curing, by moisture-retaining cover or by combination thereof. Curing method shall be approved by the Architect prior to placement of concrete slabs on grade. If curing compound is used, it shall be applied in accordance with the manufacturer's written instructions.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.8 CONCRETE SEALER

A. Prepare surface in accordance with manufacturer's written recommendations. Do not acid etch surface. Surface to be free of all dirt and debris. All joint sealants and caulks shall be in place prior to application of sealer.

B. Apply 1 coat of sealer in accordance with manufacture's written recommendations.

3.9 FIELD QUALITY CONTROL

A. Provide free access to Work and cooperate with appointed Testing Agency.

B. Submit proposed mix design of each class of concrete to inspection and Testing Agency for review prior to commencement of Work.

C. Test cylinders will be made, for every 100 cubic yards or fraction thereof of each mixture design of concrete, during the progress of the work. Each test will consist of four cylinders, two for 7 day and two for 28-day strength determinations. One 7-day cylinder shall be field cured in accordance with ASTM C31. General Contractor shall provide a protected storage area for field cured cylinders.

D. Testing will be performed in accordance with ASTM C39 by an independent testing laboratory meeting the requirements of ASTM E 329.

E. Strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength and no individual strength test result falls below the specified strength by more than 500 psi.

F. If 28-day concrete strengths do not satisfy paragraph C., additional testing of concrete will be required; these tests shall be at the Contractor's expense.

G. All concrete that does not meet the strength requirements of this specification is subject to be removed and replaced at no additional expense to the Owner. The General Contractor shall bear all costs of correcting such rejected work, including all embedded items, additional testing and inspections and compensation for the Architect's and/or Engineer's services and expenses made necessary thereby.

3.10 PATCHING

A. Allow Architect to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect upon discovery.

C. Patch imperfections in accordance with ACI 301.

3.11 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 and AAFES Project Manager.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of the Architect and AAFES Project Manager for each individual area.

3.12 SCHEDULE - CONCRETE TYPES AND FINISHES

A. All concrete shall achieve the minimum compressive strengths at 28 days and shall be proportioned per the requirements indicated on the structural drawings. The maximum water/cement ratio shall be 0.50. The air content in exterior slabs shall be between 4.5% and 7.5%

3.13 SCHEDULE - CONTROL JOINTS

A. Control joints shall be placed as indicated on the Contract Documents or as approved by the Architect.

END OF SECTION

SECTION 04300 - MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes the following:
   1. Mortar and grout.
   2. Masonry reinforcement, anchorage, flashing, and accessories.
   3. Concrete masonry units.
   4. Face brick.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units above ground on level platforms which allow air circulation under stacked units.

B. Handle units on pallets or flat bed barrows.

C. Do not permit free discharge from conveyors or transporting in mortar trays.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Masonry construction shall comply with Masonry Industry Council - Hot and Code Weather Masonry Construction.

B. The use of accelerators, antifreezes and calcium chlorides shall not be permitted for cold weather construction.

C. Masonry sand shall be heated when the outside temperature is below freezing.

D. The use of frozen or partially frozen material shall not be permitted.

PART 2 - PRODUCTS

2.1 MORTAR

A. Manufacturers:
   1. Cemex - Rich Color
   2. Essroc Corporation - Brixment in Color
   3. Approved Equal

B. Materials:
   1. Masonry Cement - ASTM C91, Type N
   2. Portland Cement - ASTM C150, Type I gray or white color, as required to produce required mortar color.
   3. Masonry Sand - ASTM C144, standard masonry type.
   4. Hydrated Lime - ASTM C207, Type S.
   5. Water - Clean and potable.

C. Mortar Color:
   1. Brick - See Exterior Finish Materials List on the drawings.
   2. Concrete Masonry Units - See Exterior Finish Materials List on the drawings.

D. Admixtures:
   1. Admixtures other than antifreeze compounds may be used in the mortar subject to prior approval by the Architect. The admixture shall not adversely affect mortar bond, color, or compressive strength of mortar designed without use of admixture. The admixture shall not contain calcium chloride, chloride salts, or any other chemical that will deleteriously affect metals embedded in mortar including coatings.

E. Mortar Mixes:
   1. ASTM C270, Type N using the Proportion Specification.
   2. Contractor, at his option, may use a masonry cement mix or a Portland cement and lime mix.

F. Mortar Mixing:
   1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.

2. Maintain sand uniformly damp immediately before the mixing process.
3. Where permitted, add admixtures in accordance with the manufacturer's instructions. Provide uniformity of mix and coloration.
4. Do not use anti-freeze compounds to lower the freezing point of mortar.
5. If water is lost by evaporation, re-temper only within two (2) hours of mixing.
6. Mortar to be mixed only as required for immediate use and shall be used as soon as possible after mixing. Any mortar left standing for a period exceeding 60 minutes that cannot regain its original plasticity by a single re-tempering shall not be used under any circumstances.

2.2 GROUT

A. Components:
1. Portland Cement - ASTM C150, Type I, gray color
2. Hydrated Lime - ASTM C207, Type S
3. Grout Aggregate - ASTM C404, fine and course
4. Water - Clean and potable

B. Grout Mix:
1. Grout for Structural Masonry : 2000 psi strength at 28 days, 8-11 inch slump; mixed in accordance with ASTM C476 fine and coarse grout.

2.3 MASONRY REINFORCEMENT AND ANCHORAGE

A. Masonry Reinforcement:
1. Reinforcing steel for lintels, bond beams and vertical reinforcement shall be deformed bars complying with ASTM A615, Grade 60. Shop fabricate reinforcement which is shown bent or hooked.

B. Horizontal Joint Reinforcement:
1. Joint reinforcement shall be factory fabricated from cold drawn steel wire conforming to ASTM A82, having a tensile strength of 80,000 psi. Reinforcement shall consist of 9 gauge (.1483") deformed longitudinal wires with 9 gauge (.1483") cross wires butt-welded every 16" o.c. to form a truss pattern.
2. Walls that are vertically reinforced shall have cross wires butt-welded every 16" o.c. to form a ladder pattern. Unit width shall be 1-1/2" less than the thickness of the masonry unit.
3. For cavity walls, provide vertically adjustable "eye and pintle" type joint reinforcement consisting of (2) - 9 gauge (.1483") size rods with welded eye sections at 16" o.c. and 3/16" diameter, two-legged rectangular pintles. Eye sections "eyes" shall not be more than 1/4" in diameter. Pintle legs shall have bends at 1-1/4" from top of leg.
4. Provide reinforcement in 10'-0" lengths with prefabricated corners and tees at intersecting walls of same design and finish as joint reinforcement.
5. Reinforcing for exterior walls shall be Hot dip galvanizing shall be done after fabrication in accordance with ASTM A153 Class B2.
6. Manufacturers:
   a. Dur-O-Wall
   b. Heckmann Building Products
   c. Hohmann & Barnard
   d. Masonry Reinforcing Corp. of America.
   e. Approved Equal

C. Veneer Wall Anchoring System:
1. All wall tie assemblies shall be hot-dip galvanized, after fabrication in accordance with ASTM A153, Class B unless noted otherwise.
2. Wall ties shall typically be 4” or 6” long. Masonry contractor to verify lengths required prior to the start of work.
3. Provide two piece wall tie assemblies consisting of 3/16" dia. wire tie and 12 gauge (.1046") sheet steel anchor section.
4. All veneer wall anchoring system components shall be from the same manufacturer.
5. Fasteners for anchor plates shall be self-drilling, stainless steel screws.
6. Wall tie assembly shall be:
   a. D/A 210 Anchor with 700 Series triangle wall ties - Dur-O-Wall, Inc.
   b. 315C Anchor with 316 Triangular Tie - Heckman Building Products
   c. DW-10 Anchor with Vee Tie - Hohmann & Barnard

d. 1004 Type III with 1100 Triangular Ties –Masonry Reinforcing Corp.
e. Approved Equal

2.4 FLASHING

A. Flexible Membrane Flashing:
1. Through-wall flashing shall be 40 mil self-adhesive, cold-applied sheet consisting of rubberized asphalt integrally bonded to an 8 mil high-density, cross-laminated polyethylene film. Flashing shall have a disposable silicone coated release sheet. Flashing shall comply with ASTM D 1970.
2. Furnish prefabricated internal and external corners where required.
3. Manufacturers:
a. Hohmann & Barnard Inc., Textroflash.
b. Dur-O-Barrier - Dur-O-Wall
c. Perm-A-Barrier - Grace Construction Products
d. TW Thru-Wall Flashing - Tamko Waterproofing
e. Aqua Flash - Masonry Reinforcing Corp. of America
f. Approved Equal

2.5 ACCESSORIES

A. Cell Vents:
1. Cell vents shall be 3/8” x 2-1/4” x 3-3/8” cellular polypropylene. Color to match mortar.
2. Manufacturers:
a. D/A 1006 - Dur-o-Wall
b. No. 85 - Heckman
c. QV Quadro-Vent - Hohmann & Barnard, Inc.
d. 3601 - Masonry Reinforcing Corp. of America
e. Approved Equal

B. Cavity Drainage System:
1. Cavity drainage system shall be woven high density polyethylene mesh, 1-inch thick.
2. Manufacturers:
a. Mortar Net
b. Hohman and Barnard
c. Masonry Reinforcing Corp. of America
d. Approved Equal

2.6 FACE BRICK

A. Face brick shall comply with ASTM C 216 Grade SW, Type FBS or better. Average dimensions of the brick shall be 3-5/8 inches thick, 2-1/4 inches high and 8 inches long (nominal). Minimum compressive strength shall be 2500 psi. Brick units shall be tested in accordance with ASTM C 67. Color and texture of brick shall be as indicated in the exterior finish materials list on the drawings and shall conform to the approved sample.

B. Special Shapes:
1. Special shapes shall be as indicated on the drawings.
2. Color, texture, and quality of special shape brick units shall match specified standard brick unit characteristics. All bricks of each type supplied shall be from the same production run.

2.7 CONCRETE MASONRY UNITS (CMU)

A. Hollow Load Bearing Units - ASTM C90, Type I - Moisture Controlled normal weight, smooth finish
1. Back-up Units: 8 inch x 8 inch x 16 inch

B. Provide special shape blocks (lintel blocks, bond beam blocks, bullnosed blocks, etc.) where indicated on the drawings.

C. Provide bullnose outside corners for all exposed concrete block having painted finish. For locations where block receives other finishes (plaster, gypsum board, etc.) corners shall generally be square. Confirm with Architect prior to the start of block work.

PART 3 - EXECUTION

3.1 GENERAL

A. Masonry cavity walls shall be constructed in accordance with Brick Institute of America Technical Note 21C.

B. Brick veneer / steel stud walls shall be constructed in accordance with Brick Institute of America Technical Note 28B.

3.2 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify items provided by other sections of work are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

D. Verify that special brick shapes are on site. Do not start installation of units until all special shapes are on site.

3.3 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.4 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness head joints to run vertical in line.

C. Modular Brick Units:
   1. Bond: Running bond.
   2. Coursing: Three (3) courses to equal 8 inches.
   3. Mortar Joints: Tooled Concave.

D. Concrete Masonry Units:
   1. Bond: Running bond.
   2. Coursing: One (1) unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Tooled Concave.

3.5 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

D. Remove excess mortar as work progresses.

E. Interlock intersections and external corners; except at stacked bond units.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, un-chipped edges. Prevent broken masonry unit corners or edges.

H. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.6 CELL VENTS

A. Install vents in veneer at 24 inches O.C. horizontally above through-wall flashing, above shelf angles and lintels, at bottom of walls and at top of walls as indicated.

3.7 CAVITY WALL

A. Maintain cavity air space as indicated on the drawings in accordance with the best practices of the industry.

B. Do not permit mortar to drop or accumulate into cavity air space or to plug weeps or cavity vents.

C. Install cavity drainage system at base of wall and at all lintels.

3.8 WALL REINFORCEMENT

A. Install horizontal joint reinforcement 16 O.C. (Maximum).

B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place joint reinforcement continuous in first joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. At corners use prefabricated “L” units in addition to masonry bonding.

F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches O.C.

3.9 VENEER ANCHORAGE

A. Secure adjustable wall ties to stud framed back-up and embed into masonry veneer at maximum 16 inches O.C. vertically and 16 inches O.C. horizontally. Place at maximum 3 inches O.C. each way around perimeter of openings, within 12 inches of openings.

B. Individual anchors shall not support more than two (2) square feet of wall area.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

3.10 MASONRY FLASHINGS

A. Extend flashings horizontally at foundation walls, above lintels, at bottom of walls, and below window sills.

B. Turn flashing up a minimum of 8 inches and bed into mortar joint of masonry. Seal masonry flashings to sheathing over steel stud framed back-up.

C. Lap end joints a minimum of 6 inches and seal watertight.

D. Turn flashing, fold, and seal at corners, bends, and interruptions.

E. Provide end dams at heads, sills, lintels and flashing terminations.

3.11 LINTELS

A. Install loose steel lintels over openings.

B. Refer to structural drawings for lintel sizes.

C. Maintain minimum 8 inch bearing on each side of opening.

3.12 GROUTED COMPONENTS

A. Lay masonry units with cores vertically aligned, clear of mortar and unobstructed.

B. Place reinforcement bars as indicated on Drawings.

C. Splice reinforcement as required by code.

D. Place and consolidate grout fill without displacing reinforcing.

3.13 BUILT-IN WORK

A. As work progresses, install built-in items furnished by other Specification Sections.

B. Install built-in items plumb and level.

C. Do not build in organic materials subject to deterioration.

3.14 TOLERANCES

A. Maximum Variation from Unit to Adjacent Unit: 1/16 inch

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 3/8 inch in 20 ft maximum.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative maximum.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.15 CUTTING AND FITTING

A. Cut and fit for pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Replace defective mortar. Match adjacent work.

C. Dry brush masonry surface after mortar has set, at the end of each day's work.

D. Clean soiled surfaces with cleaning solution. Use non-metallic tools in cleaning operations.

3.17 PROTECTION OF FINISHED WORK

A. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

END OF SECTION

SECTION 04900 - MASONRY CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Work of the Section includes the following:
   1. Cleaning of new masonry surfaces

1.2 QUALITY CONTROL

A. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.3 MOCKUP

A. Clean a section of wall, 10’ x 10’ ft to determine extent of cleaning methods.

B. Locate where directed by Architect and AAFES Project Manager.

C. Acceptable panel illustrating results of cleaning will become standard for work of this section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site in the manufacturer’s original unopened containers and packaging, bearing labels as to type and names of products and manufacturers.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Hot and Cold Weather Requirements: Comply with manufacturer’s written recommendations.

PART 2 - PRODUCTS

2.1 MASONRY CLEANING

A. Manufacturers:
   1. ProSoCo Inc.
   2. Approved Equal.

B. Masonry cleaner shall be appropriate for each type of masonry to be cleaned. Verify compatibility of cleaner with brick manufacturer and calcium silicate masonry unit supplier prior to application. Do not begin cleaning operations until cleaning product has been approved.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces to be cleaned are ready for work of this section.

3.2 PREPARATION

A. New face brick, mortar joints, etc., shall be properly prepared by masonry contractor prior to attempting final cleaning as specified under this Section.

B. Contractor doing this cleaning work shall thoroughly mask-off and protect all adjacent materials and shall be responsible for any damage caused to same by the cleaning material used.

C. Protect areas, landscaping, materials, and surfaces not receiving work of this section to protect from damage.

D. Protect calcium silicate masonry units from contact with other masonry cleaning agents in accordance with the manufacturer’s written instructions.

E. Allow 7 days for mortar to cure before final removal of stains and cleaning of masonry.

3.3 CLEANING

A. Masonry cleaner for each type of masonry to be cleaned, shall be prepared and applied in strict accordance with the manufacturer's recommendations.

B. Water for rinsing shall be clean, potable and free from organic material and deleterious amounts of dissolved acids, alkalies and salts. Unless otherwise recommended by manufacturer of cleaner, water rinse with pressure equipment providing at least 400 psi with a 40° fan spray tip.

C. When cleaning operation is considered complete by cleaning contractor, and cleaned surfaces have completely dried, call for an inspection of work. If, in the Architect's opinion, additional cleaning is necessary, the contractor shall repeat the process until accepted by the Architect and AAFES Project Manager.

3.4 CLEAN-UP

A. Remove all masking materials after masonry has been cleaned and accepted by the Architect and AAFES Project Manager.

B. Remove all empty containers, packaging, etc. and leave site in a neat, clean condition.

END OF SECTION

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes the following:
   1. Structural steel framing members and support members.
   2. Base plates.
   3. Grouting under base plates.

1.2 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC Code of Standard Practice.

B. Fabricator: Company specializing in performing the work of this section with a minimum of five (5) years documented experience.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Recycled Content: Minimum 5 percent post-consumer recycled content, or minimum 20 percent pre-consumer recycled content at contractor's option.

B. Structural Steel Members and Bolts: Refer to "General Notes" on Structural Drawings.

C. Structural Tubing: ASTM A500, Grade B.

D. Pipe: ASTM A53, Grade B.

E. Bolts, Nuts, and Washers: ASTM A325 bolts and ASTM A563 nuts.

F. Anchor Bolts: F1554, Grade 36 (typical) or Grade 55 (as noted).

G. Welding Materials: AWS D1.1; type required for materials being welded.

H. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days.

I. Shop Primer:
   1. Modified alkyd, rust-inhibitive primer.
      a. One coat - 2.0 to 4.0 mil DFT
      b. VOC - 347 g/l unthinned
   2. Equal to Tnemec Series 10, color gray.

J. Touch-Up Primer:
   1. Touch-up primer to be compatible with shop primer.
      a. One coat - 2.0 to 4.0 mil DFT
      b. VOC - less than 250 g/l

2.2 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP2 Hand Tool or SP3 Power Tool cleaning.

B. Shop prime structural steel members.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work. Do not begin work until all unsatisfactory conditions are corrected.

3.2 ERECTION

A. Allow 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.

B. Field weld components indicated on shop drawings.

C. Field connect members with threaded fasteners; torque to required resistance.

D. Do not field cut or alter structural members without approval by the Architect.

E. After erection, prime welds, abrasions, and surfaces not shop primed. Do not prime surfaces that will be in contact with concrete.

F. Provide asphaltic coating on all structural steel surfaces that will be in contact with concrete.

G. Grout under base plates.

3.3 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.4 TESTING

A. Testing shall be performed in accordance with Specification SECTION 01410 – TESTING SERVICES.

B. Testing Schedule:

1. Unless noted otherwise, bolted connections shall comply with a snug tight condition which means that tightness exists when all plies in a joint are in firm contact. This may be attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Final tightening using “Turn-of-Nut Tightening” shall be in accordance with AISC “Specification for Structural Joints Using ASTM A325 or A490 Bolts”.
2. Field Welding: Inspect and test during erection of structural steel as follows:
   a. Certify Welders and conduct inspections and tests as required.
   b. Perform visual inspection of all welds.
3. If welds do not pass visual inspection, the Testing Agency shall perform one or more of the following tests to determine acceptability of welds. Testing Agency shall make a recommendation to the Architect prior to performance of any of these tests.
   a. Liquid Penetrant Inspection: ASTM E165.
   b. Magnetic Particle Inspection: ASTM E109; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.
   c. Radiographic Inspection: ASTM E94 and ASTM E142: minimum quality level “202T”.
   d. Ultrasonic Inspection: ASTM E164.
4. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor’s expense as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

END OF SECTION

SECTION 05310 - STEEL ROOF DECK

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes the following:
   1. Steel roof deck and accessories.
   2. Formed steel, eave strips, and valley strips.
   3. Framing for openings up to and including 18 in.
   4. Bearing plates and angles.

B. American Welding Society:
   1. AWS D1.1 - Structural Welding Code - Steel.

C. Steel Deck Institute:
   1. SDI 29 - Design Manual for Composite Decks, Form Decks and Roof Decks.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers:
   1. United Steel Deck
   2. Vulcraft Steel Deck
   3. Wheeling Corrugating Co.
   4. Approved Equal.

B. Recycled Content: Minimum 5 percent post-consumer recycled content, or minimum 20 percent pre-consumer recycled content at contractor's option.

C. Sheet Steel: ASTM A653, Grade 33 Structural Quality; with G60 galvanized coating conforming to ASTM A525.

D. Bearing Plates: ASTM A36 steel

E. Welding Materials: AWS D1.1.

F. Touch-Up Primer for Galvanized Surfaces: SSPC 20 Type II - Organic

2.2 FABRICATION

A. Ribbed Metal Deck:
   1. Sheet steel, galvanized, configured as follows:
      a. Span Design: 3-span minimum
      b. Minimum Metal Thickness Excluding Finish: 20 gage (.0358)
      c. Minimum Section Properties (per foot width): S=0.235, I= 0.216.
      d. Nominal Height: 1-1/2inch
      e. Formed Sheet Width: 36 inch
      f. Side Joints: interlocking
      g. Flute Sides: plain vertical face

B. Ribbed Metal Deck - under standing seam metal roofing
   2. Sheet steel, galvanized, configured as follows:
      a. Span Design: 3-span minimum
      b. Minimum Metal Thickness Excluding Finish: 20 gage (.0358)
      c. Minimum Section Properties (per foot width): S=0.235, I= 0.216.
      d. Nominal Height: 1-1/2inch
      e. Formed Sheet Width: 36 inch
      f. Side Joints: interlocking

g. Flute Sides: plain vertical face
h. Flute spacing: 6 inch centers
i. Flute width: 1 inch

C. Related Deck Accessories: Metal closure strips, eave strips, valley strips, 22 gage thick galvanized sheet steel; of profile and size as indicated on drawings.

D. Fasteners: Galvanized hardened steel, self tapping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work. Do not begin work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Erect metal deck in accordance with SDI Manual.

B. Bear deck on steel supports with 1-1/2 inch minimum bearing. Align and level.

C. Fasten deck to steel support members as indicated in the structural drawings.

D. Weld in accordance with AWS D1.1.

E. Reinforce steel deck openings from 6 to 18 inches in size with L2 x 2 x ¼ inch steel angles. Place framing angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.

F. Install 6 inch minimum wide sheet steel cover plates, of same thickness as deck, where deck changes direction. Mechanically attach 12 inches oc maximum.

G. Place metal cant strips in position and mechanically attach.

H. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up prime paint. Blow holes in deck shall be repaired as follows: Holes up to 1/2” in diameter, fill with urethane or silicone sealant and cover with duct tape. Holes greater than 1/2” require sheet metal plate patches fastened to deck.

END OF SECTION

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes the following:
   1. Steel pipe bollards
   2. Fixed steel ladders
   3. Downspout boots
   4. Miscellaneous metal shapes, anchor bolts, nuts, washers, plates, etc. not supplied by the structural steel supplier.

PART 2 - PRODUCTS

2.1 MATERIALS - STEEL

A. Recycled Content: Minimum 5 percent post-consumer recycled content, or minimum 20 percent pre-consumer recycled content at contractor's option.

B. Steel Sections: Refer to "General Notes" on Structural Drawings.

C. Steel Tubing: ASTM A500, Grade B.

D. Plates: ASTM A283.

E. Pipe: ASTM A53, Grade B Schedule 40.

F. Bolts, Nuts, and Washers: ASTM A325 galvanized.

G. Welding Materials: AWS D1.1; type required for materials being welded.

H. Shop Primer:
   1. Modified alkyd, rust-inhibitive primer.
      a. One coat - 2.0 to 4.0 mil DFT
      b. VOC - 347 g/l unthinned
   2. Equal to Tnemec Series 10, color gray.

I. Touch-Up Primer:
   1. Touch-up primer to be compatible with shop primer.
      a. One coat - 2.0 to 4.0 mil DFT
      b. VOC - less than 250 g/l

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to project 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

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 all items not in contact with concrete with two coats of primer.

D. Provide asphaltic coating on all steel surfaces that will be in contact with concrete.

2.4 COMPONENTS

A. The following Schedule is a list of principal items only. Refer to the details on the Contract Documents for items not specifically scheduled in this section.
   1. Miscellaneous metal shapes, anchor bolts, nuts, washers, plates, etc. not supplied by the structural steel supplier.
   2. Inserts, sleeves and concrete anchors
   3. Bollards - Steel pipe, concrete filled, crowned steel cap, as detailed; prime and paint finish.
   4. Fixed Steel Ladders
      a. Fabricate ladders for the locations as indicated on the drawings with dimensions, spacings, details and anchorages as indicated.
      b. Unless otherwise shown, provide 1/2" x 2-1/2" continuous structural steel flat bar side rails with eased edges, spaced 18" apart.
      c. Provide 3/4" diameter solid structural steel bar rungs, spaced 12" o.c. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
      d. Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0" o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold the ladder clear of the wall surface with a minimum of 7" clearance from wall to centerline of rungs.
   5. Downspout Boots
      a. Manufacturer
         (1). B4924 Series, B 25 pattern - Barrycraft
         (2). DS Series - McKinley
         (3). R-4926 Series - Neenah Foundry
         (4). Approved Equal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive the work of this section.

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 as indicated on the approved shop drawings.

D. Perform field welding in accordance with AWS D1.1.

E. Obtain approval from the Contracting Officer prior to site cutting or making adjustments not scheduled or detailed in the approved shop drawings.

F. After erection, prime welds, abrasions, and surfaces not shop primed except surfaces to be in contact with concrete.

G. Provide asphaltic coating on all structural steel surfaces that will be in contact with concrete.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 07535 - SINGLE-PLY ROOFING - MECHANICALLY ATTACHED

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Work of this section shall include the following:
   1. Tapered Insulation
   2. Mechanically attached single-ply membrane roofing
   3. Base flashings, and counterflashings.

1.2 PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand positive and negative wind loads, including increased loads at building corners.
   1. Design Wind Load - Based on basic wind speed of 95 mph, exposure C.

B. Fire Rating: UL 790: Class A Fire Hazard Classification.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

1.4 QUALIFICATIONS

A. Applicator: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Store products in weather protected environment, clear of ground and moisture. Protect foam insulation from direct sunlight exposure.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not apply roofing membrane during ambient temperatures below -15 degrees F or above 115 degrees F without proper weather protection.

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.

1.7 COORDINATION

A. Coordinate Work with installation of associated roof penetrations and metal flashings, as Work of this section proceeds.

1.8 WARRANTY

A. Roofing Warranty
   1. Upon completion of the work and acceptance by the roofing manufacturer's technical representative, the roofing contractor shall furnish the roofing manufacturer's written and signed standard system warranty certifying the performance and consistency of the products for a period of fifteen (15) years from the date of building acceptance and that the installation is in accordance with the manufacturer's requirements. The warranty shall be a 15-year full system non-prorated warranty and shall include an 80 mph wind warranty.
   2. This warranty shall cover defective materials, including flashings, membrane and related components provided by the roofing manufacturer, and workmanship. The manufacturer shall be responsible for the material for the entire length of the warranty and the labor after the first year. The roofing contractor shall be responsible for workmanship and labor for the first year of the warranty period.
   3. The warranty shall cover the cost of repairs and/or replacement of defective membrane. Warranty shall be based on replacement cost and not original cost. Warranty liability shall not

be determined on a pro-rated basis.

4. The roofing manufacturer shall inspect the roof one (1) year after building acceptance and shall report any material or workmanship deficiencies.

PART 2 - PRODUCTS

2.1 ROOFING SYSTEM

A. Membrane: mechanically attached, minimum .040 inch (40 mil) thick polyester mat reinforced, polymer-modified PVC thermoplastic.

B. Manufacturers:
1. Duro-Last Membrane - Duro-Last Inc.
2. SR-50 UltraGard - Johns Manville.
3. EGSR Ever Guard PVC - GAF Materials Corp.
4. S 327 Membrane - Sarnafil.
5. Approved Equal.

C. Color: White

D. Mechanical attachment: In seam with bar or disc as recommended by the manufacturer.

E. Disc Washers and Screws: As required by the manufacturer.

F. Seams: Hot-air welded

G. Flexible Flashings: Same material as membrane.

H. Separator Sheet: Manufacturer's recommended if required.

I. Accessories:
1. Sealants - As recommended by membrane manufacturer. Membrane sealants shall have a VOC limit of 450 g/l less water.
2. Penetration Flashing - Prefabricated single-piece units fabricated from roofing membrane
3. Walkpads - Manufacturer's standard. Color to contract roof membrane color.

2.2 INSULATION

A. Insulation: ASTM C1013, faced rigid cellular polyisocyanurate roof insulation, with the following characteristics:
1. Board Compressive Strength - 20 lb/sq in.
2. Board Size - 48 x 48 inch
3. Board Thickness - 1-1/2 inches per board. Total thickness 3 inches
4. Furnish tapered units where shown on the drawings to achieve the slope indicated. Minimum board thickness, ½ inch
5. Board Edges - Square
6. Thermal Conductivity - Aged R value of 5.56 per inch
7. Rigid insulation shall contain a minimum of 9% recovered/recycled material.

B. Recycled Content: Minimum 5 percent post-consumer recycled content, or minimum 20 percent pre-consumer recycled content at contractor's option.

C. Insulation Fasteners: Appropriate for purpose intended and approved by system manufacturer; length required for thickness of material with metal washers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and site conditions are ready to receive work and that deck is supported and secure.

B. All plywood surfaces must be smooth and free of all foreign material.

C. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains, and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and wood perimeter nailing strips are in place.

3.2 INSTALLATION

A. Insulation Application:
   1. Mechanically fasten insulation to deck. Fasteners to penetrate minimum of 1 inch into wood deck.
   2. Mechanically fasten boards in accordance with manufacturer's recommendations.
   3. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
   4. Apply no more insulation than can be covered with membrane in same day.

B. Membrane Application:
   1. Apply membrane and mechanical attachment devices in accordance with manufacturer's specifications.
   2. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
   3. Overlap edges and ends and seal by heat welding. Seal permanently waterproof.
   4. Shingle joints on sloped substrate in direction of drainage.
   5. Extend membrane up cant strips minimum of 6 inches onto vertical surfaces.
   6. Seal membrane around roof penetrations.

C. Flashings And Accessories:
   1. Fully adhere flexible flashings to seal membrane to vertical elements in accordance with manufacturer's specifications.
   2. Coordinate installation of roof drains and related flashings.
   3. Seal flashings and flanges of items penetrating membrane.
   4. Install walkway pads around roof top unit. Space pad joints to permit drainage.
   5. Install additional layer of roof membrane around kitchen exhaust vents.

3.3 FIELD QUALITY CONTROL

A. Representative of the roofing manufacturer shall inspect the roof prior to the issuance of the warranty to assure that the roof was installed in accordance with the manufacturer's specifications.

3.4 CLEANING

A. 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.

B. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Protect building surfaces against damage from roofing work.

B. Where traffic must continue over finished roof membrane, protect surfaces.

END OF SECTION

SECTION 07610 - SHEET METAL ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes the following:
1. Architectural standing seam metal roofing.
2. Underlayment.
3. Eave protection.
4. Metal fascia, flashings, and trim.
5. Metal gutters and downspouts.

1.2 DESIGN REQUIREMENTS

A. Roof Loads:
1. Live Loads: As indicated on Drawings.
2. Roof Snow Loads: 10 lbs./SF

B. Wind Loads: Design and size components to withstand positive and negative wind loads, including increased loads at building corners.
1. Design Wind Load: Based on basic wind speed of 100 mph, exposure C.

C. Wind Uplift Resistance: UL 580; Class 90.

D. Air Infiltration: Limit air leakage through roof assembly to 0.03 cfm/sq ft of wall area, measured at reference differential pressure across assembly of 6.24 psf as measured in accordance with ASTM E283.

E. Water Leakage: None, when measured in accordance with ASTM E331 with test pressure of 6.24 psf.

F. Exterior Components: Accommodate the following without damage to system, components or deterioration of seals.
1. Movement within system.
2. Movement between system and perimeter framing components.
3. Dynamic loading and release of loads.
4. Deflection of structural support framing.
5. Expansion and contraction from temperature range of 170 degrees F over 12 hour period.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA Architectural Sheet Metal Manual, The NRCA Roofing and Waterproofing Manual and manufacturer’s written instructions.

1.4 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum five years documented experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials causing discoloration or staining.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.7 WARRANTY

A. Manufacturer shall furnish a twenty (20) year manufacturer warranty for metal finish against fading, chipping, chalking, and blistering.

B. Installer shall furnish a 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 SHEET METAL ROOFING AND SIDING

A. Manufacturers:
1. Berridge
   a. Roofing System - Cee-Lock
   b. Soffit - FW-12 Vented and non-vented
   c. Wall Panels - FW-12
2. Dimensional Metals
   a. Roofing System - Inter-Lock IL 20
   b. Soffit - VS05 Vented and non-vented
   c. Wall Panels - Flush Panel FP-10
3. Petersen Aluminum Corporation
   a. Snap-Clad Standing Seam Panel
   b. Soffit - PAC-750 Solid and Perforated
   c. Wall Panels - Flush Panel
4. Approved Equal

B. Architectural Standing Seam Metal Roofing: Factory formed metal roofing panel system with concealed fasteners.
1. Panel Materials: Pre-finished galvanized steel sheet 24 ga. (0.022 inch) base metal thickness.
2. Panel Width: Nominal 16 inches.
3. Panel Profile: Flat
4. Seam Type: Sanding seam snap interlocked
5. Seam Height: Nominal 1-1/2 inches.

2.2 SHEET METAL MATERIALS

A. Recycled Content: Minimum 5 percent post-consumer recycled content, or minimum 20 percent pre-consumer recycled content at contractor's option.

B. Pre-Finished Galvalume Aluminum-Zinc Alloy Coated Steel, Grade C meeting ASTM A792.

C. Coil metal shall be stretcher-leveled at the mill.

D. Finish:
1. Exposed Finish: Minimum two coat fluoropolymer coating with minimum 70 percent polyvinylidene fluoride resin.
2. Unexposed Finish: Manufacturer's standard coating.
3. Top surface shall be covered with a strippable film.
4. Color: As indicated in the exterior finish materials list on the drawings.

2.3 ACCESSORIES

A. Fasteners: Stainless steel or cadmium plated with soft neoprene washers where exposed.

B. Underlayment: ASTM D226, organic roofing felt, Type II, Number 30.

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Sealant: Butyl sealant as recommended by roofing manufacturer.

E. Eave and Valley Protection Sheet:
1. Approximate 60 mil rubberized asphalt adhesive backing with silicone release polyethylene with removable backing. Surface shall be a polyester non-woven mat fabric. Underlayment shall be designed for use under metal roofs.
2. Products:
   a. Ice & Water Shield - Grace Construction Products
   b. Weatherlock Metal Waterproofing Underlayment - Owens-Corning
   c. TW Metal and Tile Underlayment - Tamko waterproofing
   d. Approved Equal

F. Downspout Boots: see Section 05500

2.4 FABRICATION

A. Form sections shape as indicated on Drawings, accurate in size, square, and free from distortion or defects.

B. Fabricate fascia, trim, flashing, and other metal components from same material as metal roof panels. Provide exposed metal surfaces with same finish as exposed face of metal roof panels.

C. Fabricate cleats of same material as sheet, to interlock with sheet.

D. Fabricate starter strips of same material as sheet, continuous, to interlock with sheet.

E. Form pieces in single length sheets. No horizontal joints will be permitted.

F. Hem exposed edges on underside 1/2 inch; miter and seam corners.

G. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

H. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

I. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

J. Fabricate gutters to profile and size indicated on the drawings.

K. Fabricate downspouts to profile and size indicated on the drawings.

L. Fabricate accessories in profile and size to suit gutters and downspouts.
1. Anchorage Devices: Type recommended by fabricator.
2. Gutter Supports: Brackets.
3. Downspout Supports: Straps.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate prior to start of work. Substrate shall be with in the following tolerances:
1. Applicable Substrate Tolerances - Maximum variation from true planes or lies shall be 1/4” in 20’-0” or 3/8” in 40’-0”.

B. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, and properly sloped.

C. Deck shall be dry and free of snow and ice. Verify substrate joints are solidly supported and fastened.

D. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set.

E. Verify roofing termination and base flashings are in place, sealed, and secure.

F. Do not proceed with installation of metal roofing panels until out of tolerance substrate has been corrected.

3.2 PREPARATION

A. Substrate:
   1. Fill knot holes and surface cracks in wood decks with latex filler at areas of bonded eave protection.
   2. Broom clean deck surfaces under eave protection and underlayment.

B. Back paint concealed metal surfaces in contact with dissimilar metals with protective backing paint to minimum dry film thickness of 15 mil.

3.3 INSTALLATION - EAVE PROTECTION

A. Apply eave protection sheet over deck flange of eave edge flashings.

B. Place single width eave protection sheet centered over valley, hips and ridges.

3.4 INSTALLATION - UNDERLAYMENT

A. Apply underlayment over entire roof area in single layer fastened to substrate.
   1. Install underlayment laid perpendicular to slope.
   2. Weather lap edges 2 inches and nail in place.
   3. Stagger end joints minimum 24 inches.

B. Apply slip sheet in one layer, laid loose.

3.5 INSTALLATION - STANDING SEAM METAL ROOFING

A. Install furring to support roof panel side laps and receive fasteners.

B. Install roofing panels with long dimension perpendicular to eaves.

C. Install roofing panels beginning at eaves. Lap ends minimum 6 inches.

D. Install clips to secure roof panels without deforming roof panels.

E. Machine form standing seam between adjacent roofing panels. Hand form joints where machine forming is not possible.

F. Terminate roofing panels with sheet metal trim and flashing for watertight installation. Close and conceal openings between roofing panels, panel seams, and roof substrate.

G. Seal metal joints watertight.

3.6 INSTALLATION - GUTTERS AND DOWNSPOUTS

A. Secure gutters and downspouts in place using concealed fasteners.

B. Slope gutters minimum 1/4 inch per foot.

C. Seal gutters watertight. Seal joint of gutter to drain scupper.

D. Connect downspouts to downspout boots. Seal connection watertight.

E. Set splash pans under downspouts that drain to flat roof.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Do not permit traffic over unprotected roof surface.

END OF SECTION

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes:
   1. Wall coping systems.
   2. Reglet flashing and counterflashing systems.
   3. Gutters and downspouts.

1.2 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual standard details and requirements.

1.3 QUALIFICATIONS

A. Fabricator and Installer - Company specializing in sheet metal flashing work with a minimum of five (5) years experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products in accordance with the provisions of specification section 01600 - material and equipment.

B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials which may cause discoloration or staining.

1.5 COORDINATION

A. Coordinate with the work of other Sections for installing flashing reglets and coping.

PART 2 - PRODUCTS

2.1 SHEET MATERIALS

A. Recycled Content: Minimum 5 percent post-consumer recycled content, or minimum 20 percent pre-consumer recycled content at contractor’s option.

B. Aluminum Sheet: ASTM B209, 5005 alloy, H34 temper; .040 inch.

C. Pre-Finished Steel Sheet: ASTM A792, 24 ga. (.022 inch base metal)

2.2 ALUMINUM COPING - MANUFACTURED

A. Manufacturers
   1. Architectural Products Corp., AP Snap-Tight
   2. Metal-Era, Anchor-Tite.
   3. W.P. Hickman, Perma Snap Coping
   4. Peterson Aluminum Corp.
   5. MM Systems, Snap-Lok Coping System
   6. Approved Equal

B. Pre-manufactured coping shall be .063 aluminum formed and supplied in 10'-0" lengths.

C. Concealed joint covers (with finish to match coping) shall be installed under joints in the face of the coping.

D. Support Chair - manufacturer’s standard for warranted system.

E. Coping system to be designed for a wind uplift criteria of 90 MPH basic wind speed, exposure C

F. Corners to be welded construction.

2.3 METAL COPING - FABRICATED

A. Form sections shape as indicated on Drawings, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, to interlock with sheet.

C. Fabricate starter strips of same material as sheet, continuous, to interlock with sheet.

D. Form pieces in longest practical lengths.

E. Hem exposed edges on underside 1/2 inch; miter and seam corners.

F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.4 REGLET AND COUNTER FLASHING SYSTEM

A. Reglet and counterflashing system shall be fabricated to the profiles indicated on the Drawings. Reglets shall be fabricated for masonry, stucco and surface mounted applications where indicated on the drawings. At the contractor's option, reglet and counterflashing system may be shop fabricated to the profiles indicated.

B. Reglet and flashing in areas not exposed to view shall be made of .040" Aluminum, mill finish. In areas exposed to view, reglet and counterflashing shall be finished to match adjacent finishes.

C. Reglet shall have a formed end lap; flashing shall have a 6" lap. Reglet to be installed level and true.

D. Furnish accessories as required for a complete job. Accessories shall include, but necessarily limited to the following items.
   1. Interior corners.
   2. Exterior corners.
   3. Foam end closures.

E. Reglet and counterflashing shall be one of the following:
   1. Fry Reglet
   2. MM Systems
   3. W.P. Hickman Co.
   4. Approved Equal

2.5 GUTTERS AND DOWNSPOUTS

A. Fabricate gutters to profile and size indicated on the drawings.

B. Fabricate downspouts to rectangular profile; size as indicated on the drawings.

2.6 ACCESSORIES

A. Fasteners: Same material and finish as sheet metal, with soft neoprene washers.

B. Slip Sheet: Rosin sized building paper.

C. Sealant: See SECTION 07900 - JOINT SEALERS.

D. Roof Cement: ASTM D4586, Type I.

2.7 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 12 inches wide, interlockable with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside ½ inch; miter and seam corners.

E. Fabricate flashings to allow toe to extend 2 inches over roofing. Return and brake edges.

2.8 FINISH

A. Finish shall be a spray applied, two coat fluropolymer coating utilizing 70% Kynar 500 resin. Finish shall comply with the performance criteria of ASCA 96.

B. Finish shall be a 2 coat, factory applied, baked on finish, .75 to .80 mil minimum DFT color coat over a 0.2 to 0.3 mil primer coat.

C. Back of metal shall be finished with manufacturer's standard protective backing paint to a minimum dry film thickness of 1.0 mil.

D. Colors shall be as indicated in the Exterior Finish Schedule on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify 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 - MANUFACTURED COPING

A. Install manufactured coping in accordance with manufacturer's written instructions.

3.4 INSTALLATION - SHEET METAL COMPONENTS

A. Conform to drawing details included in the SMACNA manual.

B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

END OF SECTION

SECTION 07900 - JOINT SEALERS

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes:
   1. Sealants and joint backing.
   2. Precompressed foam sealers.
   3. Hollow gaskets.

1.2 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience approved by manufacturer.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.4 COORDINATION

A. Coordinate the work with all sections referencing this section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Joint sealants shall be as manufactured by one of the following:
   1. Pecora Corporation
   2. Sika Corporation
   3. Sonneborn Division of Degussa Building Systems
   4. Tremco Inc.
   5. Approved Equal

2.2 SEALANTS

A. Architectural sealants shall have a VOC limit of 250 g/l less water.

B. Type A - General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; multi component.
   1. Standard and premium colors to matching adjacent finished surfaces.

C. Type B - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, non-drying, non-skinning, non-curing.

D. Type C - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable.
   1. Standard and premium colors matching adjacent finished surfaces.

E. Type D - Bathtub/Tile Sealant: Silicone; ASTM C920, Uses M and A; single component, mildew resistant.
   1. Color to be clear or white.

F. Type E - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single component.
   1. Standard and premium colors matching adjacent finished surfaces.

G. Type F - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single component.
   1. Standard and premium colors matching adjacent finished surfaces.

2.3 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: Round foam rod compatible with sealant; ASTM D1565, open cell PVC 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 and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfiguration.

3.3 INSTALLATION

A. Perform installation in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

3.4 CLEANING

A. Clean adjacent soiled surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

3.6 SCHEDULE

A. Sealant Type A:
   1. Exterior wall expansion and control joints.
   2. Joints between concrete, masonry and other materials.
   3. Joints between metal frames and adjacent materials.
   4. Under door thresholds
   5. Other exterior joints for which no other sealant is indicated.

B. Sealant Type B:
   1. Concealed sealant bead in sheet metal work.

C. Sealant Type C:
   1. Interior wall and ceiling control joints.
   2. Joints between door and window frames and wall surfaces.
   3. Other interior joints for which no other type of sealant is indicated.

D. Sealant Type D:
   1. Joints between plumbing fixtures and floor and wall surfaces.
   2. Between countertops and walls.
   3. Interior corner joints at all ceramic tile.

E. Sealant Type E:
   1. Control and expansion joints in floors.

F. Sealant Type F:
   1. Joints in sidewalks and concrete vehicular paving.

END OF SECTION

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section includes the following:
   1. Surface preparation and field application of paints and coatings.

1.2 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.3 QUALIFICATIONS

A. Manufacturer: Company regularly engaged in and specializing in manufacturing the Products specified in this section with minimum five (5) years experience.

B. Applicator: Company specializing in performing the work of this section with minimum five (5) years experience. Applicator shall possess all necessary licenses, certifications, and other written approvals necessary for execution of the work specified in this section and as required by the product manufacturer(s) supplying the coating materials.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Deliver products to site in the manufacturer’s original unopened and labeled containers; inspect to verify acceptability.

C. Container label shall be in legible condition and shall 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.

D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when the surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Do not apply exterior coatings during rain or snow, to wet surfaces, when there is a chance of rain within 24 hours after application, or when the relative humidity is outside the humidity ranges required by the paint product manufacturer.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish and Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface during painting applications.

1.6 EXTRA MATERIALS

A. Provide one (1) gallon of each type paint and color specified. Clearly label.

B. Turn over to Contracting Officer at project closeout.

1.7 SUSTAINABILITY

A. All paints and coatings used on the interior of the building shall comply with the following criteria: (LEED - EQ Credit 4.2: low-emitting materials: Paints & coatings)

B. Architectural paints, coating, and primers applied to the interior walls and ceilings: Do not exceed the VOC content limits:
   1. flats: 50 g/L

2. Non-flats: 150g/L

C. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates: Do not exceed the VOC content limits:
1. Clear wood finishes: varnish 350 g/L; Lacquer 550 g/L
2. Floor coatings: 100 g/L
3. Sealers: waterproofing sealers 250 g/L; sanding sealers 275 g/L, all other sealers 200 g/L
4. Shellacs: Clear 730 g/L, pigmented 550 g/L
5. Stains: 250 g/L

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers - Paint
1. Sherwin Williams.
2. ICI Dulux.
3. Pittsburgh Paints
4. Benjamin Moore

B. Manufacturers - Transparent Finishes
1. Sherwin Williams
2. ICI Dulux.
3. Pittsburgh Paints
4. Benjamin Moore

C. Manufacturers - Stain
1. Sherwin Williams
2. ICI Dulux
3. Pittsburgh Paints
4. Benjamin Moore

D. Manufacturers - Primer Sealers
1. Sherwin Williams
2. ICI Dulux.
3. Pittsburgh Paints
4. Benjamin Moore

E. Substitutions:
1. Manufacturer's wishing to have their products listed as an approved equal shall submit the following technical information:
a. Wet film and dry film thickness
b. Vehicle
c. Percentage of solids per volume
d. VOC content
e. List of painting contractors in the project area that use the manufacturer's product.
2. Any submittal lacking the information listed above will be rejected.

F. Refer to Finish Materials List on Contract Drawings for color selections.

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. Gypsum Wallboard: 12 percent.
2. Interior Wood: 15 percent, measured in accordance with ASTM D4442-92.
3. Concrete Floors: 8 percent.

3.2 PREPARATION - COATINGS

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 or latex stain blocking sealer any marks that might bleed through paint finishes.

D. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply compatible sealer or primer.

E. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

F. Concrete Floors: Remove dirt, dust, soap scum, coatings, oil, wax, concrete curing compounds, etc. prior to the start of installation. The means and methods used to remove curing compound shall be in accordance with the coating manufacturer’s written recommendations and shall be approved by the Contracting Officer. Acid shall not be used to remove contamination from floor.

G. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

H. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

I. 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.

J. 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.

K. 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.

L. 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.

M. Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.3 APPLICATION - COATINGS

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. Paint shop primed equipment.

B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

D. 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.

E. Paint exposed conduit and electrical equipment occurring in finished areas.

F. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

G. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated on color schedule. Color band and identify with flow arrows names and numbering.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.5 CLEANING

A. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.6 SCHEDULE - EXTERIOR SURFACES

A. Masonry - CMU
   1. One Coat of Primer
      a. S-W: Loxon Block Surfacer, A24W200 at 8.0 mils DFT
      b. ICI: Prep & Prime 3010 Interior/Exterior Block Filler Water Based
      c. PPG: SpeedHide Interior/Exterior Masonry Block Filler Latex 6-7 at 4.8 mils DFT
      d. B-M: Moore's Hi Build Acrylic Masonry Primer #068 at 1.0 mils DFT
   2. Two coats of Latex enamel, gloss
      a. S-W: A-100 Exterior Latex Satin, A82 Series1.3 mils DFT
      b. ICI: Dulux Fortis 6407 Premium 100% Acrylic Exterior
      c. PPG: Int/Ext Semi-gloss Acrylic Metal Finish 7-347 at 1.5 mils DFT
      d. B-M: Impervex Latex High Gloss Enamel #309 at 1.2 mils DFT

B. Steel - Unprimed, Shop Primed (first coat touch up with primer), and Galvanized:
   1. One coat of Primer/Sealer
      a. SW: ProCryl® Universal Primer, B66-310 Series at 2.4 mils DFT
      b. ICI: Devflex 4020PF DTM Primer
      d. PPG: Pitt-Tech Acrylic Primer 90-712 at 2.0-3.0 mils DFT
      e. B-M: Acrylic Metal Primer #OM04 at 1.5 to 2.5 mils DFT

   2. Two coats of latex enamel, semi-gloss.
      a. S-W: S-W A-100® Exterior Latex Gloss, A8 Series at 1.3 mils DFT
      b. ICI: Dulux Ultra 1506 Advanced Oil Int/Ext

c. PPG: Pitt-Tech Acrylic Satin 90-474 at 2.0-3.0 mils DFT
d. B-M: DTM Acrylic semi-gloss #M29 at 2.0 mils DFT.

3.7 SCHEDULE - INTERIOR SURFACES

A. Wood - Painted:
1. One coat of latex prime sealer.
a. S-W: Harmony Low Odor Interior Latex Primer, B11W900 at 1.3 mils DFT
b. ICI: Prep & prime 3210 Gripper Primer Sealer Stain Killer
c. PPG: Seal Grip Interior Acrylic Undercoater 17-955 at 1.6 mils DFT
d. B-M: Eco Spec Interior Primer Sealer #231 at 1.2 mils DFT
2. Two coats of latex enamel, semi-gloss.
a. S-W: Harmony Low Odor Interior Latex Semi-Gloss, B10 Series at 1.6 mils DFT
b. ICI: Dulux Lifemaster 9200 interior
c. PPG: Speedhide Interior High Lustre 100% Acrylic Semi-Gloss 6-8510 at 1.1 mils DFT
d. B-M: Eco Spec Interior Latex Semi-Gloss 224 at 1.4 mils DFT

B. Wood - Transparent (products with an * after them do not meet LEED VOC Compliance):
1. One coat stain
a. S-W: WoodClassics Oil Stain, A49 Series *
b. ICI: WoodPride 1700 Interior Solventborne Wood Finishing Stain *
c. PPG: Rez Interior Oil Stain 77-560*
d. B-M: Benwood Finishes Penetrating Stain #234*
2. Two Coats Polyurethane Varnish:
a. S-W: WoodClassics Waterborne Polyurethane Varnish, A68 Series
b. ICI: WoodPride 1808 Interior Waterborne Aquacrylic Varnish
c. PPG: Rez Interior Polyurethane 77-85 Gloss or 77-89 Satin *
d. B-M: Benwood Clear Acrylic Gloss #422 or Low Lustre #423
3. Sand between each coat.
a. Stain to be as indicated on the drawings
b. Submit stained and finished sample for each species of wood before proceeding with any stain work.

C. Steel - Unprimed, Shop Primer (first coat touch up with primer), and Galvanized:
1. One coat of latex primer.
a. S-W: ProCryl Universal Primer, B66-310 Series at 2.0 - 4.0 mils DFT
b. ICI: Devflex 4020PF DTM Primer
c. PPG: Pitt-Tech Acrylic Primer 90-712 at 2.0-3.0 mils DFT
d. B-M: Acrylic Metal Primer #OM04 at 1.5 to 2.5 mils DFT

2. Two coats of latex enamel, semi-gloss
a. S-W: Harmony Low Odor Interior Latex Semi-Gloss, B10 Series at 1.6 mils DFT
b. ICI: Advanced Oil 1506 Semi-Gloss
c. PPG: Pitt-Tech Acrylic Satin 90-474 at 2.0-3.0 mils DFT
d. B-M: Eco Spec Interior Latex Semi-Gloss 224 at 1.4 mils DFT

D. Gypsum Board:
1. One coat interior latex primer
a. S-W: Harmony Low Odor interior wall Primer at 1.6 mils DFT.
b. ICI: Lifemaster 2000 LM 9116 Primer Finish.
c. PPG: Speedhide Interior Latex Primer 6-2 at 1.2 mils DFT
d. B-M: Pristine Eco Spec Latex Primer #231 at 1.2 mils DFT.
2. Two coats interior latex eggshell enamel.
a. S-W: Harmony Low Odor Interior Latex Enamel 1.6 mils DFT.
b. ICI: Lifemaster 2000 LM 9300at 1.5 - 2.0 mils DFT.
c. PPG: Pure Performance Low Odor Eggshell Latex 9-300 at 1.4 mils DFT
d. B-M: Pristine Eco Spec Latex #223 at 1.4 mils DFT.

E. Concrete Block (new):
1. One coat of interior epoxy filler/sealer
a. S-W: Approved Equal
b. ICI: Approved Equal
c. PPG: Approved Equal

d. B-M: Waterborne Epoxy Block Filler #OM31 at 8.0 to 12.0 mils DFT

2. Two coats of interior epoxy gloss
   a. S-W: Approved Equal
   b. ICI: Approved Equal
   c. PPG: Approved Equal
   d. B-M: Acrylic Epoxy Gloss Coating #OM43 at 2.0 mils DFT

F. Concrete Block (existing):
1. Two coats of interior epoxy gloss
   a. S-W: Approved Equal
   b. ICI: Approved Equal
   c. PPG: Approved Equal
   d. B-M: Acrylic Epoxy Gloss Coating #OM43 at 2.0 mils DFT
   e. Provide test patch to check product compatibility with existing surface paint.

G. Concrete Floor Paint:
1. Two coats of epoxy floor coating
   a. S-W: Approved Equal
   b. ICI: Tru-Glaze-WB 4406 Waterborne Epoxy Semi-Gloss coating
   c. PPG: Approved Equal
   d. B-M: 100% Solids Epoxy Floor Coating #OM40 at 8.0 mils DFT
   e. Provide test patch to check product compatibility with existing surface paint.

H. Mechanical and Electrical Equipment:
1. Mechanical and Electrical items such as ductwork, conduit and pipes shall be primed and painted with (2) finish coats as described in the drawings and this specification.

I. All equipment attached to the ceiling such as HVAC grilles, speakers and electrical equipment must be painted to match drywall ceiling or ceiling tile and grid color. (Except factory painted light fixtures and equipment.)
1. One coat of alkyd spray enamel primer:
   a. S-W: Approved Equal
   b. ICI: Approved Equal
   c. PPG: Approved Equal
   d. B-M: IronClad Metal & Wood Aerosol Primer #4930113

2. Two coats of an alkyd semi-gloss spray enamel:
   a. S-W: Approved Equal
   b. ICI: Approved Equal
   c. PPG: Approved Equal
   d. B-M: IronClad Wood & Metal Low Lustre Enamel #495 series
   e. The above equipment painting shall be accomplished before installation into ceiling.

3.8 PROTECTION OF FINISHED WORK

A. Protect finished coatings from damage until completion of project.

B. Touch-up damages coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

3.9 CLEANING

A. Clean work under provision of SECTION 01720 - CLEANING.

END OF SECTION

SECTION 15052 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping materials and installation instructions common to most piping systems.

B. Transition fittings.

C. Dielectric fittings.

D. Mechanical sleeve seals.

E. Sleeves.

F. Escutcheons.

G. Plumbing demolition.

H. Equipment installation requirements common to equipment sections.

I. Painting and finishing.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
   1. ABS: Acrylonitrile-butadiene-styrene plastic.
   2. CPVC: Chlorinated polyvinyl chloride plastic.
   3. PE: Polyethylene plastic.
   4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:
   1. EPDM: Ethylene-propylene-diene terpolymer rubber.
   2. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

A. Product Data: For the following:
   1. Transition fittings.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Escutcheons.

1.4 QUALITY ASSURANCE

A. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

C. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

D. Solvent Cements for Joining Plastic Piping:
1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
1. Manufacturers:
a. Cascade Waterworks Mfg. Co.
b. Dresser Industries, Inc.; DMD Div.
c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
d. JCM Industries.
e. Smith-Blair, Inc.
f. Viking Johnson.
2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
4. Aboveground Pressure Piping: Pipe fitting.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
1. Manufacturers:
a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.

d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
1. Manufacturers:
a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
1. Manufacturers:
a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.
2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
1. Manufacturers:
a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
1. Manufacturers:
a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
1. Manufacturers:
a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

B. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Cast-Brass Type: With set screw.
   1. Finish: Polished chrome-plated.

C. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
   1. Finish: Polished chrome-plated.

D. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.

E. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw, and chrome-plated finish.

2.9 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PLUMBING DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.
   1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
   3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
   4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
   5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Sleeves are not required for core-drilled holes.

M. Permanent sleeves are not required for holes formed by removable PE sleeves.

N. Install sleeves for pipes passing through concrete and masonry walls and concrete floor slabs.

O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
   2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
   3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
      a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
      b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
         1) Seal space outside of sleeve fittings with grout.
   4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

R. Verify final equipment locations for roughing-in.

S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
   3. PVC Nonpressure Piping: Join according to ASTM D 2855.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
   3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
   4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout. Avoid air entrapment during placement of grout.

D. Place grout, completely filling equipment bases. Place grout on concrete bases and provide smooth bearing surface for equipment.

E. Place grout around anchors.

F. Cure placed grout.

END OF SECTION

SECTION 15061 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal pipe hangers and supports.

B. Thermal-hanger shield inserts.

C. Fastener systems.

D. Pipe stands.

E. Pipe positioning systems.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:
1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.4 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:
1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Plastic.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

2.5 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

C. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

D. Pipe Stand Installation:
1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 15 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

   b. NPS 4: 12 inches long and 0.06 inch thick.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.3 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.4 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
   2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
   3. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
   4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   5. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   6. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   7. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
   2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
   2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
   3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
   3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
   4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   5. C-Clamps (MSS Type 23): For structural shapes.

6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
8. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

O. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 15082 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Domestic cold-water piping.

B. Domestic hot-water piping.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

B. Qualification Data: For qualified Installer.

C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

D. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports for Plumbing Piping and Equipment."

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Aeroflex USA, Inc.; Aerocel.
      b. Armacell LLC; AP Armaflex.
      c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

D. Mineral-Fiber, Preformed Pipe Insulation:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
1. Products: S Insulation, Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
1. Products: Subject to compliance with requirements, provide the following:
a. Ramco Insulation, Inc.; Thermokote V.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
1. Products: Subject to compliance with requirements, provide the following:
a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.
2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies 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," including 2004 Addenda.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.
2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies 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," including 2004 Addenda.

D. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.

d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Use adhesive that complies 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," including 2004 Addenda.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
   b. Vimasco Corporation; 749.
2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
   b. Eagle Bridges - Marathon Industries; 550.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
   d. Mon-Eco Industries, Inc.; 55-50.
   e. Vimasco Corporation; WC-1/WC-5.
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
   b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
   c. Vimasco Corporation; 713 and 714.
3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.

3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White.
5. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Use sealants that 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," including 2004 Addenda.

B. PVC Jacket Flashing Sealants:
1. Products: Subject to compliance with requirements, provide the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that 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," including 2004 Addenda.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.
2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide one of the following:
a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. ABI, Ideal Tape Division; 370 White PVC tape.
   b. Compac Corporation; 130.
   c. Venture Tape; 1506 CW NS.
2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

2.10 SECUREMENTS

A. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
   a. For below-ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Fittings and Elbows:
   1. Install mitered sections of pipe insulation.
   2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed valve covers manufactured of same material as pipe insulation when available.
   2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   3. Install insulation to flanges as specified for flange insulation application.
   4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
   3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Fittings and Elbows:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

C. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
   3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   4. Install insulation to flanges as specified for flange insulation application.

3.8 FINISHES

A. Insulation Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
   1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
      a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:
   1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three Insert number locations of welded fittings, two Insert number locations of threaded strainers, two Insert number locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
   1. Underground piping.
   2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:
   1. NPS 1 and Smaller: Insulation shall be one of the following:
      a. Flexible Elastomeric: 1/2 inch thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
   2. NPS 1-1/4 and Larger: Insulation shall be one of the following:
      a. Flexible Elastomeric: 1 inch thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot Water:
   1. NPS 1-1/4 and Smaller: Insulation shall be the following:
      a. Flexible Elastomeric: 1 inch thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
   2. NPS 1-1/2 and Larger: Insulation shall be one of the following:
      a. Flexible Elastomeric: 1 inch thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

END OF SECTION

SECTION 15111 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Brass ball valves.

B. Bronze ball valves.

C. Bronze swing check valves.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. SWP: Steam working pressure.

1.3 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.4 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set ball valves open to minimize exposure of functional surfaces.
4. Block check valves in either closed or open position.

B. Use the following precautions during storage:
1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
1. Handlever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

F. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Red-White Valve Corporation.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two-piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Red-White Valve Corporation.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

2.4 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
   a. Standard: MSS SP-80, Type 4.
   b. CWP Rating: 300 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded.
   f. Disc: PTFE or TFE.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior 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. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION

SECTION 15140 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

1.2 SUBMITTALS

A. Product Data: For the following products:
   1. Transition fittings.
   2. Dielectric fittings.

B. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61 for potable domestic water piping and components.

1.4 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
   1. Notify Construction Manager or Owner no fewer than two days in advance of proposed interruption of water service.
   2. Do not proceed with interruption of water service without Construction Manager's or Owner's written permission.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
   1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
   2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
   3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
   4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
   5. Copper Pressure-Seal-Joint Fittings:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Elkhart Products Corporation; Industrial Division.
         2) NIBCO INC.
         3) Viega; Plumbing and Heating Systems.
      b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
   6. Copper-Tube Extruded-Tee Connections:
      a. Manufacturers: Subject to compliance with requirements, provide products by the following:
         1) T-DRILL Industries Inc.
      b. Description: Tee formed in copper tube according to ASTM F 2014.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
   1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
   2. Copper Pressure-Seal-Joint Fittings:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Elkhart Products Corporation; Industrial Division.
         2) NIBCO INC.

3) Viega; Plumbing and Heating Systems.

b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.

2.2 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

2.3 TRANSITION FITTINGS

A. General Requirements:
1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Cascade Waterworks Manufacturing.
b. Dresser, Inc.; Dresser Piping Specialties.
c. Ford Meter Box Company, Inc. (The).
d. JCM Industries.
e. Romac Industries, Inc.
f. Smith-Blair, Inc; a Sensus company.
g. Viking Johnson; c/o Mueller Co.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Hart Industries International, Inc.
d. Jomar International Ltd.
e. Matco-Norca, Inc.
f. McDonald, A. Y. Mfg. Co.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
h. Wilkins; a Zurn company.
2. Description:
a. Standard: ASSE 1079.
b. Pressure Rating: 150 psig.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Elster Perfection.
b. Grinnell Mechanical Products.
c. Matco-Norca, Inc.
d. Precision Plumbing Products, Inc.
e. Victaulic Company.
2. Description:
a. Standard: IAPMO PS 66
b. Electroplated steel nipple. complying with ASTM F 1545.
c. Pressure Rating: 300 psig at 225 deg F.
d. End Connections: Male threaded or grooved.
e. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve immediately upstream of each dielectric fitting.

D. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping adjacent to equipment and specialties to allow service and maintenance.

I. Install piping to permit valve servicing.

J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 15 Section "Sleeves and Sleeve Seals for Plumbing Piping."

O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 15 Section "Sleeves and Sleeve Seals for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

E. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 15 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for all piping.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 15 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.
   1. Vertical Piping: MSS Type 8 or 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
   2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
   3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:
   1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
   2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
      a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
      b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
   3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
   4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:
   1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
   2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 ADJUSTING

A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Remove and clean strainer screens. Close drain valves and replace drain plugs.
4. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
5. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

A. Portions of disinfecting requirements in this article are taken from model plumbing codes; revise if requirements vary. Option in first paragraph below is for disinfection of non-potable domestic water piping.

B. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:
1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Clean non-potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

D. Prepare and submit reports of purging and disinfecting activities.

E. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water piping, shall be the following:
   1. Soft copper tube, ASTM B 88, Type K; wrought-copper solder-joint fittings; and brazed joints.

E. Aboveground domestic water piping, shall be the following:
   1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and brazed or soldered joints.

END OF SECTION

SECTION 15141 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sleeves.

B. Sleeve-seal systems.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors and walls are constructed.
1. Cut sleeves to length for mounting flush with both surfaces.
a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:
   1. Exterior Concrete Walls above Grade:
      a. Piping Smaller Than NPS 6: Cast-iron wall sleeves.
   2. Concrete Slabs-on-Grade:
      a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
      b. Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

END OF SECTION

SECTION 15145 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Vacuum breakers.

B. Backflow preventers.

C. Water hammer arresters.

D. Trap-seal primer valves.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. NSF Compliance: Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Ames Co.
      b. Cash Acme.
      c. Conbraco Industries, Inc.
      d. FEBCO; SPX Valves & Controls.
      e. Rain Bird Corporation.
      f. Toro Company (The); Irrigation Div.
      g. Watts Industries, Inc.; Water Products Div.
      h. Zurn Plumbing Products Group; Wilkins Div.
   2. Standard: ASSE 1001.
   3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
   4. Body: Bronze.
   5. Inlet and Outlet Connections: Threaded.
   6. Finish: Rough bronze.

2.2 BACKFLOW PREVENTERS

A. Beverage-Dispensing-Equipment Backflow Preventers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Conbraco Industries, Inc.
      b. Watts Industries, Inc.; Water Products Div.
      c. Zurn Plumbing Products Group; Wilkins Div.
   2. Standard: ASSE 1022.
   3. Operation: Continuous-pressure applications.
   4. Size: NPS 1/4 or NPS 3/8.

5. Body: Stainless steel.
6. End Connections: Threaded.

2.3 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AMTROL, Inc.
b. Josam Company.
c. MIFAB, Inc.
d. PPP Inc.
e. Sioux Chief Manufacturing Company, Inc.
f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
g. Tyler Pipe; Wade Div.
h. Watts Drainage Products Inc.
i. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.4 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. MIFAB, Inc.
b. PPP Inc.
c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Watts Industries, Inc.; Water Products Div.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
1. Locate backflow preventers in same room as connected equipment or system.
2. Do not install bypass piping around backflow preventers.
B. Install water hammer arresters in water piping according to PDI-WH 201.
C. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 FIELD QUALITY CONTROL

A. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

END OF SECTION

SECTION 16060 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding systems and equipment.

1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression or exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

C. Grounding and Bonding for Piping: Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 16073 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hangers and supports for electrical equipment and systems.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti Inc.
        4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.
2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
    1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
    1. To Wood: Fasten with lag screws or through bolts.
    2. To New Concrete: Bolt to concrete inserts.
    3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
    4. To Existing Concrete: Expansion anchor fasteners.
    5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
    6. To Light Steel: Sheet metal screws.
    7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 16075 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Identification for raceways.

B. Identification of power and control cables.

C. Identification for conductors.

D. Warning labels and signs.

E. Instruction signs.

F. Equipment identification labels.

G. Miscellaneous identification products.

1.2 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.3 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.2 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Warning label and sign shall include, but are not limited to, the following legends:
1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.3 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.4 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.5 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways , 600 V or Less, for Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot maximum intervals.

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes, use color-coding conductor tape to identify the phase.
   1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors; verify color coding matches existing coding in facility.
   2. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
   3. Colors for 208/120-V Circuits:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
   4. Colors for 480/277-V Circuits:
      a. Phase A: Brown.
      b. Phase B: Orange.
      c. Phase C: Yellow.
   5. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
   3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

D. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

E. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
   1. Comply with 29 CFR 1910.145.
   2. Identify system voltage with black letters on an orange background.
   3. Apply to exterior of door, cover, or other access.

F. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
   1. Labeling Instructions:
      a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
      b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
      c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
   2. Equipment to Be Labeled:
      a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
      b. Enclosed switches.
      c. Enclosed circuit breakers.
      d. Enclosed controllers.
      e. Contactors.
      f. Remote-controlled switches, and control devices.
      g. Transformers.

END OF SECTION

SECTION 16120 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building wires and cables rated 600 V and less.

B. Connectors, splices, and terminations rated 600 V and less.

1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders and Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway.

B. Class 1 Control Circuits: Type THHN-THWN, in raceway.

C. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

D. Support cables according to Division 16 Section "Hangers and Supports for Electrical Systems."

E. Identify and color-code conductors and cables according to Division 16 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
1. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Test Reports: Prepare a written report to record the following:
1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 16130 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. EMT: ANSI C80.3.

E. FMC: Zinc-coated steel or aluminum.

F. LFMC: Flexible steel conduit with PVC jacket.

G. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Fittings for EMT: Steel set-screw or compression type.
2. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.

H. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.

2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Type EPC-40-PVC**,** unless otherwise indicated.

C. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2.4 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
2. Concealed in Ceilings and Interior Walls and Partitions: EMT.

3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Rigid steel conduit.
5. Raceways for Concealed General Purpose Distribution of Communications Cable: EMT.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 16 Section "Hangers and Supports for Electrical Systems."

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

G. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

H. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures**,** equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations.

I. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

C. Rectangular Sleeve Minimum Metal Thickness:
1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

H. Interior Penetrations of Non-Fire-Rated Walls: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials.

J. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.4 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.5 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Receptacles, receptacles with integral GFCI, and associated device plates.

B. Snap switches and wall-box dimmers.

1.2 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
   2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
   3. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; 5351 (single), 5352 (duplex).
      b. Hubbell; HBL5351 (single), CR5352 (duplex).
      c. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

A. General Description: Straight blade type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; GF20.
      b. Pass & Seymour; 2084.
   2. Exterior devices shall be listed weather resistant.

2.4 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
      b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
      c. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

2.5 WALL PLATES

A. Single and combination types to match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Material for Finished Spaces: Smooth, high-impact thermoplastic in Dining Area and 0.035-inch**-** thick, satin-finished stainless steel in Food Service Areas.
   3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
   4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, In-Use Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant thermoplastic with lockable cover.

2.6 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.
   1. Wiring Devices: Ivory, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:
   1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:
   1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION

SECTION 16511 - LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Lighting fixtures, lamps, and ballasts.

B. Emergency lighting units.

C. Exit signs.

D. Lighting fixture supports.

1.2 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. LER: Luminaire efficacy rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of lighting fixture including dimensions.
   2. Emergency lighting units including battery and charger.
   3. Ballast, including BF.
   4. Energy-efficiency data.
   5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
   6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
      a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

C. Installation instructions.

D. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
   1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Fluorescent Fixtures: Comply with UL 1598.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers and Globes:
   1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
      a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
      b. UV stabilized.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. Ballasts shall be manufactured by G.E., Motorola, or Magnetek.

B. General Requirements for Electronic Ballasts:
   1. Comply with UL 935 and with ANSI C82.11.
   2. Designed for type and quantity of lamps served.
   3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
   4. Sound Rating: Class A.
   5. Total Harmonic Distortion Rating: Less than 10 percent.
   6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   7. Operating Frequency: 42 kHz or higher.
   8. Lamp Current Crest Factor: 1.7 or less.
   9. BF: 0.88 or higher.
   10. Power Factor: 0.95 or higher.
   11. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

C. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.

D. Electronic Programmed-Start Ballasts for T5 and T8 Lamps: Comply with ANSI C82.11 and the following:
   1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
   2. Automatic lamp starting after lamp replacement.

E. Ballasts for Low-Temperature Environments:
   1. Temperatures 0 Deg F and Higher: Electronic type rated for 0 deg F starting and operating temperature with indicated lamp types.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.

3. Sound Rating: Class A.
4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher unless otherwise indicated.
9. Power Factor: 0.95 or higher.
10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.5 FLUORESCENT LAMPS

A. Lamps shall be manufactured by G.E., Philips, or Osram Sylvania, equal to lamp types scheduled or noted on the drawings. Fluorescent lamps shall be low-mercury type.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 16 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:
1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
1. Install ceiling support system rods or wires**,** independent of the ceiling suspension devices**,** for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Connect wiring according to Division 16 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Division 16 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner.

END OF SECTION

EVERGREEN
ARCHITECTS

168 West Franklin Street ■ Centerville, Ohio 45459 ■ www.evergreen-architects.com ■ 937.434.8400 ■