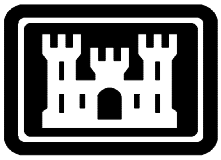

US Army Corps
of Engineers
Baltimore District

CONSTRUCTION SPECIFICATIONS

STADIUM IMPROVEMENTS

ANACOSTIA SENIOR HIGH SCHOOL, WASHINGTON, DC

REQUEST FOR PROPOSAL **DACW31-03-R-0003**

CONTRACT NO.

DATE **JAN 13, 2003**

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SECTION 01000-ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SUBMITTALS: Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Title Evidence

Proof of purchase for equipment and/or materials.

Invoice Copies

Proof of rental equipment costs.

Proof of full payment.

Photographs - 3"x5" min.

SD-03 PRODUCT DATA-G A/R

Cost or Pricing Data

Proof of actual equipment costs

Equipment Data

An itemized list of serial/model numbers and equipment installed by the Contractor under this contract.

Commissioning Activity for HVAC; G A/R

The Contractor shall provide a separate activity for commissioning. Commissioning shall start only after all HVAC related work has been completed and all HVAC O&M manuals have been submitted and approved by the Government.

SD-10 OPERATIONS AND MAINTENANCE DATA

O and M Data

A list of proposed maintenance and instruction manuals that is mainly used for but not limited to customized equipment.

1.2 PROGRESS SCHEDULING AND REPORTING (DEC 1998)

1.2.1 PRACTICABLE PROGRESS SCHEDULE: The Contractor shall, within 20 days after date of commencement of work or as otherwise determined by the Contracting Officer, submit for approval a practicable progress schedule in accordance with Specification Section 01320 PROJECT SCHEDULE showing the manner in which he intends to prosecute the work.

1.2.2 SOFTWARE PACKAGE: The Contractor shall utilize recognized software package to implement the requirements of Section 01320 PROJECT SCHEDULE. The program and data must be IBM PC compatible in a Window environment. These requirements are not intended to restrict the Contractors selection of an automated scheduling system but to establish a format, which will allow use of the same program with government computers and automated information systems. The Contractor will provide at least one program installation and maintenance on government hardware complete with all program and data files. Such installation shall be maintained for the duration of the project until fiscal completion and shall allow analysis and of the project schedule by government personnel or agents.

1.2.3 ADDITIONAL SCHEDULING REQUIREMENTS: The Contractor shall incorporate the following requirements in addition to those specified in Section 01320 PROJECT SCHEDULE.

1.3 PAYMENTS TO CONTRACTORS: (NOV 1976) For payment purposes only, an allowance will be made by the Contracting Officer of 100 percent of the invoiced cost of materials or equipment delivered to the site but not incorporated into the construction, pursuant to the Contract Clause entitled “PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS”. The Contracting Officer may also, at his discretion, take into consideration the cost of materials or equipment stored at locations other then the job site, when making progress payments under the contract. In order to be eligible for payment, the Contractor must provide satisfactory evidence that he has acquired title to such material or equipment, and that it will be utilized on the work covered by this contract. Further, all items must be properly stored and protected. Earning will be computed using 100% of invoiced value.(CENAB-C0-E)

1.4 IDENTIFICATION OF EMPLOYEE: (OCT 1983) Each employee assigned to this project by the Contractor and subcontractors shall be required to display at all times, while on the project site, an approved form of identification provided by the Contractor, as an authorized employee of the Contractor/Subcontractor. In addition, on those projects where identification is prescribed and furnished by the Government, it shall be displayed as required and it shall immediately be returned to the Contracting Officer for cancellation upon release of the assigned employee and or completion of project.

1.5 PURCHASE ORDER: (SEP 1975) One readable copy of all purchase orders for material and equipment, showing firm names and addresses, and all shipping bills, or memoranda of

shipment received regarding such material and equipment, shall be furnished the appointed Contracting Officer's Representative as soon as issued. Such orders, shipping bills or memoranda shall be so worded or marked that all material and each item, piece or member of equipment can be definitely identified on the drawings. Where a priority rating is assigned to a contract, this rating, the required delivery date, and the scheduled shipping date shall also be shown on the purchase order. At the option of the Contractor, the copy of the purchase order may or may not indicate the purchase price.

1.6 EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE (OCT 1995)

(a) This clause does not apply to termination. Basis for settlement of proposals and FAR Part 49.

(b) Allowable cost for construction and equipment in sound workable conditions owned or controlled and furnished by a Contractor or Subcontractor at any tier shall be based on actual costs data for each piece of equipment or groups of similar serial and services for which the government can determine both ownership and operating costs from the Contractor's accounting records. When both ownership and operating costs can not be determined for any piece of equipment or groups of similar serial or series equipment from the Contractor's accounting records, costs for that equipment from the Contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP1110-1-8 Construction Equipment Ownership and Operating Expenses Schedule, Region East. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the Contracting Officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall be applied. For retroactive pricing, the schedule in effect at the time the work was performed shall apply.

(c) Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d) (ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-leaseback arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established proactive of leasing the same or similar equipment to unaffiliated leases.

(d) When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the Contracting Officer shall request the Contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Proposal Cover Sheet.

1.7 REAL PROPERTY EQUIPMENT DATA: (APR 1975) At or before the time of completion of the contract, the Contractor shall submit to the Contracting Officer a complete itemized list, including serial and model number where applicable, showing the unit retail value of

each Contractor furnished item of mechanical, electrical and plumbing equipment installed by the Contractor under this contract. For each of the items which is specified herein to be guaranteed for a specified period from the date of acceptance thereof, either for beneficial use of final acceptance, whichever is earlier, against defective materials, design, and workmanship, the following information shall be given: the name, address and telephone number of subcontractor, Equipment Supplier; or Manufacturer originating the guaranteed item.

The list shall be accompanied by a copy of the specific guarantee document for each item which is specified herein to be guaranteed if one had been furnished to the Contractor by the Equipment Supplier Manufacturer.

The Contractor's guarantee to the Government of these items will not be limited by the terms of any manufacturer's guarantee to the Contractor. Baltimore District NADB Form 1019 may be utilized for the itemized listing and will be made available to the Contractor upon request.

1.8 O and M DATA: (JUL 1979) The requirements for furnishing operating and maintenance data and field instruction are specified elsewhere in the Specifications. The Contractor shall submit to the Contracting Officer, at a time prior to the 50% project completion time, a list of proposed maintenance and instruction manuals to be furnished the Government and the scheduled dates of all required field instructions to be provided by Contractor furnished personnel or manufacturer's representatives. All maintenance and instruction manuals must be furnished to the Contracting Officer at least 2 weeks prior to the scheduled dates of any required Contractor furnished field instructions or at least one month prior to project completion if no Contractor furnished field instructions are required.

1.9 NEGOTIATED MODIFICATIONS: (OCT 84) Whenever profit is negotiated as an element of price for any modification to this contract with either prime or subcontractor, a reasonable profit shall be negotiated or determined by using the OCE Weighted Guidelines method outlined in EFARS 15.902. (Sugg. NAB 84-232).

1.10 PHOTOGRAPHIC COVERAGE: (SEP 85) The Contractor shall furnish ten each 8"x10" (commercial grade color photographs of the project (with negatives) to the Contracting Officer. These photographs shall be taken at systematic intervals caring the contract where and when directed by the Contracting Officer.

1.11 PARTNERING: (NOV 92) In order to most effectively accomplish this contract, the Government is willing to form a cohesive partnership with the Contractor and its subcontractors. This partnership would strive to draw on the strengths of each organization in an effort to achieve a quality project done right the first time, within budget and on schedule. This partnership would be bilateral in make-up and participation will be totally voluntary. Any cost associated with effectuating this partnership will be agreed to be both parties and will be shared equally with no change in contract price.

PART 3 –EXECUTION (NOT APPLICABLE)

END OF SECTION 01000

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The project includes the complete improvements to the stadium at the Anacostia Senior High School, and incidental related work.

B. Project Location:
1. Anacostia Senior High School
16th and Ridge Place, SE
Washington, DC 20020

1. Owner: District of Columbia Public Schools, Washington, DC

B. Architect Identification: The Contracts Documents, dated May 25th, 2001, and revisions, were prepared for the project by Bryant Associates, P.C. 1420 N Street NW, Suite 100 Towne Terrace East, Washington, DC 20005.

C. The work consists of the complete renovation of the existing high school stadium, with necessary improvements to support various athletic events.

1. The work includes the installation of a synthetic NCAA running track, and a new football field and landscaping as shown on the contract documents.
2. The work also includes a new three story masonry building with elevator, to be used as a Press building. Other buildings to be located on the site are a maintenance building, and a locker room/concession building. A new ticket booth will also be required. This work includes all labor and materials necessary for complete buildings, including lighting, plumbing, HVAC, telecommunications and security systems, ready for occupancy.
3. The work includes the construction of new spectator bleachers, all in accord with the contract documents and national and local codes.

1.3 CONTRACTS

A. Project will be constructed under a single prime contract.

1.4 WORK SEQUENCE

A The work shall be conducted in a single phase. It shall start with the notice to proceed (NTP) and be completed by a date to be specified by the Owner.

1.5 USE OF PREMISES

A. General: The General Contractor shall have limited use of the site for construction operations, during the construction period. The contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors for other unrelated work at the building.

1.6 WORK UNDER OTHER CONTRACTS

A. There are no other contracts scheduled for this project.

1.7 EXISTING WORK

A. In addition to any FAR clauses pertaining to the protection of existing vegetation, structures, equipment, utilities, and improvements,

B. Remove or alter existing work in a such a manner as to prevent injury or damage to any portions of the existing work which is to remain.

C. Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as approved by the Contracting Officer. At the completion of operations, existing work shall be in a condition equal to or better that that which existed before new work commenced.

1.9 GOVERNMENT FURNISHED AND INSTALLED MATRERIAL AND EQUIPMENT.

A. For the purposes of this contract, the security equipment and telephones will be considered Owner furnished and installed items. However the General Contractor shall be responsible for any and all electronics, utility, and electrical hook-ups, and therefore must coordinate with the Owners equipment supplier.

PART 2 - PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION 01010

SECTION 01050 – JOB CONDITIONS

PART 1-LAYOUT CONDITIONS

1.1 LAYOUT OF WORK: (NOV 1993) The Contractor shall lay out his work from the Government established for all measurements in connection with layout. The Contractor shall furnish, at his own expense, all stakes, templates, platforms, equipment, tools and materials and labor required to lay out any part of the work. The Contractor will be held responsible for the executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also, be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due the Contractor.

1.2 PHYSICAL DATA: (APR 1984) Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation or conclusion drawn from the data or information by the Contractor.

1.3 TRANSPORTATION FACILITIES: Anacostia Senior High School is located at 1601 16th Street, SE, Washington, D.C. and is accessible by public transportation.

1.4 EXPLORATIONS: The physical conditions indicated on the drawings and in the Specifications are the result of site investigations by visual inspection. Foundation exploration logs are shown on drawings. Whenever subsurface exploration logs are presented in the contract documents, soil test results are available for inspection in the Baltimore District, Corps of Engineers, Geotechnical Engineering Branch, Room 9250, City Crescent Building, 10 South Howard Street, Baltimore, Maryland. Soils and rock samples are also available for inspection; however, prospective bidders are required to call (410) 962-4045 between the hours of 9:00 a.m. and 3:30 p.m., Monday through Friday (excluding Federal Holidays), a minimum of 24 hours in advance to arrange a time and date for the inspection of the samples.

1.5 SUBMITTALS: Government approval is required for submittal with a "G" designation; submittals not having a " G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01PRECONSTRUCTION SUBMITTALS
Shut down Utility Services; G A/R
Prior approval for service/utility interruption.

ADVANCE NOTICE
When changes and/or relocation are required.
Checklist; G A/R.

A Risk Assessment for excavation and other work in the vicinity of utilities. Interruption of railroad traffic.

The recording for which all materials and equipment specified to be salvaged and turned over to the Government.

1.6 UTILITIES: Except for sanitary facilities (covered elsewhere), the Contractor is permitted to use school utilities under this contract. All utility investigations and connections addressed in paragraph AVAILABILITY OF UTILITIES INCLUDING LAVATORY FACITLITIES below shall be coordinated with the Contracting Officer.

1.6.1 AVAILABILITY OF UTILITIES INCLUDING LAVATORY FACILITIES: (JUN 1980) It shall be the responsibility of the Contractor to provide all utilities he may require during the entire life of the contract. He shall make his own investigation and determinations as to the availability and adequacy of utilities for his use for construction purposes and domestic consumption. He shall install and maintain all necessary supply lines, connections, piping, and meters if required, but only at such locations and in such manner as approved by the Contracting Officer. Before final acceptance of work under this contract, all temporary supply lines, connections and piping installed by the Contractor shall be removed by him in a manner satisfactory to the Contracting Officer.

1.6.2 INTERRUPTION OF UTILITIES: (1972)

a. No utility services shall be interrupted by the Contractor to make connections, to relocate, or for any purpose without approval of the Contracting Officer.

b. Request for permission to shutdown utility services shall be submitted in writing to the Contracting Officer not less than (17) days prior to proposed date of interruption. The request shall give the following information.

1. Nature of Utility (Gas. L.P. or H. P., Water, Etc.)
2. Size of line and location of shutoff.
3. Buildings and services affected.
4. Hours and date of shutoff.
5. Estimated length of time service will be interrupted.
6. Services will not be shut off until receipt of approval of the proposed hours and date from the Contracting Officer.

c. Shutoffs which will not be shut off until receipt of approval of the proposed hours and date from the Contracting Officer.

d. Operations for valves on water mains will be by Government personnel.
Where shutoff of water lines interrupts services to fire hydrants or fire sprinkler systems, the Contractor shall arrange his operations and have sufficient material and personnel available to complete the work without undue delay or to restore service without delay in event of emergency.

e. Flow in gas mains, which have been shut off, shall not be restored until the Government inspector has determined that all items serviced by the gas line have been shut off.

1.7 ALTERATIONS TO UTILITIES: (AUG 1968) Where changes and relocation's of utility lines are noted to be performed by others, the Contractor shall give the Contracting Officer in writing advance notice at least thirty days' of the time that the change or relocation is required. In the event that, after the expiration of thirty days after receipt of such notice by the Contracting Officer, such utility lines have not been changed or relocated and delay is occasioned to the completion of the work under this contract, the Contractor will be entitled to a time extension equal to the period of time lost by the Contractor after the expiration of said thirty day period. Any modification to existing or relocated lines required as a result of the Contractor's method of operation shall be made wholly at the Contractor's expense and no additional time will be allowed for delay incurred by such modifications.

1.8 UTILITY MARKING: The Contractor shall contact, a minimum of (14) days prior to any excavation, the Post DPW and Miss Utility requesting utility location markings. The Contractor shall not proceed with any excavation until all utilities, including abandoned utilities, have been marked to the satisfaction of the Contracting Officer. Prior to requesting the marking of utilities, the Contractor shall stake out proposed excavations and limits of work with white lines ("White lining").

It is the Contractor's responsibility to ensure that all permits (excavation or otherwise, including DPW permits) are current and up-to-date-without expiration. In addition to the above requirements the Contractor shall:

a. Visually survey and verify that all utility markings are consistent with existing appurtenances such as manholes, valve boxes, poles, pedestals, pad-mounted devices, gas meters, etc. prior to any excavation.

b. Hand digs test holes to verify the depth and location of all utilities prior to any mechanical excavation within the limits of work. The Contracting Officer, as indicated in (d) below, may consider other non-damaging methods for utility verification, subject to approval. Also, verify that any abandoned utilities are not active.

c. Preserve all utility markings for the duration of the project to the furthest extent possible.

d. When excavation is performed within 2 feet of any utility line, a non-damaging method of excavation shall be used. The non-damaging methods, such as, soft digging, vacuum excavation, pneumatic hand tools, may be considered subject to approval by the Contracting Officer.

e. Regardless of the type of excavation, the Contractor shall notify the Contracting Officer a minimum of 24 hours prior to any excavation activity. Failure to notify the Contracting Officer can result in the issuance of a "Stop

Work" order, which shall not be justification for contract delay or time extension. The Government reserves the right to have personnel present on site during any type of excavation.

f. The Contractor's Quality Control System Manager shall ensure that all excavation requirements herein are met at the time of the preparatory phase of quality control, and that the excavation procedures are reviewed during the preparatory phase meeting.

g. Any work other then excavation in the vicinity of a utility, that could damage or interrupt a utility, such as, exterior or interior work near transformers, power lines, poles above ground gas lines, gas meters, etc., shall be done with extreme care. The Contractor shall specifically note during the preparatory phase of quality control, the construction techniques to be used to preclude damaging or interrupting any utility. This preparatory phase of control shall also establish and document contingency plans and actions to be followed in the event that existing utilities are damaged or interrupted. Locations of shut off or isolation devices along with other safety features shall be established and their operation reviewed.

h. The Contractor shall complete a risk assessment, using the attached checklist, at least one week prior to the start of any excavation or other work in the vicinity of utility. The risk assessment shall be submitted for Government approval prior to any excavation.

1.9 DISPOSAL OF EXISTING MATERIAL AND EQUIPMENT: (DEC 1975) All removed, dismantled or demolished material and/or equipment including rubble, scrap and debris not specified or indicated to be government salvaged, reinstalled under this contract or otherwise retained for disposal on D.C. Public School land will become the property of the Contractor and shall be promptly removed from the site and disposed of by the Contractor at his own expense and responsibility.

1.10 COMPLIANCE WITH DC SCHOOL REGULATIONS: (Jul 1980) The site of the work is at a D.C. Public School and all rules and regulations issued by the authorized D.C. Public School official covering general safety, security, sanitary requirements, pollution control, traffic regulations and parking, shall be observed by the Contractor.

Information regarding these requirements may be obtained by contacting the Contracting Officer, who will provide such information or assist in obtaining it from appropriate authorities.

1.11 MAINTENANCE OF ACCESS: (DEC 1975) Where buildings are unoccupied or non-operational, consult the Contracting Officer concerning access blockage and material storage. Unless approved by the Contracting Officer, the Contractor shall not block passage through sidewalks, roads, alleys or other entranceways to buildings during performance of work under this contract. In addition, the Contractor shall at all times maintain safe and clear passage through interior corridors and doorways to allow minimal disruption of normal activities within the building. If the school is not in use

during renovation, construction material and equipment may be stored in the building, subject to the approval of the Contracting Officer. All existing equipment, materials and debris removed during the works that are not to reinstall shall be removed daily by the Contractor from the building.

1.12 PROTECTION OF GOVERNMENT PROPERTY AND PERSONNEL: (DEC 1975)

1.12.1 PROTECTION OF EQUIPMENT: All existing non-contractors owned the Contractor from damage caused by construction operations should protect material and equipment within the work area. As a minimum, the Contractor shall cover all furniture, equipment and carpets in the work area with dust barriers and protect such items from any damage due to dust, vibration, water, heat or other conditions resulting from construction activities. The Contractor at his owns expense shall promptly repair existing work damaged by construction operations.

1.12.2 The Contractor shall protect school personnel and students by installing safety rails and/or barricades as applicable to prevent injury from unauthorized entry into work areas. Warning signs shall be erected as necessary to indicate Construction areas or hazardous zones. Work shall proceed in such manner as to prevent the undue spread or dust and flying particles.

1.12.3 MEASURES TO PREVENT DAMAGE/INJURY: The Contractor shall take such additional measures as may be directed by the Contracting Officer to prevent damage of injury to non-Contractor property or personnel.

1.13 STREET CLOSINGS: (May 1978) When operations in connection with contract work necessitate the closing of streets, it shall be the Contractor's responsibility to arrange in advance with the Contracting Officer for such street closings and to provide appropriate barricades, signs markers, flares, and other devices as may be required by the Contracting Officer's Representative for traffic guides and public safety.

1.14 ORDER OF WORK AND COORDINATION WITH OTHER CONTRACTORS: (FEB 1979) Other Contractors may be working in the same school. After award of this contract a meeting will be held with all contractor representative and the Contracting Officer to develop a plan of work coordination. In case of disagreement regarding use of an area the decision of the Contracting Officer will control.

1.15 ASBESTOS HANDLING AND REMOVAL: Through site investigations, friable asbestos has not been found, however if asbestos is encountered, its testing, removal and disposal is covered in "CHANGES" clause of the Contract Clauses.

1.16 TIME EXTENSIONS FOR UNUSALLY SEVERE WEATHER

1.16.1 PROCEDURE FOR DETERMINATION: This provision specifies the procedure for determination of time extensions for unusually severe weather in accordance with contract clause entitled "Default: (Fixed Price Construction)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied.

a. The weather experienced at the project site during the contract period must be found to be unusually severe than the adverse weather anticipated for the project location during any given month.

b. The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

1.16.2 ANTICIPATION ADVERSE WEATHER DELAYS: The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY
WORK DAYS BASED ON (5) DAY WORKWEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
4	5	6	7	6	6	6	5	2	5	4	3

1.16.3 Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work and critical activities for 50 percent or more of the contractor's scheduled workday. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph 2.9.2, above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather workdays, and issue a modification in accordance with the contract clause entitled "Default (Fixed Price Construction)".

1.17 WORKING HOURS AND COORDINATION WITH SCHOOL PERSONNEL

1.17.1 Working Hours: Work will be allowed from 7:00 AM until 7:00 PM, Monday through Friday. If work is scheduled to be performed during the normal school day and the Contractor is unable to prevent disturbance to the operations of the school, he shall schedule the work before or after school classes.

In order to meet the required completion date specified in this contract, work may be required to be done during early mornings, evenings, weekends and holidays at no additional expense to the Government. The Contractor shall take all necessary measures to ensure that the work performed outside of the normal school day is performed without disturbance to the local residential neighborhood. The Contractor's schedule to perform work outside of normal school hours shall be furnished in writing to the Contracting Officer and/or the designated DCPS official 48 hours in advance. Disturbance to the operation of the school is defined as noise, dust, order or any other physical disruption to the operation of the school determined by the school principal, local residence, or the Contracting Officer. The Contractor shall obtain any work permits required for extended working hours.

1.17.2 Coordination with DCPS Maintenance Personnel for School Access: Contractor personnel will not be given any keys to the school. Any doors, which must be opened for the contractor's employees, will be done by the building maintenance staff.

1.17.3 Coordination with the Contracting Officer will be required to inform DCPS personnel what areas of the facility the Contractor intends to work at the school and when. The Contractor shall coordinate personnel movement and access requirements exclusively through the Contracting Officer.

1.18 MANUFACTURER'S RECOMMENDATIONS: Where installation or application procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed or applied, printed copies of these recommendations shall be furnished to the Contracting Officer prior to installation. Installation or application of the item will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the materials.

1.19 SITE RESTRICTIONS

1.19.1 General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises is limited only by the Owner's right to perform work or to retain other contractors on portions of the project.

Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the work is indicated.

1. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

Entrances and Work Areas: The Contractor shall use only school entrances to the work area as designated by the Contracting Officer. Except to access a work area, the Contractor shall not occupy any rooms or corridors outside work areas. Contractor personnel found in non-work areas without a valid reason may be permanently restricted from returning to the site.

1.19.2 Security of Outer Doors and Entrances: See subparagraph "Coordination with DCPS Maintenance Personnel for School Access" in this section. Unless otherwise approved by the Contracting Officer, the Contractor shall ensure all existing or renovated exterior doors are locked to maintain security of the building and to effectively prevent unauthorized entry into the work area and removal of school property and supplies.

Entranceways at uncompleted exterior doors shall be secured by means approved by the Contracting Officer. Coordinate with school officials if school security personnel are required at uncompleted exterior doors.

1.19.3 Elevators and Loading Docks: Freight elevators and loading docks shall be used for movement of all material, equipment and supplies. Passenger elevators shall not be used to move materials, equipment, etc., however, the Contractor's work areas. School system personnel shall have priority use of elevators and loading docks unless material or equipment is already loaded on these facilities.

1.20 FINAL INSPECTION/ACCEPTANCE: When in the opinion of the Contractor the project is substantially complete, the Contractor shall give the Contracting Officer written notice at least seven (7) calendar days in advance of date on which project will be 100% complete and ready for final inspection. Prior to final inspection date, the Contractor shall verify that, in his best judgment, no deficiencies exist.

1.21 PHASING AND WORK CONDITIONS

1.21.1 Working Around Students: The Contractor shall be considerate when working around high school students. Care shall be taken when moving material and equipment through doors, hallways, and on stairways. Students may be preoccupied or unaware of Contractor movement and inadvertently obstruct passage through doorways, halls, and on stairways. When groups of students approach, the Contractor shall if at all possible give students the right-of-way. If Contractor personnel are transporting material or equipment the size or weight of which requires continuous movement to a work site; another Contractor employee who is not assisting in the actual movement shall accompany the carriers to warn students to give right-of-way to workers.

PART 3-PRODUCT (NOT APPLICABLE)

PART 4- EXECUTION (NOT APPLICABLE)

END OF SECTION 01050

RISK ASSESSMENT FOR
EXCAVATION AND OTHER WORK IN THE VICINITY OF UTILITIES

PROJECT NAME:_____
CONTRACT NUMBER:_____
PROJECT INSTALLATION AND LOCATION:_____
PROPOSED EXCAVATION START DATE:_____

1. ☐ ESTABLISH EXCAVATION DETAILS AND DRAWINGS (check when completed)

2. ☐ PROPOSED EXCAVATION AREA MARKED ("white lining") (check when completed)

3. ☐ CONTACT APPROPRIATE ONE-CALL SERVICE FOR PUBLIC UTILITIES:
MD: Miss Utility 1-800-257-7777 N Y : New York City - Long Island One Call Center 1-800-272-4480
N. VA: Miss Utility 1-800-552-7777 PA: Pennsylvania One-Call System Incorporated 1-800-242-1776
VA: Miss Utility of VA 1-800-552-7001 DC: Miss Utility 1-800-257-7777
ONE-CALL NATIONAL REFERRAL CENTER: 1-888-258-0808

☐ CONTACT INSTALLATION/OWNERS OF ALL PRIVATELY OWNED UTILITIES (NON ONE-CALL MEMBERS)

4. ☐ DATE UTILITIES MARKED AND METHOD OF MARKING
ONE-CALL LOCATORS _____
OTHER LOCAT ORS _____

5. ☐ CONTACT APPROPRIATE DPW REPRESENTATIVES AND COMPLY WITH INSTALLATION PERMIT REQUIREMENTS: _____

6. ☐ UTILITIES IDENTIFIED ON-SITE:
☐ NONE ☐ ELECTRIC ☐ GAS ☐ WATER ☐ TELEPHONE ☐ CATV ☐ SEWER ☐ OTHER _____

7. ☐ LEVEL OF RISK: (Based upon personnel safety and consequences of utility outages.)
☐ SEVERE: Excavation required within the immediate vicinity (<2-ft) of a MARKED utility.
☐ MODERATE: Excav. required outside the immediate vicinity (> 2-ft) of MARKED utility.
☐ MINIMAL: Excavation required in an area with NO utilities.

8. ☐ EXISTING FACILITIES/UTILITIES IN VICINITY:
☐ NON-CRITICAL ☐ MISSION CRITICAL ☐ HIGH-PROFILE ☐ CEREMONIAL
☐ OTHER_____
☐ CONSEQUENCES IF EXISTING UTILITIES ARE DAMAGED/DISRUPTED _____
_____

9. ☐ ENGINEERING CONTROLS REQUIRED:
☐ NONE ☐ HAND EXCAVATE TO LOCATE UTILITY ☐ EXCAVATE WITH DUE CARE
☐ OTHER_____

10. ☐ ADMINISTRATIVE CONTROLS REQUIRED:
☐ Notification of Contracting Officer's Representative, NOTIFIED on: _____
☐ Notification of Installation/DPW Representative, NOTIFIED on:_____

11. ☐ EMERGENCY NOTIFICATION AT INSTALLATION: POC & PHONE NUMBER _____

THE INFORMATION NOTED ABOVE IS ACCURATE AND THE WORK IS READY TO PROCEED
SIGNED and DATE _____CQC MANAGER

12. ☐ ON-SITE GOVERNMENT REP. RECOMMENDATION FOR APPROVAL TO EXCAVATE:
☐ YES ☐ NO SIGNATURE AND DATE: _____
Comments:_____

13. ☐ AREA ENGINEER APPROVAL TO EXCAVATE:
☐ APPROVED ☐ DENIED SIGNATURE AND DATE: _____
Comments:_____

14. ☐ CHIEF,_____ DIVISION APPROVAL TO EXCAVATE:
☐ APPROVED ☐ DENIED SIGNATURE AND DATE: _____
Comments:_____

SECTION 01060-SAFETY

PART 1- GENERAL

1.1 APPLICABLE PUBLICATION: The publications listed below form a part of this Specification and are referred to in the text by the basic designation only. All interim change (changes made between publications of new editions) to the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, will be posted on the Headquarters Website. The date that it is posted shall become the official effective date of the change and contracts awarded after this date shall require complying accordingly. The website location where these changes can be found is under the button entitled "Changes to EM" located at: http://ww.hq.usace.army.mil/soh/hqusace_soh.htm.

U.S. Army Corps of Engineers:
EM385-1-1 (3 Sep 1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

1.2 SUBMITTALS: Government approval is required for submittals with a " G" designation; submittals not having a "G" designation are for information only. When used, a designation following the " G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 PRECONSTRUCTION SUBMITTALS
Safety Supervisor; G A/R.
A safety supervisor shall be responsible for overall supervision of accident prevention activities.

SD-07 CERTIFICATES
Language Certification
It is the Contractors responsibility to ensure that all employees understand the Basic English language.

SD-09 Reports
Activity Phase Hazard Analysis Plan; G A/R.
The addressing of the activity phase hazard analysis plan for each activity performed in a phase of work.

Outline Report
A report for each past activities review.

OSHA LOG
A log shall be reported monthly for injuries.

1.3 GENERAL: 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 a follow:

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 (a) communicated to the workers in a language they understand (reference EM 385-1-1, September 1996, 01.A.04). It is the Contractor's responsibility to ascertain if there are workers on the job who do not speak and/or understand the English language, if such workers are employed by the prime Contractor or subcontractors, at any tier, it is the prime Contractor's responsibility to insure that all safety program, signs, and tool box meetings are communicated to the workers in a language they understand, and that a bilingual employee is on site at all time. If the Contractor contends that interpreters and/or bilingual signs are not required, language certification must be provided which verifies that all workers (whose native tongue is other than English) have a command of the English language sufficient to understand all direction, training and safety requirements, whether written or oral, and (b) incorporated in work methods, and (2) inspecting the work to ensure that safety supervisor name and qualifications shall be submitted in writing for approval to the Contracting Officer's Representative. This individual must have prior experiences as a safety engineer or be able to demonstrate his/her familiarity and understanding of the safety requirements over a prescribed trail 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. This 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 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 job site safety meetings shall be held as follows:

(1) A safety meeting shall be held at least once a month for al 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 lease one safety meeting shall be conducted weekly, or whenever new crews begin work, by the appropriate field supervisors or foremen 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.

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

1.4.1 ACCIDENT REPORTING, ENG FORM 3394: Section 1, Paragraph 01.D. OF EM 385-1-1 and the 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 with (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 the 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.

1.4.2 OSHA REQUIREMENTS

1.4.2.1 OSHA LOG: A copy of the Contractor's OSHA Log of Injuries shall be forwarded monthly to the Contracting Officer.

1.4.2.2 OSHA INSPECTORS: Contractors shall immediately notify the Contracting Officer when an OSHA Compliance official (Federal or State representative) presents his/her credentials and informs that 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.

1.5 GOVERNMENT APPROVAL: Submittals shall be in accordance with Section 01330 SUBMITTAL 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.

PART 2 – PRODUCT (NOT APPLICABLE)

PART 3- EXECUTION (NOT APPLICABLE)

END OF SECTION 01060

Site Security Log

Location: _____

_____

Name (Printed)	Name (Signature)	Agency or Company	Telephone #	Time (entering) Time (exiting)

With my signature, I hereby certify and acknowledge that I have received a security and safety briefing from the Contractor's on-site Quality Control and/or Safety Representative. The information received includes on-site security requirements imposed by the District of Columbia Public Schools and safety rules and regulations that must be followed in accordance with Corps of Engineers Safety Manual EM385-1-1. With my signature, I understand that all possible on-site safety hazards have not been addressed and that caution and my personal knowledge of construction safety and security should be utilized when visiting the construction site.

SECTION 01090-SOURCE FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES: Various publications are referenced to other Sections of the Specifications to establish requirements for the work. These references are identified in each Section by document number, date and title. The document number used in the citation is the number assigned by the sponsoring organization, e.g. ASTM B 564 Nickel Alloy Forging. However, when the sponsoring organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION: The address of the organizations whose publications are referenced in other sections of these Specifications are listed below, and if the source of the publications is different from the address of he sponsoring organization, that information is also provided. Documents listed in the specifications with numbers, which were not assigned by the sponsoring organization, should be ordered from the source by title rather than by number.

AAMA	American Architectural Manufacturers Assoc. 1540 E. Dundee Road, Suite 310 Palatine, IL 60067	(708) 202-1350
AAN	American Association of Nurserymen 1250 Eye St., NW, Suite 500 Washington, DC 20005	(202) 789-2900
ACI	American Concrete Institute P.O. Box 19150 Detroit, MI 48219	(313) 532-2600
ACPA	American Concrete Pipe Assoc. 8300 Boone Blvd., Suite 400 Vienna, VA 22182	(703) 821-1990
AHA	American Hardboard Assoc. 1210 W. Northwest Highway Palatine, IL 60067	(708) 934-8800
AI	Asphalt Institute Research Park Dr. P.O. Box 14052 Lexington, KY 40512-4052	(606) 288-4960

AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006	(202) 626-7300
AISI	American Iron and Steel Institute 1101 17th St., NW Washington, DC 20036-4700	(202) 452-7100
AITC	American Institute of Timber Construction 11818 SE Mill Plain Blvd., Suite 407 Vancouver, WA 98684-5092	(206) 254-9132
ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, MD 20875	(301) 972-1700
ARMA	Asphalt Roofing Manufacturers Assoc. 6000 Executive Dr., Suite 301 Rockville, MD 20852-3803	(301) 231-9050
ASA	Acoustical Society of America 500 Sunnyside Blvd. Woodbury, NY 11797	(516) 349-7800
ASC	Adhesive and Sealant Council 1627 K St., NW, Suite 1000 Washington, DC 20006-1707	(202) 452-1500
ASPA	American Sod Producers Assoc. 1855-A Hicks Rd. Rolling Meadows, IL 60008	(708) 705-9898
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake, CA 91362	(805) 495-7120
AWI	Architectural Woodwork Institute P.O. Box 1550 13924 Braddock Rd., Suite 100 Centerville, VA 22020	(703) 222-1100
AWPB	American Wood Preservers' Bureau (This organization is now defunct.)	
BHMA	Builders' Hardware Manufacturers Assoc. 355 Lexington Ave., 17th Floor New York, NY 10017	(212) 661-4261

BIA	Brick Institute of America 11490 Commerce Park Dr. Reston, VA 22091	(703) 620-0010
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Rd. Schaumburg, IL 60173	(708) 517-1200
CTI	Ceramic Tile Institute of America 28720 Roadside Dr., Suite 300 Agora Hills, CA 91301-3321	(213) 660-1911 (818) 889-8453
EJMA	Expansion Joint Manufacturers Assoc. 25 N. Broadway Tarrytown, NY 10591	(914) 332-0040
ETL	ETL Testing Laboratories, Inc. P.O. Box 2040 Route 11, Industrial Park Cortland, NY 13045	(607) 753-6711
FGMA	Flat Glass Marketing Assoc. White Lakes Professional Bldg. 3310 S.W. Harrison St. Topeka, KS 66611-2279	(913) 266-7013
HI	Hydronics Institute P.O. Box 218 35 Russo Place Berkeley Heights, NJ 07922	(908) 464-8200
HMA	Hardwood Manufacturers Assoc. 400 Penn Center Blvd. Pittsburgh, PA 15235	(412) 829-0770
HPVA	Hardwood Plywood and Veneer Assoc. 1825 Michael Farraday Dr. P.O. Box 2789 Reston, VA 22090	(703) 435-2900
IESNA	Illuminating Engineering Society of North America 345 E. 47th St. New York, NY 10017	(212) 705-7926

IGCC	Insulating Glass Certification Council c/o ETL Testing Laboratories, Inc. P.O. Box 2040 Route 11, Industrial Park Cortland, NY 13045	(607) 753-6711
ISA	Instrument Society of America P.O. Box 12277 67 Alexander Dr. Research Triangle Park, NC 27709	(919) 549-8411
LPI	Lightning Protection Institute 3365 N. Arlington Heights Rd., Suite J Arlington Heights, IL 60004	(800) 488-6864
MBMA	Metal Building Manufacturer's Assoc. c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851	(216) 241-7333
MCAA	Mechanical Contractors Association of America 1385 Piccard Dr. Rockville, MD 20850-4329	(301) 869-5800
NAA	National Arborist Assoc. The Meeting Place Mall Route 101, P.O. Box 1094 Amherst, NH 03031-1094	(603) 673-3311
NAAMM	National Association of Architectural Metal Manufacturers 600 S. Federal St., Suite 400 Chicago, IL 60605	(312) 922-6222
NAPA	National Asphalt Pavement Assoc. NAPA Building 5100 Forbes Blvd. Lanham, MD 20706-4413	(301) 731-4748
NAPF	National Association of Plastic Fabricators (Now DLPA)	
NCMA	National Concrete Masonry Assoc. 2302 Horse Pen Rd. Herndon, VA 22071-3406	(703) 435-1900
NEC	National Electrical Code (from NFPA)	

NECA	National Electrical Contractors Assoc. 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814	(301) 657-3110
NEMA	National Electrical Manufacturers Assoc. 2101 L St., NW, Suite 300 Washington, DC 20037	(202) 457-8400
NETA	International Electrical Testing Assoc. P.O. Box 687 Morrison, CO 80465	(303) 467-0526
NHLA	National Hardwood Lumber Assoc. P.O. Box 34518 Memphis, TN 38184-0518	(901) 377-1818
NKCA	National Kitchen Cabinet Assoc. (Now KCMA)	
NLGA	National Lumber Grades Authority 1055 W. Hastings St., Suite 260 Vancouver, British Columbia Canada V6E 2E9	(604) 687-2171
NPA	National Particleboard Assoc. 18928 Premiere Court Gaithersburg, MD 20879	(301) 670-0604
NPCA	National Paint and Coatings Assoc. 1500 Rhode Island Ave., NW Washington, DC 20005	(202) 462-6272
NRCA	National Roofing Contractors Assoc. 10255 W. Higgins Rd., Suite 600 Rosemont, IL 60018-5607	(708) 299-9070
NSSEA	National School Supply and Equipment Assoc. 8300 Colesville Rd., No. 250 Silver Spring, MD 20910	(301) 495-0240
PATMI	Power Actuated Tool Manufacturers' Institute, Inc. 1000 Fairgrounds Rd., Suite 200 St. Charles, MO 63301	(314) 947-6610

PCA	Portland Cement Assoc. 5420 Old Orchard Road Skokie, IL 60077	(708) 966-6200
PDI	Plumbing and Drainage Institute c/o Sol Baker 1106 W. 77th St., South Dr. Indianapolis, IN 46260	(317) 251-6970
RFCI	Resilient Floor Covering Institute 966 Hungerford Dr., Suite 12-B Rockville, MD 20805	(301) 340-8580
RMA	Rubber Manufacturers Assoc. 1400 K St., NW Washington, DC 20005	(202) 682-4800
SGCC	Safety Glazing Certification Council c/o ETL Testing Laboratories Route 11, Industrial Park Cortland, NY 13045	(607) 753-6711
SHLMA	Southern Hardwood Lumber Manufacturers Assoc. (Now HMA)	
SIGMA	Sealed Insulating Glass Manufacturers Assoc. 401 N. Michigan Ave. Chicago, IL 60611	(312) 644-6610
SPRI	Single Ply Roofing Institute 20 Walnut St. Wellesley Hills, MA 02181	(617) 237-7879
SSPC	Steel Structures Painting Council 4400 Fifth Ave. Pittsburgh, PA 15213-2683	(412) 268-3327
SWI	Steel Window Institute c/o Thomas Associates, Inc. 1300 Sumner Ave, Cleveland, OH 44115-2851	(216) 241-7333
TIMA	Thermal Insulation Manufacturers Assoc. (This Organization is now defunct.)	
TPI	Truss Plate Institute 583 D'Onofrio Dr., Suite 200 Madison, WI 53719	(608) 833-5900

UNI	Uni-Bel PVC Pipe Assoc. 2655 Villa Creek Dr., Suite 155 Dallas, TX 75234	(214) 243-3902
WA	Wallcovering Assoc. 401 N. Michigan Ave. Chicago, IL 60611-4267	(312) 644-6618
WIC	Woodwork Institute of California P.O. Box 11428 Fresno, CA 93773-1428	(209) 233-9035
WLPDIA	Western Lath, Plaster, Drywall Industries Assoc. (Formerly California Lath & Plaster Assoc.) 8635 Navajo Rd. San Diego, CA 92119	(619) 466-9070
WRI	Wire Reinforcement Institute 1101 Connecticut Ave. NW, Suite 700 Washington, DC 20036-4303	(202) 429-5125
WSC	Water Systems Council 600 S. Federal St., Suite 400 Chicago, IL 60605	(312) 922-6222
WWPA	Western Wood Products Assoc. Yeon Building 522 SW 5th Ave. Portland, OR 97204-2122	(503) 224-3930

ACI INTERNATIONAL (AC)

PO Box 9094
Farmington Hills, MI 48333-9094
Ph: 248-848-3700
Fax: 248-848-3701
Internet: http://www.aci-int.org
AOK 6/00
LOK 6/00

AGRICUTURAL MARKETING SERVICE (AMS)

Seed Regulatory and Testing Branch
USDA, AMS, LS Div.
Room 209, Bldg. 306, BARC-East
Beltsville, Md. 20705-2325
Ph: (301)-50409430
Fax: (301) 504-8098
Internet: http://www.ams.usda.gov/lsg
Email:james_p_triplitt@usda.gov
AOK 6/00
LOK 6/00

AIR CONDITIONING & REFRIGERATION INSTITUTE (ARI)

4301 North Fairfax Dr., Suite 425
ATTN: Pubs Dept.
Arlington, VA 22203
Ph: 703-524-8800
Fax: 703-528-3816
E-mail: ari@ari.org
Internet: www.ari.org
AOK 6/00
LOK 6/00

AIR DIFFUSION COUNCIL (ADC)

105 SO. Michigan Ave., No.1500
Chicago, IL 60603
Ph: 312-201-0101
Fax: 312-201-0214
Internet:www.flexibleeduc.org
AOK 6/00
LOK 6/00

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

30 W. University Dr.
Arlington Heights, IL 60004-1893
Ph: 847-394-0150
Fax:847-253-0088
Internet: www.amca.org
AOK 6/00
LOK 6/00

ALUMINUN ASSOCIATION (AA)

900 19TH Street NW
Washington, DC 20006
Ph: 202-862-5100
Fax: 202-862-5164
Internet: www.aluminum.org
AOK 6/00
LOK 6/00

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (ASSHTO)

444 N. Capital St. NW, Suite 249
Washington, DC 20001
Ph.: 800-231-3475 (202) 624-5800
Fax: 800-525-5562 (202) 624-5806
Internet: www.aashto.org
AOK 6/00
LOK 6/00

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (ATTCC)

P.O. Box 12215
1 Davis Drive
Research Triangle Park, NC 27709-2215
Ph: 919-549-8141
Fax:919-549-8933
Internet: www.aatcc.org
AOK 6/00
LOK 6/00

AMERICAN BEARING MANUFACTURERS ASSOCIATION (AFBMA)

1200 19th St., NW-Suite 300
Washington, DC 20036-2422
Ph: 202-429-5155
Fax:202-828-6042
Internet: www.abma_dc.org
AOK 6/00
LOK 6/00

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

1330 Kemper Meadow Dr.
Suite 600
Cincinnati, OH 45240
Ph: 513-742-2020
Fax:513-742-3555
Internet: www.acgih.org
E-mail: pubs@acgih.org
AOK 6/00
LOK 6/00

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)

ATTEN: Publications Dept.
111 Nineteenth St. NW, Suite 800
Washington, DC 20036
Ph: 800-294-2372 (202) 463-2700
Fax: 202 463-2471
Internet: http://www.afandpa.org
AOK 6/00
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AMERICAN GAS ASSOCIATION (AGA)

400 N. Capitol St. NW, Suite 450
Washington, DC 20001
Ph: 202-824-7000
Fax: 202-824-7115
Internet: www.aga.org
AOK 6/00
LOK 6/00

AMERICAN INSTITUE OF STEEL CONSTRUCTION (AISC)

One East Wacker Dr., Suite 3100
Chicago, IL 6060-2001
Ph: 312-670-2400
Publications: 800-644-2400
Fax: 312-670-5403
Internet: www.aisc.org
AOK 6/00
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AMERICAN IRON AND STEEL INSTITUTE (AISI)

1101 17th St., NW-Suite 1300
Washington, DC 20036
Ph: 202-452-7100
AOK 6/00
LOK 6/00

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

11 West 42nd St.
New York, New York 10036
Ph: 212-642-4900
Fax:212-398-0023
Internet: www.ansi.org/
Note: Documents beginning with the letter "S" can be ordered from: Acoustical Society of America
PO Box 1020
Sweickley, PA 15143-9998
Ph: 412-741-1979
Fax: 412-741-0609
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Internet: www.wwpa.org
E-mail: info@wwpa.org
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END OF SECTION 01090

SECTION 01200-WARRANTY REQUIREMENTS

PART 1 GENERAL

1.1 WARRANTY OF CONSTRUCTION: The Contractor shall warranty all materials and workmanship in accordance with Contract Clause (FAR 52.246-21), "WARRANTY OF CONSTRUCTION".

1.2 MANUFACTURER'S WARRANTY: The Contractor shall provide manufacturer's warranties, when available, on all equipment for one year starting from the day of facility acceptance by the Government. Any warranty offered by the manufacturer for periods greater than one year or required by other sections of the Specifications shall also be provided.

1.3 WARRANTY PAYMENT: Warranty work is a subsidiary portion of the contract work, and has a value to the Government of $5,000 of the one percent (1%) of the accepted bid price of the contract. The Contractor will assign a value of that amount in the breakdown for progress payments mentioned in the Contract Clause (FAR.52.232-5) "PAYMENTS UNDER FIXED-PRICE CONSTRUCTION". If the Contractor fails to respond to warranty items as provided in paragraph CONTRACTOR'S RESPONSE TO WARRANTY SERVICE REQUIREMENTS below, the Government any elect to acquire warranty repairs through other sources and, if so, shall backcharge the Contractor for the cost of such repairs. Such backcharges shall be accomplished under the Contract Clause (FAR 52.243-4) "CHANGES" of the contract through a credit modification (s).

1.4 PERFORMANCE BOND: The Contractor's Performance Bond will remain effective throughout the construction warranty period and warranty extensions.

1.4.1 FAILURE TO COMMENCE: In the event the Contractor or his designated representative (s) fail to commence and diligently pursue any work required under this clause, and in a manner pursuant to the requirements thereof, the Contracting Officer shall have the right to demand that said work be performed under the PERFORMANCE BOND by making written notice on the surety. If the surety fails or refuses to perform the obligation it assumed under the Performance Bond, the Contracting Officer shall have the work performed by others, and after completion of the work, may demand reimbursement of any or all expenses incurred by the GOVERNMENT while performing the work, including, but not limited to administrative expenses.

1.5 PREWARRANTY CONFERENCE: Prior to contract completion and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this specification. Communication procedures for Contractor

notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty shall be reviewed at this meeting. The Contractor shall provide names, addresses, and telephone numbers of all subcontractors, equipment suppliers, or manufacturers with specific designation of their area of responsibilities if they are to be contacted directly on warranty corrections. This point of contact will be located within the local service area of the warranted construction, will be continuously available, and will be responsive to Government inquiry on warranty work action and status. Minutes of the meeting will be prepared by the Government and signed by both, the Contractor and the Contracting Officer. The minutes shall become part of the contract file.

1.6 SUBMITTALS: Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 SAMPLES

1.6.1 SAMPLE TAGS: To identify the warranty for all Contractor and Government furnished equipment, which the Contractor installs.

1.7 ADDDITIONAL REQUIREMENTS

1.7.1 ROOF SURVEY: The Contractor shall during the ninth (9) month of the warranty period conduct an infrared roof survey on any project involving a membrane roofing system. This survey will be conducted in accordance with ASTM C1153-90, "Standard Practice for the Location of Wet Insulation in Roofing Systems Using Infrared Imaging". Contractor shall be required to replace all damaged materials and to locate and repair sources of moisture penetration.

1.7.2 EQUIPMENT WARRANTY IDENTIFICATION TAGS: The Contractor shall provide warranty identification tags on all Contractors and Government furnished equipment, which he has installed.

1.7.3 FORMAT AND SIZE FOR TAGS: The tags shall be similar in format and size to the exhibits provided by this specification, they shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and they shall be installed in a position that is easily for most easily (or most easily) noticeable. Contractor furnished equipment that has

differing warranties on its components will have each component tagged.

1.7.4 SAMPLE TAGS: Sample tags shall be filled out representative of how the Contractor will complete all other tags. These tags shall be submitted to Government.

1.7.5 TAGS FOR WARRANTED EQUIPMENT: The tag for this equipment shall be similar to the following. Exact format and size will be as approved.

EQUIPMENT WARRANTY
CONTRACTOR FURNISHED EQUIPMENT

MFG:_____ MODEL NO.:_____

SERIAL NO:_____ CONTRACT NO._____

CONTRACTORS NAME:_____

CONTRACTOR WARRANTY EXPIRES:_____

MFG WARRANTY (IES) EXPIRE:_____

EQUIPMENT WARRANTY
GOVERNMENT FURNISHED EQUIPMENT

MFG:_____ MODEL NO.:_____

SERIAL NO:_____ CONTRACT NO._____

CONTRACTORS NAME:_____

CONTRACTOR WARRANTY EXPIRES:_____

MFG WARRANTY (IES) EXPIRE:_____

1.7.6 EXECUTION: The Contractor will complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment. All tags shall be mechanically attached to the equipment as directed by the Contracting Officer.

1.7.7 EQUIPMENT WARRANTY TAG REPLACEMENT: The Contractor shall provide new tags on repaired or replaced equipment during the warranty period. The tag shall be identical to the original tag, except that the Contractor's warranty expiration date shall be updated to show the correct warranty expiration date.

1.8 CONTRACTOR'S RESPONSE TO WARRANTY SERVICE REQUIREMENTS

1.8.1 NOTIFICATION TO WARRANTY SERVICE REQUIREMENTS: Following oral or written notification by authorized representative of the installation designated in writing by the Contracting Officer, the Contractor shall respond to warranty service requirements in accordance with the "Warranty Service Priority List" and the three categories of priorities listed below.

1.8.2 Categories of Priorities

a. First Priority Code 1: Perform on site inspection to evaluate situation, determine course of action, initiate work within 24 hours and work continuously to completion or relief.

b. Second Priority Code 2: Perform on site inspection to evaluate situation, determine course of action, initiate work within (48) hours and work continuously to completion or relief.

c. Third Priority Code 3: All other work to be initiated within (5) workdays end work continuously to completion or relief.

1.8.3 WARRANTY SERVICE PRIORITY LIST:

Air Conditioning System:
Code 1:

a. Entire building down.
b. Buildings with computer equipment.
c. Commissary and Main PX.

Code 2:

a. Recreational Support
b. Air conditioning leak in part of building, if causing damage.

Doors:
Code 1:

a. Overhead doors not operational.

Electrical:
Code 1:

a. Power failure (entire area any building).
b. Traffic control devices
c. Security lights

Code 2:

a. Power failure (no power to room or part of building),
b. Receptacle and lights
c. Fire alarm systems.

Gas
Code 1:

a. Leaks and breaks.

Heat
Code 1

a. New building heating system failure.

Plumbing
Code 2

a. Flush valves
b. Fixture drains supply line commode, or water pipe leaking.
c. Commode leaking at base

Roof Leaks
Code 1

a. Temporary repairs will be made where major damage to property is occurring.

Code 2.

a. Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

Water (Exterior)
Code 1.

a. Normal operation of water pump station.

Code 2.

a. No water to facility

Sprinkler System
Code 1.

a. All sprinkler systems, valves, manholes, deluge systems, and air systems to sprinkler.

1.8.4 AVAILABILITY OF REQUIRED PARTS: Should parts be required to complete the work and the parts are not immediately available the Contractor shall have a maximum of (12) hours after arrival at the job site to provide authorized representative of the installation with firm written plan for emergency alternatives and temporary repairs for Government participation with the Contractor to provide emergency relief until the required parts are available on site for the Contractor to perform permanent warranty repair. The Contractors plan shall include a firm date and time that the required parts shall be available on site to complete the permanent warranty repair.

PART 2 PRODUCTS- (NOT APPLICABLE)

PART 3 EXECUTION- (NOT APPLICABLE)

END OF SECTION 01200

SECTION 01320-PROJECT SCHEDULE

PART 1 GENERAL

1.1 REFERENCE: The publications listed below form a part of the specification to the extent referenced. The publications are referenced in the next text by basic designation only.

ENGINEERING REGULATIONS (ER)

ER1-1-11	(1995) Progress, Schedules, and Network Analysis Systems

1.2 SUBMITTALS: Government approval is required for submittals with a "G" designation; submittals not having a " G" designation are for information only. When use, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 PROCONSTRUCTION SUBMITTALS
Preliminary Project Schedule; G A/R
Payment Purposes
Initial Project Schedule; G A/R
Shows sequence of activities for work through the entire project and shall be at a reasonable level of detail.
Periodic Schedule Updates: G A/R
These updates enables the Contracting Officer assess Contractor's progress.
Qualifications; G A/R
A responsible authorized representative
Narrative Report; G A/R
Reports that Contain: Activity numbers, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.

1.3 The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS: Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS, a Project Schedule as described below shall be prepared. The scheduling of construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers working

on the project shall also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used to measure the progress of the work, it aid in evaluating time extensions, and to provide the basis of all progress payments.

3.2 BASIS FOR PAYMENT: The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel will result in an inability of the Contracting Officer to evaluate Contractor's progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire submission and inability of the Contracting Officer to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer and those revision have not been included in the Project Schedule, then the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

3.3 PROJECT SCHEDULE: The computer software system utilized by the Contractor to produce the Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manual methods used to produce any required information shall require approval by the Contracting Officer.

3.3.1 USE OF THE CRITICAL PATH METHOD: The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in the Precedence Diagram Method (PDM).

3.3.2 LEVEL OF DETAIL REQUIRED: The Project Schedule shall include an appropriate level of detail. Failure to develop update the Project Schedule or provide data to the Contracting Officer at the appropriate level of detail, as specified by the Contracting Officer, shall result in the disapproval of the schedule. The Contracting Officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule.

3.3.3 ACTIVITY DURATIONS: Contractor submissions shall follow the direction of the Contracting Officer regarding reasonable activity duration's are those that allow the progress of activities to be accurately determined between payment periods (usually less than 2 percent of all non-procurement activities' Original Duration's are greater than 20 days).

3.3.4 PROCUREMENT ACTIVITIES: Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment

are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to submittals, approvals, procurement, fabrication, and delivery.

3.3.5 GOVERNMENT ACTIVITIES: Government and other agency activities that could impact progress shall be shown. These activities include, but are not limited to approvals, inspections, utility tie-in, Government Furnish Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements.

3.3.6 MODIFICATION OR CLAIM NUMBER: Any activity that is added or changed by contract modification or used to just claimed time shall be identified by a mod or claim code that changed the activity. Activities shall not belong to more than one modification or claim item. The Mod or Claim Number shall identify the modification or claim number of each activity. Whenever possible, changes shall be added to the schedule by adding new activities. Existing activities shall not normally be changed to reflect modifications.

3.3.7 CATEGORY OF WORK: All Activities shall be identified in the project schedule according to the category of work which best describes the activity. Category of work refers, but is not limited, to the procurement chain of activities including such items as submittals, approvals, procurement, fabrication, delivery, installation, start-up and testing. The category of work for each activity shall be identified by the Category of Work Code.

3.3.8 FEATURE OF WORK: All activities shall be identified in the project schedule according to the feature of work to which the activity belongs. Feature of work refers, but is not limited to a work breakdown structure for the project. The feature of work for each activity shall be identified by the Feature of Work Code.

3.3.9 SCHEUDLED PROJECT COMPLETION: The schedule interval shall extend from Notice to Proceed to the contract completion date.

3.3.10 PROJECT START DATE: The schedule shall start no earlier than the date on which the Notice to Proceed (NTP) was acknowledged. The Contractor shall include as the first activity in the project schedule an activity called “Start Project”. The “Start Project” activity shall have: an “ES” constraint date equals to the date that the NTP was acknowledged, and zero day duration.

3.3.11 CONSTRAIN OF LAST ACTIVITY: Completion of the last activity in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, than the float

calculation shall reflect a negative float on the critical path. The Contractor shall include as the last activity in the project schedule an activity call "End Project". The "End Project" activity shall have an "LF" constraint date equal to the completion date for the project, and zero day duration.

3.3.12 EARLY PROECT COMPLETION: In the event the project schedule shows completion of the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. Contractor shall specifically address each of the activities noted in the narrative report at every project schedule update period to assist the Contracting Officer in evaluating the Contractor's ability to actually complete prior to the contract period.

3.3.13 INTERIM COMPLETION DATE: Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

3.3.14 END PHASE: The Contractor shall include as the last activity in a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have an "LF" constraint date equal to the completion date for the project, and zero day duration.

3.3.15 PHASE X: The Contractor shall include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The Phase "X" activity shall be logically tied to the earliest and latest activities in the phase.

3.3.16 DEFAULT PROGRESS DATA DISALLOWED: Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in CPM Scheduling software systems. Actual Start and Finish dates on the CPM Schedule shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report for every in-progress or completed activity and failure to ensure that the data contained on the Daily Quality Control Reports is the sole basis for schedule up keeping shall result in the disapproval of the Contractor's schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. Updating of the percent complete and the remaining duration of any activity shall be independent functions. Program features, which calculate one of these parameters from the other, shall be disabled.

3.3.17 OUT OF SEQUENCE PROGRESS: Activities that have posted progress without all preceding logic being satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case approval of the Contracting Officer. The Contractor shall propose logic corrections to eliminate all out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule.

3.3.18 NEGATIAVE LAGS: Lag durations contained in the project schedule shall not have a negative value.

3.4 PROJECT SCHEDULE SUMISSIONS: The Contractor shall provide the submission as described below. The data disk, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1 PRELIMINARY PROJECT SCHEDULE SUBMISSION: The Preliminary Project Schedule, defining the Contractor's planned operations for the first 60 calendar days shall be submitted for approval with 20 calendar days after Notice to Proceed is acknowledged. The approved preliminary schedule shall be used for payment purposes not to exceed 60 calendar days after Notice to Proceed.

3.4.2 INTIAL PROJECT SCHEDULE SUBMISSION: The Initial Project Schedule shall be submitted for approval within 40 calendar days after Notice to Proceed. The schedule shall provide a reasonable sequence of activities, which represent work through the entire project and shall be at a reasonable level of detail.

3.4.3 PERIODIC SCHEDULE UPDATES: Based on the result of progress meetings, specified in "Periodic Progress Meeting," the Contractor shall submit periodic schedule updates. These submissions shall enable the Contracting Officer or authorized representative, is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment any be made.

3.4.4 STANDARD ACTIVITY CODING DICTIONARY: The Contractor shall use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11, Appendix A. This exact structure is mandatory, even if some fields are not used.

3.5 SUBMISSION REQUIREMENTS: The following items shall be submitted by the Contractor for the preliminary submission, and every periodic project schedule update throughout the life of the project:

3.5.1 DATA DISKS: Two data disks containing the project schedule shall be provided. Data on the disks shall adhere to the SDEF format specified in ER-1-1-11, Appendix A.

3.5.2 FILE MEDIUM: Required data shall be submitted on 3.5 disks, formatted to hold 1.44 MB of data, under the MS-DOS Version 5. or 6.x, unless otherwise approved by the Contracting Officer.

3.5.3 DISK LABEL: A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type of schedule (Preliminary, Initial, Update, or Change), full contract number, project name, project location, data date, name and telephone number or person responsible for the schedule, and the MS-DOS version used to format the disk.

3.5.4 FILE NAME: Each file submitted shall have a name related to either the schedule data date, project name, or contract number. The Contractor shall develop a naming convention that will ensure that the names of the files submitted are unique. The Contractor shall submit the file naming convention to the Contracting Officer for approval.

3.5.5 NARRATIVE REPORT: A Narrative Report shall be provided with the preliminary, initial, and each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities along the (2) most critical paths, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. The narrative report is expected to relay to the Government, the Contractor's thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through that analysis.

3.5.6 APPROVED CHANGES VERIFICATION: Only project schedule changes that have previously approved by the Contracting Officer shall be included in the schedule submission. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

3.5.7 SCHEDULE REPORTS: The format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total

Float. Actual Start and Actual Finish Dates shall be printed for those activities in progress or completed.

3.5.8 ACTIVITY REPORT: A list of all activities sorted according to activity number.

3.5.9 LOGIC REPORT: A list of preceding and succeeding activities for every activity in ascending order by activity number. Preceding and succeeding activities shall include all information listed above in paragraph Schedule Reports. A blank line shall be left between each activity grouping.

3.510. TOTAL FLOAT REPORT: A list of all incomplete activities sorted in ascending order of total float. Activities, which have the same amount of total float, shall be listed in ascending order of Early Start Dates. Completed activities shall not be shown on this report.

3.5.11 EARNINGS REPORT: A compilation of the Contractor's Total Earnings on the project from the Notice to Proceed until the most recent Monthly Progress Meeting. This report shall reflect the Earnings of specific activities based on the agreements made in the field and approved between the Contractor and Contracting Officer at the most recent Monthly Progress Meeting. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment. Activities shall be grouped by bid item and sorted by activity numbers. This report shall sum all activities in a bid item and provide a bid item percent; and complete and sum all bid items to provide a total project percent complete. This printed report shall contain, for each activity: the Activity Number, Activity Description, Original Budgeted Amount, and Total Quantity, Quantity to Date, Percent complete (based on cost) and Earnings to Date.

3.5.12 NETWORK DIAGRAM: The network diagram shall be required on the initial schedule submission and on monthly schedule update submissions. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.13 CONTINUOUS FLOW: Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity number, description, duration, and estimated earned value shall be shown on the diagram.

3.5.14 PROJECT MILESTONE DATES: Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.15 CRITICAL PATH: The critical path shall be clearly shown.

3.5.16 BANDING: Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

3.15.17 S-CURVES: Earnings curves showing projected early and late earnings and earnings to date.

3.6 PERIODIC PROGRESS MEETINGS: Progress meetings to discuss payment shall include a monthly onsite meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor shall describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Contracting Officer will approve activity progress, proposed revisions, and adjustments as appropriate.

3.6.1 MEETING ATTENDANCE: The Contractor's Project Manager and Scheduler shall attend the regular progress meeting.

3.6.2 UPDATES SUBMISSION FOLLOWING PROGRESS MEETING: A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than (4) working days after the monthly progress meeting.

3.6.3 PROGRESS MEETING CONTENTS: Updates information, including Actual Start Dates, Actual Finish Dates, Remaining Durations, and Cost-to-Date shall be subject to the approval of the Contracting Officer. As a minimum, the Contractor shall address the following items on an activity by activity basis, during each progress meeting.

3.6.4 START AND FINISH DATE: The Actual Start and Actual Finish dates for each activity currently in-progress or completed.

3.6.5 TIME COMPLETION: The estimated Remaining Duration for each activity in-progress. Time-based progress calculations must be based on Remaining Duration for each activity.

3.6.6 COST COMPLETION: The earnings for each activity started. Payment will be based on earnings for each in-progress or completed activity. Payment for individual activities will not be made for work

that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

3.6.7 LOGIC CHANGES: All logic changes pertaining to Notice to Proceed on change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

3.6.8 OTHER CHANGES: Other changes required due to delays in completion of any activity or group of activities include: (1) delays beyond the Contractor's control, such as strikes and unusual weather. (2) delays encountered due to submittals, Government Activities, deliveries or work stoppages, which make re-planning the work necessary. (3) changes required to correct a schedule, which does not represent the actual plan prosecution and progress of the work.

3.7 REQUEST FOR TIME EXTENSIONS: In the event the Contractor requests an extension of the contract completion date, or any interim milestone date, the Contractor shall furnish the following for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of delays, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any approvals.

3.7.1 JUSTIFICATION OF DELAY: The project schedule shall clearly display that the Contractor has used, in full, all the float time, available for the work involved with this request. The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in the extension of the schedule, will not be a cause for time extension to the contract completion date.

3.7.2 SUBMISSION REQUIREMENTS: The Contractor shall submit a justification for each request for a change in the contract completion date of under (2) weeks based upon the most recent schedule update at the time of the Notice to Proceed or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

a. A list of affected activities, with their associated project schedule activity number.

b. A brief explanation of the causes of the change.
c. An analysis of the overall impact of the changes proposed.
d. A sub-network of the affected area.

Activities impacted in each justification for change shall be identified by a unique activity code contained in the required data file.

3.7.3 ADDITIONAL SUBMISSION REQUIREMENTS: For any requested time extension of over (2) weeks, the Contracting Officer may request in interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Contracting Officer's request.

3.8 DIRECTED CHANGES: If Notice to Proceed (NTP) is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer within (2) weeks of the NTP begin issued. The proposed revisions to the schedule will be approved by the Contracting Officer prior to inclusion of those changes within the project schedule. If the Contracting Officer fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor with suggested revisions in the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer within (2) weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions, the Contractor will be deemed to concur with the Contracting Officer's proposed revisions, the Contractor will be deemed to concur with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9 OWNERSHIP OF FLOAT: Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

END OF SECTION 01320

SECTION 01330-SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL IDENTIFICATION: Submittals required are identified by SD numbers and titles as follows:

SD-01 Preconstruction Submittals

SD-02 Shop Drawings

SD-03 Product Data

SD-04 Samples

SD-05 Design Data

SD-06 Test Reports

SD-07 Certificates

SD-08 Manufacturer's Instructions

SD-09 Manufacturer's Field Reports

SD-10 Operation And Maintenance Data

SD-11 Closeout Submittals

1.2 SUBMITTALS CLASSIFICATION: Submittals are classified as follows:

1.2.1 GOVERNMENT APPROVED: Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items are designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings".

1.2.2 INFORMATION ONLY: All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above. Submittal Register ENG FORM 4288, column labeled "Reviewer", this column is blank and is understood that the reviewer is "AR" (Area Office).

1.3 APPROVED SUBMITTALS: The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After the Contracting Officer has approved submittals, no resubmittal for the

purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.4 DISAPPROVED SUBMITTALS: The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.5 WITHHOLDING OF PAYMENT: Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL: The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and each item shall be stamped, signed, and dated by the CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certification; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

3.2 SUBMITTAL REGISTER: At the end of this section is one set of ENG Form 4288 listing items of equipment and materials for which submittals are required by the specification; this list may not be all inclusive and additional submittals may be required. The Contractor will also be given the submittal register files, containing the computerized ENG Form 4288 and instructions on the use of the files. These submittal register files will be furnished on a separate diskette. Columns "c" through "f" have been completed by the Government; the Contractor shall complete column "a" and "g" through "i" and submit the forms (hard copy plus associated electronic file) to the Contracting Officer for approval within (30) calendar days after Notice to Proceed. The Contractor shall keep this diskette up-to-date and shall submit it to the Government together with the monthly payment request.

The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated.

3.3 SCHEDULING: Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 30 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

3.4 TRANSMITTAL FORM (ENG FORM 4025): The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filing out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3.5 SUBMITTAL PROCEDURES: Six (6) copies of submittals shall be made a follows:

3.5.1 PROCEDURES: In the signature block provided on ENG FORM 4025 the Contractor certifies that each item has been reviewed in detail and is correct and is in strict conformance with the contract drawings and specifications unless noted otherwise. The accuracy and completeness of submittals is the responsibility of the Contractor. Any costs due to resubmitted of documents caused by inaccuracy, lack of coordination, and/or checking shall be the responsibility of the Contractor shall set forth, in writing, the reason for and description of such variations. If these requirements are not met, the submittal may be returned for corrective action.

3.5.2 DEVIATIONS: For submittals which include proposed deviations requested by the Contractor, the column “variation” of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

3.6 CONTROL OF SUBMITTALS: The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved “Submittal Register”.

3.7 GOVERNMENT APPROVED SUBMITTALS: Upon completion of review of submittals requiring Government approval, the submittal will be identified as having received approval by being so stamped and dated. The Contracting Officer will retain four (4) copies of the submittal and (2) copies of the submittal will be returned to the Contractor.

3.8 INFORMATION ONLY SUBMITTALS: Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of non-conforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

3.9 STAMPS: Stamps used by the Contractor on the submittal date to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR

(Firm Name)

_____ Approved

_____ Approved with corrections as noted on submittal data and/or attached sheet (s).

SIGNATURE:_____

TITLE: _____

DATE:_____

a. Provide the samples on 8-1/2" x 11" board modules with a maximum spread of 25-1/2"x33" for foldouts. Label the modules with the project titles and design them to fit on a standard loose-leaf, three-post binder. The modules shall support and anchor all samples. Anchor large or heavy samples with mechanical fasteners. Samples must be labeled in accordance with the finish schedule.

b. Organize the submittals in a logical manner to allow a fast review. Write descriptions and explanations clearly. Drawings and photographs must be clear and concise.

c. Organize samples by scheme with a separate scheme for each room or for groups of rooms with the same scheme. Coordinate the schemes by room names and numbers shown on the architectural floor plans and room finish and color schedule. Include floor plans and schedule in modules.

d. Indicate true pattern color and texture for interior material and finish samples. Carpet samples shall be large enough to indicate a complete pattern or design, but not less than 3"x5".

e. Include color/finish pattern and texture for exterior materials and finishes.

f. Provide at least a 6x6 inch square sample where either interior or exterior special finishes, such as architectural concrete or prefinished textured metal panels, are required.

END OF SECTION 01330

SUBMITTAL REGISTER
(ER 415-1-10)

CONTRACT NUMBER

TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
01000

ACTIVITY NO	TRANS-MITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSI-FICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
				Title Evidence	X										X											
				Invoice Copies	X										X											
				Payment Evidence	X										X											
				Photographs	X										X											
			1.6	Cost of Printing Data											X											
			1.7	Equipment Data											X											
				Progress Schedule											X	X	A/R									
				Modified Chart												X	A/R									
			1.8	O and M Data											X											
				Commissioning Activity for HVAC												X	A/R									

SUBMITTAL REGISTER
(ER 415-1-10)

CONTRACT NUMBER

TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
01050

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.4.2	Shut Down Utility Services	X											X	A/R									
			1.4.3	Advance Notice	X										X											
			1.4.4	Checklist	X											X	A/R									
				Maintenance of Traffic	X										X											
			1.10	Control Records	X										X											
			1.12.4	Summarization											X											
				Survey Data												X	A/R									
				Quantity Surveys											X											

SUBMITTAL REGISTER
(ER 415-1-10)

CONTRACT NUMBER

TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
01060

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3.1.2	Safety Supervisor	X											X	A/R									
			1.3.1.2	Language Certification				X							X											
			1.3.1.2	Activity Phase Hazard Analysis						X						X	A/R									
				Outline Report						X					X											
				OSHA Log											X											

SUBMITTAL REGISTER (ER 415-1-10)	CONTRACT NUMBER
TITLE AND LOCATION **STADIUM IMPROVEMENTS AT ANACOSTIA SHS** · CONTRACTOR	SPECIFICATION SECTION **01200**

					TYPE OF SUBMITTAL										CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANS-MITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O& M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.7.2.2	Sample Tags		X									X											
												x			X											

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SPECIFICATION SECTION
01320

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			3.4.1	Preliminary Project Schedule	X											X	A/R									
			3.4.2	Initial Project Schedule	X											X	A/R									
			3.4.3	Periodic Schedule Updates	X											X	A/R									
			1.3	Qualifications	X											X	A/R									
			3.5.2	Narrative Report	X											X	A/R									
			3.5.4	Schedule Reports	X											X	A/R									

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SPECIFICATION SECTION
01451

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			3.2	CQC Plan	X											X	A/R									
				Phase Notification	X										X											
				Request	X											X	A/R									
				CQC Mgr. Qualification	X										X	X	G									
				Change Notification	X										X											
			3.8.1	Punch list	X										X											
			3.3	Minutes											X											
			3.7.1	Tests			X								X											
				Reports			X								X											
			3.7.1	Test Performed			X								X											
				QC Records			X									X	A/R									

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01510

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.5	Temporary Electrical Work												X	A/R									

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01561

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.9.4	Facility Plan												X	A/R									
			1.9.5	Temporary Plan												X	A/R									

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01562

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.5	Implementation												X	A/R									

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SPECIFICATION SECTION
01720

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
				Progress Prints												X	A/R									
				Final Prints												X	A/R									
				CADD Files											X											

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SPECIFICATION SECTION
01780

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.2.1	As-Built Drawings												X	A/R									
			1.2.2	As-Built Record of Equipment Materials											X											
			1.3.1	Warranty Management Plan												X	A/R									
				Warranty Tags												X	A/R									
			1.6	Final Cleaning											X											

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SPECIFICATION SECTION
02070

					TYPE OF SUBMITTAL										CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.5	Proposed dust control											x											
				Noise control measures																						
				Schedule of selective																						

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STADIUM IMPROVEMENTS AT ANACOSTIA SHS

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SPECIFICATION SECTION
02200

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.4	Fill/Backfill material	x										x											
				Soil material test								x														
				Max. Density						x																
				Test reports						x																
				Photographs											x											

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TITLE AND LOCATION **STADIUM IMPROVEMENTS AT ANACOSTIA SHS**																		CONTRACTOR								SPECIFICATION SECTION **01000**	
					TYPE OF SUBMITTAL										CLASSI-FICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANS-MITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.4	Job Mix Design	X						X				X											
				Shop Drawings		X																				
				Samples of Paving Fabric	X																					
				Qualification Data											X											
				Material Test Reports	X																					
				Material Certificates											X											

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SPECIFICATION SECTION
02520

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3	Product Data	x										x											
				Design Mixes	x																					
				Laboratory Tests reports						x																
				Material certificates							x															
				Minutes of preinstallation conference											x											

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SPECIFICATION SECTION
02665

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			3.1	Installation											X											
				Waste Water Disposal Method											X											
				Satisfactory Installation											X											
			3.3.1	Bacteriological Disinfection	X										X											
			3.4	Manufacturer's Representative			X								X											
			3.1	Installation			X								X											
			2.8.8	Meters			X								X											

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SPECIFICATION SECTION
02700

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.5.8	Polymer Concrete	X		X								X											
				Backmeter Valves, Plastic,	X																					
			C	Manholes		X																				
			D	CIP Masonry MH		X																				
			E	Design Mixes						X																
			F	Coordinate Drawings-MH		X																				
			G	Coordinate Piping System		X																				

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ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.5.8	Polymer Concrete	X		X								X											
				Backmeter Valves, Plastic,	X																					
			C	Manholes		X																				
			D	CIP Masonry MH		X																				
			E	Design Mixes						X																
			F	Coordinate Drawings-MH		X																				
			G	Coordinate Piping System		X																				

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02810

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
				Valve Manholes, Pipe, and Equipment											X											
				Insulated Sections		X																				
				Valve Manholes, Pipe, and Equipment											X											

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SPECIFICATION SECTION
02831

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			2.1.1	Chain Link Fence				X							X												
				Electro-Mechanical Locks											X												
				Gate Operator											X												

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02900

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
				Edging Material								X			X											
			1.3-F	Materials		X				X																
			1.3-D	Mulch		X						X			X											
			1-3-G	Schedule					X																	
			1.6	Installer's Qualification		X									X											
			1.3-C	Seed											X											
			1.3-H	Maintenance Instructions																						

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02990

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3	Standard printed specifications	x																					
				Affidavit attesting to track					x																	
				Synthetic track material sample								x														
				List of install application incl.											x											

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ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3	Product Data	x																					
				Shop Drawings		x																				
				Material samples								x														
				Color finishes												x										
				Normal weight aggregates												x										
				Fiber reinforcement												x										
				Reglets												x										
				Water stops												x										
				Vapor retarders/barriers												x										
				Form liners												x										
				Laboratory test reports						x																

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SPECIFICATION SECTION
03350

					TYPE OF SUBMITTAL										CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.4	Product data	x																					
				Samples								x														
				Laboratory test reports						x																
				Material certificates							x															

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03520

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3	Product data	x																					
				Certificates of testing laboratory							x															

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SPECIFICATION SECTION
04200

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
				Mortar Coloring				X							X											
				Insulation				X							X											
				Insulation				X							X											
				Mortar Admixtures				X							X											
				Grout Admixtures				X							X											
			1.4	Masonry Work												X										
				Clay Brick											X											
				Cold Weather Installation											X											
				Concrete Masonry Units (CMU)		X									X											
				Stone Items		X									X											
				Anchors, Ties, and Bar		X									X											
				Expansion-Joint Materials		X									X											
				Joint Reinforcement		X									X											
				Portable Panel		X									X											
				Efflorescence Test			X								X											
				Field Testing of Mortar			X								X											
				Field Testing of Grout			X								X											
				Masonry Cement			X								X											
				CMU Glazed			X								X											
				Special Inspection			X								X											
				Concrete Masonry Units (CMU)				X							X											
				Control Joint Keys				X							X											
				Reinforcing Steel Bars and Rods				X							X											
				Masonry Cement				X							X											

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SPECIFICATION SECTION
05120

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					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3	Product data	x																					
				Structural steel								x														
				High-strength bolts							x															
				Steel primer						x																
				Shrinkage-resistant grout											x											
				Shop drawings																						
				Test reports																						
				Certified copies of surveys																						

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SPECIFICATION SECTION
05310

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3	Deck Units	X					X	X				X											
				Attachments											X											
				Holes and Openings		X									X											
				Deck Units	X					X	X				X											
				Test reports																						
				Research reports																						

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05320

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3	Product data	x																					
				Shop Drawings		x																				
				Product certificates							x															
				Welder certificates							x															
				Test reports						x																
				Research reports						x																

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SPECIFICATION SECTION
05400

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.4	Framing Components												x	A/E									
				Mill Certificates				x			x				x											
				Welds				x			x				x											
				Qualifications	x										x											
				Products	x					x																

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SPECIFICATION SECTION
05510

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.4B	Product Data	X											X										
			1.4C	Shop Drawings		X																				
			1.4D	Samples								X														
			1.4E	Welding Certificates							X															
			1.4F	Qualifications	X										X											

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SPECIFICATION SECTION
05521

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.5B	Product Data	X											X										
			1.5C	Shop Drawings		X		X																		
			1.5D	Samples								X														
			1.5E	Test Reports						X																
			1.5F	Qualifications	X																					

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SPECIFICATION SECTION
06100

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.4	Lumber							x				x											
				Wood Treatments	x										x											
				Sheathing	x					x																
				Metal Framing	x					x																
				Fasteners	x					x																
				Adhesives	x																					

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SPECIFICATION SECTION
06100

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.4	Lumber							x				x											
				Wood Treatments	x										x											
				Sheathing	x					x																
				Metal Framing	x					x																
				Fasteners	x					x																
				Adhesives	x																					

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CONTRACTOR

SPECIFICATION SECTION
06402

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3B	Product Data	X											X										
			1.3D	Shop Drawings		X																				
			1.3E	Samples								X			X											
			1.3G	Product Certificates							X															
			1.3H	Qualifications	X																					

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CONTRACTOR

SPECIFICATION SECTION
07160

					TYPE OF SUBMITTAL										CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANS-MITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
				Materials	x			x							x											

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CONTRACTOR

SPECIFICATION SECTION
07210

					TYPE OF SUBMITTAL										CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANS-MITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.5	Insulation							x				x											

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SPECIFICATION SECTION
07210

					TYPE OF SUBMITTAL										CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANS-MITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.5	Insulation							x				x											

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CONTRACTOR

SPECIFICATION SECTION
07527

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3.2	Roofing System	X						X				X											
			3.3	Installation/Installer		X																				
			1.3.4	Materials	X		X			X	X				X											
				Field Tests						X																

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SPECIFICATION SECTION
07620

					TYPE OF SUBMITTAL										CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANS-MITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.4	Materials	x										x											
				Layout		X																				
				Installation			X																			
				Installer							X															

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07720

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3B	Product Data	X											X										
			1.3C	Shop Drawings		X																				
			1.3D	Samples								X			X											

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SPECIFICATION SECTION
07901

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					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.4	Backing											X											
						X									X											
				Bond-Breaker											X											
				Sealant				X							X											
				Sealant				X							X											

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SPECIFICATION SECTION
07905

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3B	Product Data	X											X										
			1.3C	Samples								X			X											
			1.3D	Certificates							X															
			1.3E	Qualification Data	X																					
			1.3F	Test Reports						X																

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SPECIFICATION SECTION
08111

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3	Doors, Frames and Windows											X											
				Fire Rated Doors											X											
				Doors and Frames		X									X											
				Fire Rated Doors				X							X											
				Thermal Insulated Doors				X							X											

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08331

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					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3B	Product Data	X																					
			1.3C	Shop Drawings		X																				
			1.3D	Certificates							X															

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SPECIFICATION SECTION
08520

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.5B	Product Data	X																					
			1.5C	Shop Drawings		X																				
			1.5D	Samples								X														
			1.5E	Certificates							X															

SUBMITTAL REGISTER
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CONTRACT NUMBER

TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
08710

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.5	Door Hardware Schedule				X								X											

SUBMITTAL REGISTER
(ER 415-1-10)

CONTRACT NUMBER

TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
08800

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			3.2	Installation								X			X											
			2.2	Glazing Accessories								X			X											
				Tempered Glass				X				X			X											
				Bullet Resistant Glass							X	X															

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CONTRACT NUMBER

TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
09255

					TYPE OF SUBMITTAL										CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			2.3.1	Water Resistant Gypsum Board				x							x											

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CONTRACT NUMBER

TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
09300

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			2.1	Tile											X											
			2.1	Tile											X											
			2.2	Setting-Bed											X											
			2.4	Mortar, Grout and Adhesive											X											
				Mortar and Grout											X											
			2.1	Tile		X									X											
			2.1.1	Accessories		X									X											
			2.5	Marble Thresholds		X									X											
				Testing			X								X											
			2.1	Tile				X							X											
			2.4	Mortar, Grout and Adhesive				X							X											

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CONTRACT NUMBER

TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
09512

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
				See Detail Drawings for the							x				x											
				Acoustical Ceiling Systems																						
			2.1	Acoustical Units	x																					
			2.5	Ceiling Attenuation Class and			x								x											
			2.1	Acoustical Units			x								x											
				Adhesives	x																					

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TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
09660

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
				Approved Detail Drawings											X											
			3.3	Installation											X											
			1.3	Flooring		X									X											
			1.4	Materials				X							X											

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TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
09680

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			3.4	Installation											x											
			2.3	Molding											x											
			1.3	Carpet											x											
			2.1	Carpet											x											
			2.1.1	Carpet											x											
			3.1	Carpet											x											
			3.1	Surface Preparation											x											
			3.4	Installation											x											
			1.3	Regulatory Requirements											x											
			1.3	Carpet		x									x											
			2.1	Carpet		x									x											
			2.1.1	Carpet		x									x											
			3.1	Carpet		x									x											
			2.3	Molding		x									x											
			3.2	Moisture and Alkanity Test			x								x											
			1.3	Carpet			x								x											
			2.1	Carpet											x											
			2.1.1	Carpet											x											
			3.1	Carpet											x											
			3.5	Cleaning and Protection											x											

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TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
09900

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			2.1	Paint											x											
			3.3	Mixing and Thinning											x											
			3.4	Application											x											
			1.5	Moisture-Curing Polyurethane		x									x											
			2.1	Paint		x									x											
			2.1	Paint			x								x											
			2.1.3	Lead			x								x											
			2.1.2	Mildewcide and Insecticide			x								x											
			2.1.5	Volatile Organic Compound			x								x											
				Content																						

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STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
10155

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3A	Product Data	X											X										
			1.3B	Shop Drawings		X																				
			1.3C	Samples								X														

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(ER 415-1-10)

CONTRACT NUMBER

TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
10200

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.5B	Product Data	X											X										
			1.5C	Shop Drawings		X																				
			1.5D	Wiring Diagrams		X																				
			1.5E	Samples								X														
			1.5F	Product Test Reports						X																
			1.5G	Product Certificates							X															
			1.5H	Qualification DAta	X																					

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TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
10420

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL: DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	CLASSIFICATION: INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	CONTRACTOR SCHEDULE DATES: SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CONTRACTOR ACTION: CODE	DATE	SUBMIT TO GOVERNMENT	GOVERNMENT ACTION: CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.4	Product Data	X											X										
				Shop Drawings		X																				
				Samples								X														

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TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
10505

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3B	Product Data	X		X									X										
			1.3C	Shop Drawings		X																				
			1.3D	Samples								X														
			1.3E	Maintenance Instructions			X																			

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CONTRACT NUMBER

TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
10522

					TYPE OF SUBMITTAL										CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANS-MITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3B	Product Data	X											X										
			1.3C	Samples								X														

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STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
10800

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			2.1.2	Finishes											X											
				FIO											X											
			2.2	Accessory Items											X											
			2.1.2	Finishes		X									X											
			2.2	Accessory Items		X									X											
				Electric Hand Dryer											X											

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TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
11230

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3B	Shop Drawings		X																				
			1.3C	Product Data	X																					
			1.3D	Samples								X														
			1.3E	Installation Instructions			X																			
			1.3F	Certificate							X															

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CONTRACTOR

SPECIFICATION SECTION
12320

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			3.1	Installation											X											
				Cabinets											X											
			2.1	Countertops and Backsplash											X											
				Cabinets		X									X											
			2.1	Countertops and Badksplash		X									X											
				Cabinets and Countertops			X								X												

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TITLE AND LOCATION
STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
13070

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			1.3B	Shop Drawings		X																				
			1.3C	Product Data	X																					
			1.3D	Certificate							X															

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STADIUM IMPROVEMENTS AT ANACOSTIA SHS

CONTRACTOR

SPECIFICATION SECTION
14000

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
				Training Data	X										X											
				Elevator System	X										X											
				Elevator System		X									X											
			3.7	Framed Instructions			X								X											
				Qualification Certificates					X						X											
			3.6	Testing							X				X											
				Finishes								X			X											
				Test Procedures									X			X										
				Elevator System										X		X										

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SPECIFICATION SECTION

ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	aa
			15260	Piping Insulation	X										X											
			15410	Plumbing Piping	X										X											
			15430	Plumbing Specialities	X	X	X								X											
			15440	Plumbing Fixtures	X										X											
			15450	Plumbing Equipment	X										X											
			15835	Terminal Heat Transfer Units	X										X											
			15865	Fans	X										X											
			15891	Ductwork	X										X											
			15910	Ductwork Accessories	X										X											
			16111	Conduit	X										X											
			16120	Wires and Cables	X						X				X											
			16470	Panel Boards	X	X									X											
			16510	Lighting Fixtures	X										X											
			16610	Security System	X										X											
			16670	Lightning Protection	X	X					X				X											

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE

(Read instructions on the reverse side prior to initiating this form)

DATE	TRANSMITTAL NO.

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS *(This section will be initiated by the contractor)*

TO:	FROM:	CONTRACT NO.	CHECK ONE: ☐ THIS IS A NEW TRANSMITTAL ☐ THIS IS A RESUBMITTAL OF TRANSMITTAL _____
SPECIFICATION SEC. NO. *(Cover only one section with each transmittal)*	PROJECT TITLE AND LOCATION		

ITEM NO. *a.*	DESCRIPTION OF ITEM SUBMITTED *(Type size, model number/etc.)* *b.*	MFG OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. *(See instruction no. 8)* *c.*	NO. OF COPIES *d.*	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE CODE *g.*	VARIATION *(See instruction No. 6)* *h.*	FOR CE USE CODE *i.*
				SPEC. PARA. NO. *e.*	DRAWING SHEET NO. *f.*			

REMARKS

I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as other wise stated.

_____

NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED *(List by Item No.)*	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.

2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.

3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288 for each entry on this form.

4. Submittals requiring expeditious handling will be submitted on a separate form.

5. Separate transmittal form will be used for submittals under separate sections of the specifications.

6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".

7. Form is self-transmittal, letter of transmittal is not required.

8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.

9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A	--	Approved as submitted.	E	--	Disapproved (See attached).
B	--	Approved, except as noted on drawings.	F	--	Receipt acknowledged.
C	--	Approved, except as noted on drawings. Refer to attached sheet resubmission required.	FX	--	Receipt acknowledged, does not comply as noted with contract requirements.
D	--	Will be returned by separate correspondence.	G	--	Other *(Specify)*

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

SECTION 01451-CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES: 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1999b) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
ASTM E 329	(1998a) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

1.2 SUBMITTALS: Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submitted in accordance with Section 013300 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals
CQC Plan; G A/R
Identifies personnel, procedures, control, instructions, test, records and forms to be used.

Phase Notification
The Government shall be notified in a specified amount of time in advance of beginning the preparatory control phase.

Request; G A/R
The requesting of specialized individuals in specific disciplines to perform quality control.

CQC Mgr. Qualification; G A/R
The evaluation of the project to determine the level of CQC System Manager required.

SD-Design Data
Change Notification
Punchlist
Near the completion of all work, the CQC System Manager shall prepare a list of items, which do not conform to the approved drawings and specifications.

Minutes
Prepared by the Government and signed by both the Contractor and the Contracting Officer and shall become a part of the contract file.

SD-06 Test Reports
Test
Specified or required tests shall be done by the Contractor to verify that control measures are adequate.

Reports
Results of test taken
Tests Performed
An information copy provided directly to the Contracting Officer
QC Records; G A/A.
Provide factual evidence that required quality control activities and/or tests have been performed.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS: The Contractor is responsible for quality controls and shall establish and maintain an effective quality system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product, which complies with the contract requirements. The system shall cover all construction sequence. The site project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site.

3.2 CQC PLAN

3.2.1 GENERAL: The Contractor shall furnish for review by the Government, not later than (30) days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction."

The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first (60) days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.2 CONTENT OF THE CQC PLAN: The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.

b. The name, qualifications (in resume format), duty responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager assigned by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, supplies, and purchasing agents. These procedures shall be in accordance with SECTION 01330 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. The Contractor shall include a copy of his proposed laboratory's latest Corps of Engineers inspection report in the Quality Control Plan. The inspection report details the tests that the lab has been validated to perform under Corps of Engineers contracts. (Laboratory facilities will be approved by the Contracting Officer).

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task, which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each

section of the specifications may generally be considered as a definable feature of work, there is frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

3.2.3 ACCEPTANCE OF PLAN: Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4 NOTIFICATION OF CHANGES: After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING: After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of (14) calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasion when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures, which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 PERSONNEL REQUIREMENTS: The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety and Health Manager shall receive direction and authority from the CQC System Manager and shall serve as a member of the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, showing drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be

responsible to maintain these documents and records at the site at all times except as otherwise acceptable t the Contracting Officer.

3.4.2 CQC SYSTEM MANAGER: The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer with a minimum of five (5) years construction experience on construction similar to this contract. This CQC System Manager shall be on site at all times during construction and shall be employed by the prime Contractor.
The CQC System Manager shall have no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

3.4.3 CQC PERSONNEL: In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for hazardous materials. These individuals shall be directly employed by the prime contractor or may be employees of supplier or a subcontractor on this project; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan.

Experience Matrix

Area	Qualifications
a. Civil	Graduate Civil Engineer with 5 years experience.
b. Structural	Graduate Structural Engineer with 2 years experience or 5 years related experience.
c. Electrical	Graduate electrical Engineer with 2 years experience or 5 years related experience.

d. Mechanical	Graduate mechanical Engineer with 2 years experience or 5 years related experience.
e. Architectural	Graduate Architect with 2 years experience or person with 5 years related experience

3.4.4 ADDITIONAL REQUIREMENT: In addition to the above experience and/or education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management for Contractor" within 45 calendar days after NTP is a mandatory requirement for the position of the Quality Control Systems Manager. Certification is good for five (5) years at which time re-training is required. The Contractor's QC Systems Manager may be appointed and serve fully in the capacity pending certification. If the CQC Systems Manager fails to successfully complete the training, the Contractor's should promptly appoint a new CQSM who shall then attend the next available course. The course is nine (9) hours long (1 day). The Construction Quality Management Course (CQMC) will be taught at least nine (9) times per year by the Baltimore District Corps of Engineers, at various locations around Baltimore and Washington, DC, or at another site if conditions warrant. The CQMC cost will be borne by the Contractor and is one hundred and twenty-five dollars ($125.00) per course, per person. Payment shall be made by check payable to either sponsors of course: Associated Builders and Contractor, Inc., (ABC) 14120 Park Long Court, Suite 111, Chantilly, Virginia 20151 (Phone: 703-968-6205), or to The Associated General Contractors of America (AGC), Maryland Chapter, 1301 York Road, Heaver Plaza, Suite 202, Lutherville Maryland 21093 (Phone: 410-321-7870) prior to the start of the course. Reservations to attend the course should be made directly to the organization sponsoring the course they attend. The Contractor has forty-five (45) calendar days to attend the course after the issuance of the NTP. The Contractor shall contact the Contracting Officer upon award of the contract for arrangements for the course.

3.4.5 ORGANIZATIONAL CHANGES: The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.4.6 SUBMITTALS: Submittals, if needed, shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements.

3.5 CONTROL: Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.5.1 Preparatory Phase: This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

a. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field shall be made available by the Contractor at the preparatory inspection. These copies shall be maintained in the field and available for use by Government personnel until final acceptance of the work.
b. A review of the contract drawings.
c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
d. Review of provisions that have been made to provide required control inspection and testing.
e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
j. Discussion of the initial control phase.
k. The Government shall be notified at least 72 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.5.2 INITIAL PHASE: This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
d. Resolve all differences.
e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
f. The Government shall be notified at least 72 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.5.2 FOLLOW-UP PHASE: Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work, which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

3.5.3 ADDITIONAL PREPARATORY AND INITIAL PHASES: Additional preparatory and initial phases shall be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, onsite production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.6 TESTS

3.6.1 TESTING PROCEDURE: The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

a. Verify that testing procedures comply with contract requirements.
b. Verify that facilities and testing equipment are available and comply with testing standards.
c. Check test instrument calibration data against certified standards.
d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where

tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.6.2 TESTING LABORATORIES

3.6.2.1 CAPABILITY CHECK: The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.6.2.2 CAPABILITY RECHECK: If the selected laboratory fails the capability check, the Contractor will be assessed a charge of $1,500.00 to reimburse the Government for each succeeding rechecks of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.6.2.3 ONSITE LABORATORY: The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.6.2.4 FURNISHING OR TRANSPORTATION OF SAMPLES FOR TESTING NOTE: If the project is indoor renovation work, the Soils Laboratory Unit shall be deleted. Furnishing or Transportation of Samples for Testing: Costs incidental to the transportation of samples or materials will be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the following address: Field Exploration Unit or Soils Laboratory Unit (indicate which on shipping or mailing forms) Fort McHenry Yard Baltimore, Maryland 21230"

3.7 COMPLETION INSPECTION

3.7.1 PUNCH-OUT INSPECTION: Near the completion of all work or any increment thereof established by a completion time stated in the Special Clause in Section 00800 of the Solicitation entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a punchlist of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in

the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.7.2 PRE-FINAL INSPECTION: The Government will perform pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.7.3 FINAL ACCEPTANCE INSPECTION: The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.8 DOCUMENTATION: The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

a. Contractor/subcontractor and their area of responsibility.
b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase is identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

f. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.

g. Off-site surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and/or specifications.

j. Contractor's verification statement. These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.9 SAMPLE FORMS & NOTE: Sample forms enclosed at the end of this section.

3.10 NOTIFICATION OF NONCOMPLIANCE: The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

END OF SECTION 01451

Contractor's Name: _____
Address: _____
_____
Phone Number: _____

CONSTRUCTION QUALITY CONTROL REPORT

PROJECT NAME: _____
LOCATION:_____ DATE: _____
CONTRACT NUMBER:_____ REPORT NO.:_____

SUPERINTENDENT:_____

TYPE OF WORKERS	NUMBER	TYPES OF CONSTRUCTION EQUIPMENT ON SITE	NUMBER

SUBCONTRACTORS

COMPANY	RESPONSIBILITY	FOREMAN	NO. OF WORKERS

TOTALS

NO. OF WORKERS TODAY	MANHOURS TODAY	MANHOURS FOR THIS PERIOD

CONTRACT MATERIALS AND EQUIPMENT DELIVERED TO SITE:

WEATHER:_____ SITE CONDITIONS:_____

DID A DELAY OR WORK STOPPAGE OCCUR TODAY? _____
IF YES, EXPLAIN.

HAS ANYTHING DEVELOPED IN THE WORK WHICH MAY LEAD TO A CHANGE OR FINDING OF FACT? _____ IF YES, EXPLAIN.

DESCRIPTION OF ALL WORK PERFORMED TODAY
(LIST BY DEFINABLE FEATURES OF WORK)

PREPARATORY INSPECTION:

LIST ALL INSPECTIONS BY SUBJECT AND SPECIFICATION LOCATION.
ATTACH MINUTES OF MEETING AND LIST OF ALL ATTENDEES.

HAVE ALL REQUIRED SUBMITTALS AND SAMPLES OF CONSTRUCTION BEEN APPROVED.

DO THE MATERIALS AND EQUIPMENT TO BE USED CONFORM TO THE SUBMITTALS?

HAS ALL PRELIMINARY WORK BEEN INSPECTED, TESTED, AND COMPLETED?

TEST REQUIRED AND INSPECTION TECHNIQUES TO BE EXECUTED TO PROVE CONTRACT COMPLIANCE (INCLUDE BOTH EXPECTED AND ACTUAL RESULTS)

HAS A PHASE HAZARD ANALYSIS BEEN PERFORMED?

COMMENTS AND DEFICIENCIES NOTED AND CORRECTIVE ACTIONS TAKEN:

ALL INSTRUCTIONS RECEIVED FROM QA PERSONNEL AND ACTIONS TAKEN:

JOB SAFETY (INCLUDE MEETINGS HELD AND DEFICIENCIES NOTED WITH CORRECTIVE ACTIONS):

INITIAL INSPECTION:

LIST ALL INSPECTIONS BY SUBJECT AND SPECIFICATION LOCATION. COMMENTS AND/OR DEFICIENCIES NOTED AND CORRECTIVE ACTION TAKEN:

FOLLOW-UP INSPECTION:

LIST ALL INSPECTIONS BY SUBJECT AND SPECIFICATION LOCATION. COMMENTS AND/OR DEFICIENCIES NOTED AND CORRECTIVE ACTION TAKEN.

SIGNATURE:_____
QUALITY CONTROL REPRESENTATIVE/MANAGER

THE ABOVE REPORT IS COMPLETE AND CORRECT. ALL MATERIALS AND EQUIPMENT USED AND ALL WORK PERFORMED DURING THIS REPORTING PERIOD ARE IN COMPLIANCE WITH THE CONTRACT SPECIFICATIONS, AND SUBMITTALS, EXCEPT AS NOTED ABOVE.

SIGNATURE:_____
CONTRACTOR'S APPROVED AUTHORIZED REPRESENTATIVE

SECTION 01510-TEMPORARY CONSTRUCTION ITEMS

PART 1 GENERAL

1.1 GENERAL: The work covered by this section consists of furnishing all labor, materials, equipment, and services and performing all work required for or incidental to the items herein specified. No separate payment will be made for the construction and services required by this section and all costs in connection therewith shall be included in the overall cost of the work unless specifically stated otherwise.

1.2 SUBMITTALS: Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submitted in accordance with Section 013300 SUBMITTAL PROCEDURES:

SD-03 PRODUCT DATA
Temporary Electrical Work; G A/R
The Contractor shall submit a temporary power distribution sketch prior to the installation of any temporary power.

1.3 PROJECT SIGN: (AUG 1974) A project sign shall be provided and erected at a location designated by the Contracting Officer. The sign shall conform to the requirements as shown on Attachment No. 1, a copy of which is attached hereto. The sign shall be erected as soon as possible and within (15) days after the date of receipt of notice to proceed. Upon completion of the project, the sign shall be removed and disposed of by the Contractor.

1.4 SAFETY SIGN: (AUG 1974) A sign shall be provided and erected at a location designated by the Contracting Officer. The sign shall conform to the requirements as shown on Attachment No. 2, a copy of which is attached hereto. The sign shall be erected as soon as possible and within (15) days after the date of receipt of notice to proceed. The data required by the sign shall be corrected daily, with light colored metallic or non-metallic numbers. Numerals, including mounting hardware, shall be subject to the approval of the Contracting Officer. Upon completion of the project, the sign shall be removed and disposed of by the Contractor.

1.5 TEMPORARY ELECTRICAL WORK: (APR 1962 REV JUL 2000) Temporary electrical work shall be in accordance with Sections 7 and 11 of EM 385-1-1 U.S. Army Corps of Engineers Safety and Health Requirements Manual. The Contractor shall submit for approval a temporary power distribution sketch prior to the installation of any temporary power. The sketch shall include location, voltages, and means of protection for all temporary distribution system wiring and components to include lighting, receptacles, grounding, disconnecting means, and GKCIs. The Contractor

shall test the temporary power system and devices for polarity, ground continuity, and ground resistance prior to the initial use and before use after any modification. The Contractor shall verify to the satisfaction of the Contracting Officer or his representative by a calibrated light meter that the minimum illumination required by Table 7-1 of the EM 385-1-1 is being provided.

1.6 GOVERNMENT FIELD OFFICE

1.6.1 RESIDENT ENGINEER'S OFFICE: The Contractor shall provide the Government Resident Engineer with an office, approximately 200 square feet in floor area, located where directed, and providing space heat, electric light and power, toilet facilities consisting of one lavatory and one water closet complete with connections to water and sewer mains. A mail slot shall be provided in the door, or an apartment-type lockable mailbox mounted on the surface of the door. At completion of the project, the office shall remain the property of the Contractor and shall be removed from the site. All utility connections shall be connected and disconnected in accordance with local codes and to the satisfaction of the Contracting Officer. If a window style air conditioner is used then the refrigerant shall be one of the fluorocarbon gases that is in accordance with FS BB-F 1421 and has an Ozone Depletion Potential (ODP) of less than or equal to 0.05.

1.6.2 TRAILER-TYPE MOBILE OFFICE (CONTRACTOR'S OPTION): In lieu of constructing, maintaining and, at end of construction period, removing a temporary type field office, the Contractor may, at his option, furnish and maintain a trailer-type mobile office acceptable to the Contracting Officer and providing as a minimum the facilities specified above. The trailer shall be securely anchored to the ground at all four corners to guard against movement during high winds.

1.7 TEMPORARY PAVING PATCH: The Contractor shall place a temporary patch of cold mixed asphalt of adequate size and thickness immediately after utility trenches or other road or paved area openings are backfilled and compacted as specified in DIVISION II. The Contractor shall maintain the temporary patch until he permanently repairs the opening as delineated in DIVISION II.

1.8 BULLETIN BOARD: (NOV 1983) Immediately upon beginning of work under this contract, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 36x48 inches in size, for displaying the Equal Employment Opportunity Poster, a copy of the wage decision contained in the contract, Wage Rate Information Poster, and other information approved by the Contracting Officer.

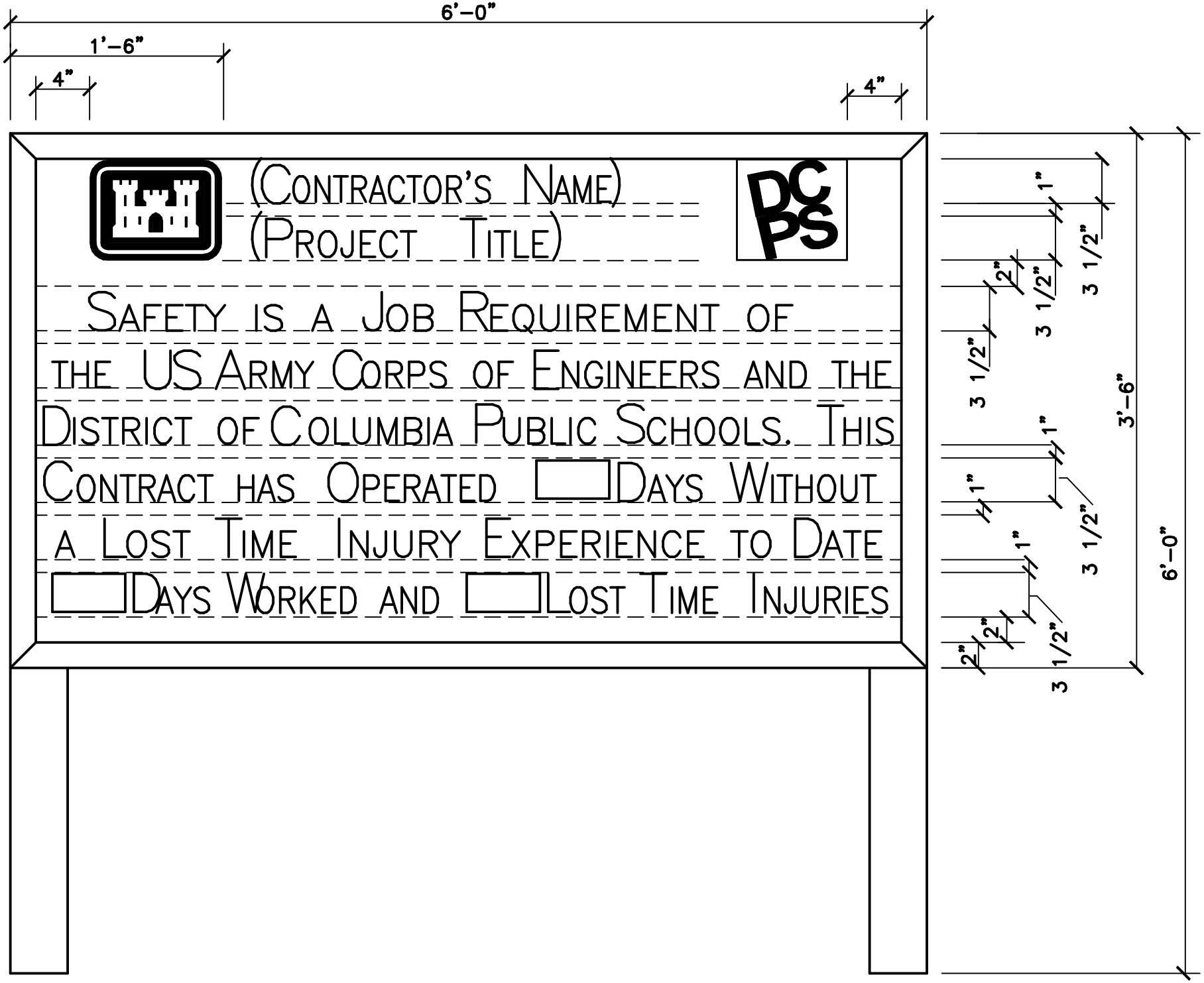
The bulletin board shall be located at the site of work in a conspicuous place easily accessible to all employees as approved by the Contracting Officer. Legible copies of the aforementioned data shall be displayed until work under the contract is complete. Upon completion of work under this contract the bulletin board shall be removed by and remain the property of the Contractor.

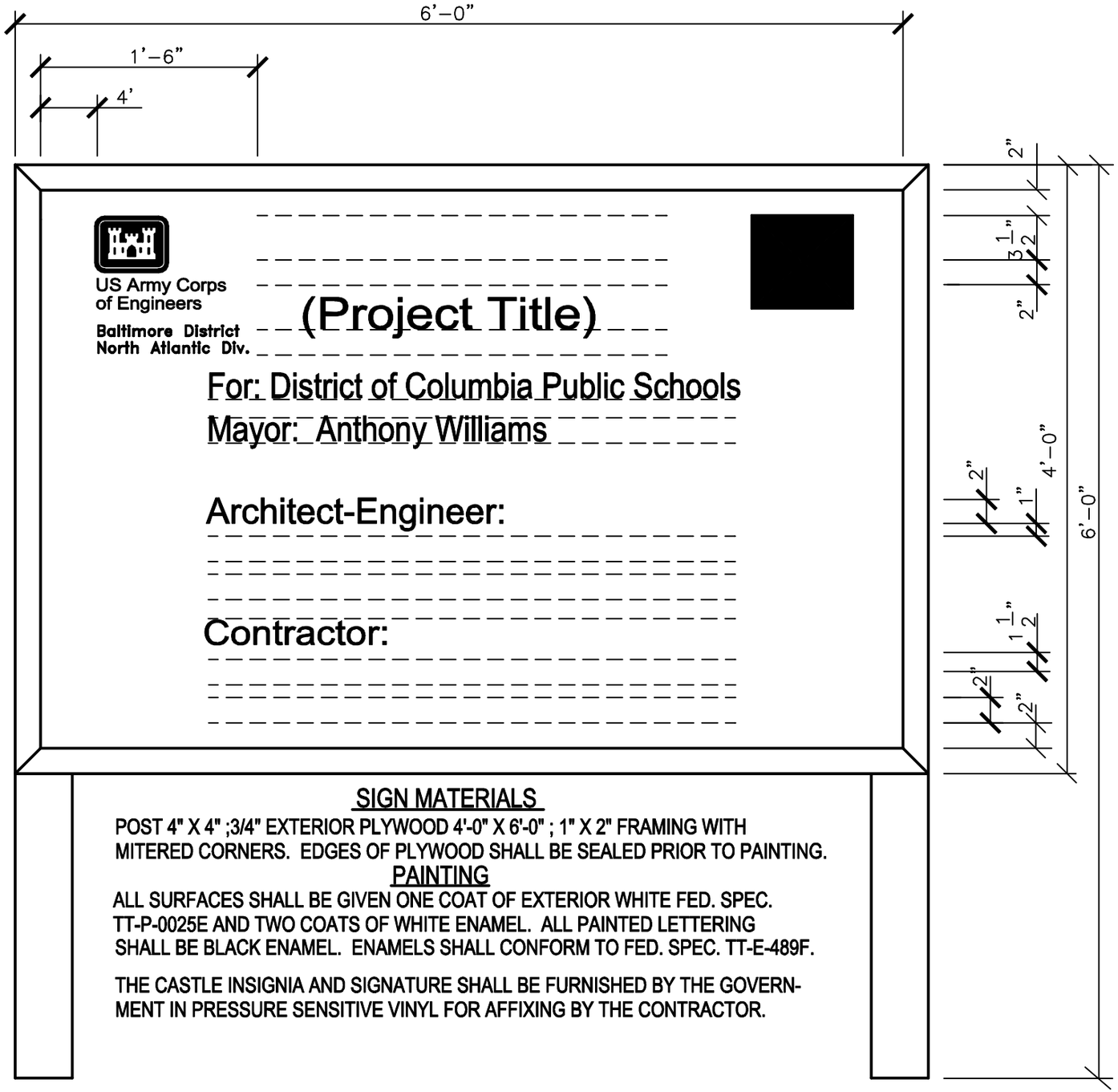
1.9 MEASUREMENT AND PAYMENT: No separate measurement and payment will be made for the work performed in this Section 01510, TEMPOARY CONSTRUCTION ITEMS, specified herein, and all costs in connection therewith shall be considered a subsidiary obligation of the Contractor, and shall be included in the overall cost of the work.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 01510


6'–0"
1'–6"
4"
4"
(CONTRACTOR'S NAME)
(PROJECT TITLE)
DCPS
SAFETY IS A JOB REQUIREMENT OF THE US ARMY CORPS OF ENGINEERS AND THE DISTRICT OF COLUMBIA PUBLIC SCHOOLS. THIS CONTRACT HAS OPERATED ☐ DAYS WITHOUT A LOST TIME INJURY EXPERIENCE TO DATE ☐ DAYS WORKED AND ☐ LOST TIME INJURIES
1"
3 1/2"
2"
3 1/2"
3 1/2"
1"
1"
3 1/2"
1"
2"
2"
3 1/2"
3'–6"
6'–0"



SIGN MATERIALS

POST 4" X 4" ;3/4" EXTERIOR PLYWOOD 4'-0" X 6'-0" ; 1" X 2" FRAMING WITH MITERED CORNERS. EDGES OF PLYWOOD SHALL BE SEALED PRIOR TO PAINTING.

PAINTING

ALL SURFACES SHALL BE GIVEN ONE COAT OF EXTERIOR WHITE FED. SPEC. TT-P-0025E AND TWO COATS OF WHITE ENAMEL. ALL PAINTED LETTERING SHALL BE BLACK ENAMEL. ENAMELS SHALL CONFORM TO FED. SPEC. TT-E-489F.

THE CASTLE INSIGNIA AND SIGNATURE SHALL BE FURNISHED BY THE GOVERNMENT IN PRESSURE SENSITIVE VINYL FOR AFFIXING BY THE CONTRACTOR.

SECTION 01561 - ENVIRONMENTAL PROTECTION

PART 1 GENERAL

The work covered by this section consists of furnishing all labor, materials and equipment and performing all work required for the prevention of environmental pollution during, and as the result of, construction operations under this contract except for those measures set forth in the Technical Provisions of these specifications. For the purpose of this specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life or affect other species of importance to man. The control of environmental pollution requires consideration of air, water, and land.

1.1 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. When used ,a designation following the ”G” designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL ROCEDURES:

SD-05 Design Data
Facility Plan; GA|AR
Location of storage and service facilities.
Temporary Plan; GA|AR
Temporary excavation and embankments.

1.2 APPLICABLE REGULATIONS

The Contractor and his subcontractors in the performance of this contract, shall comply with all applicable Federal, State, and local laws and regulations concerning environmental pollution control and abatement in effect on the date of this solicitation, as well as the specific requirements stated elsewhere in the contract specifications.

1.3 NOTIFICATION

The Contracting Officer will notify the Contractor of any non-compliance with the foregoing provisions and the action to be taken. The Contractor shall, after receipt of such notice, immediately take corrective action. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of time lost due to any such stop order shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.4 SUBCONTRACTORS

Compliance with the provisions of this section by subcontractors will be the responsibility of the Contractor.

1.5 PROTECTION OF WATER RESOURCES

The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acid construction wastes or other harmful materials. All work under this contract shall be performed in such a manner that objectionable conditions will not be created in streams through or adjacent to the project areas.

1.6 EROSION AND SEDIMENTATION CONTROL

The Contractor shall accomplish the erosion and sedimentation control in accordance with the contract drawings. At the outset of construction, the Contractor will be required to accept by signature a Transfer of Authority letter. The acceptance of the Transfer of Authority places responsibility on the Contractor to fully adhere to the provisions of the General Permit for erosion and sedimentation control and stormwater management

1.7 BURNING

Burning will be allowed only if permitted in other sections of the specifications or authorized in writing by the Contracting Officer. The specific time, location and manner of burning shall be subject to the approval of the Contracting Officer. Fires shall be confined to a closed vessel, guarded at all times and shall be under constant surveillance until they have burned out or have been extinguished. All burning shall be so thorough that the materials will be reduced to ashes.

1.8 EXPLOSIVES

Use of explosives not allowed

1.9 DUST CONTROL

The Contractor shall maintain all work area free from dust which would contribute to air pollution. Approved temporary methods of stabilization consisting of sprinkling, chemical treatment, light bituminous treatment or similar methods will be permitted to control dust. Sprinkling, where used, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs

1.10 OF LAND RESOURCES

1.10.1 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 be natural and not detract from the appearance of the project. Insofar as possible, the Contractor shall confine his construction activities to areas defined by the plans and specifications or to be cleared for other operations. The following additional requirements are intended to supplement and clarify the requirements of the CONTRACT CLAUSES:

1.10.2 Protection of trees retained

1.10.2.1 Contractors Responsibility

The Contractor shall be responsible for the protection of the tops, trunks and roots of all existing trees that are to be retained on the site. Protection shall be maintained until all work in the vicinity has been completed and shall not be removed without the consent of the Contracting Officer. If the Contracting Officer finds that the protective devices are insufficient, additional protection devices shall be installed.

1.10.2.2 Stockpiling

Heavy equipment, vehicular traffic, or stockpiling of any materials shall not be permitted within the drip line of trees to be retained.

1.10.2.3 Storage

No toxic materials shall be stored within 100 feet (30 5 m) from the drip line of trees to be retained.

1.10.2.4 Confined Area

Except for areas shown on the plans to be cleared, the Contractor shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without special authority. Existing near by trees shall not be used for anchorage unless specifically authorized by the Contracting Officer. Where such special emergency use is permitted, the Contractor shall first adequately protect the trunk with a sufficient thickness of burlap over which softwood cleats shall be tied.

1.10.2.5Tree Defacing

No protective devices, signs, utility boxes or other objects shall be nailed to trees to be retained on the site.

1.10.3 Restoration of landscape damage

Any trees or other landscape feature scarred or damaged by the Contractor's operations shall be restored as nearly as possible to its original condition at the 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. All scars made on trees, designated on the plans to remain, and all cuts for the removal of limbs larger than 1-inch 25.4 mm in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted. Where tree climbing is necessary, the use of climbing spurs will not be permitted. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the 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. Replacement trees shall measure no less than 2 inches 50.8 mm in diameter at 6 inches152.4 mm above the ground level.

1.10.4 Location of Storage and Services Facilities

The location on Government property of the Contractor's storage and service facilities, required temporarily in the performance of the work, shall be upon cleared portions of the job site or areas to be cleared. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. A facility plan showing storage and service facilities shall be submitted for approval to the Contracting Officer. Where buildings or platforms are constructed on slopes, the Contracting Officer may require cribbing to be used to obtain level
foundations. Benching or leveling of earth may not be allowed, depending on the location of the proposed facility.

1.10.5 Temporary Excavation and Embankment

If the Contractor proposes to construct temporary roads, embankments or excavations for plant and/or work areas, he shall submit a temporary plan for approval prior to scheduled start of such temporary work.

PART 2 PRODUCT

NOT APPLICABLE

PART 3 EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01720-AS-BUILT DRAWINGS – CADD

PART 1 GENERAL

1.1 PREPARATION: This section covers the preparation of as-built drawings complete, as a requirement of this contract. The terms "drawings," "contract drawings," "drawing files," and "final as-built drawings" refer to a set of computer-aided design and drafting (CADD) contract drawings in electronic file format which are to be used for as-built drawings.

1.2 PROGRESS MARKED UP AS-BUILT PRINTS: The Contractor shall revise one set of paper prints to show the as-built conditions during the prosecution of the project. These as-built marked prints shall be kept current and available on the jobsite at all times. All changes from the contract plans, which are made in the work, or additional information, which might be uncovered in the course of construction, shall be accurately and neatly recorded as they occur by means of details and notes. The as-built marked prints will be jointly reviewed for accuracy and completeness by the Contracting Officer and a responsible representative of the construction Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the as-built drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the as-built drawings and will continue the monthly deduction of the 10% retainage even after 50% completion of the contract. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and a representative of the Contractor regarding the accuracy and completeness of updated drawings. The prints shall show the following information, but not be limited thereto:

1.2.1 LOCATION AND DESCRIPTION: The location and description of any utility lines or other installations of any kind or description known to exist within the construction area. The location includes dimensions to permanent features.

1.2.2 LOCATION AND DIMENSIONS: The location and dimensions of any changes within the building or structure.

1.2.3 CORRECTIONS: Correct grade, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans. Correct elevations if changes were made in site grading.

1.2.4 CHANGES: Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc. The topography, invert elevations and grades of all drainage installed or affected as a part of the project construction. All changes or modifications which result from the final inspection.

1.2.5 OPTIONS: Where contract drawings or specifications present options, only the option selected for construction shall be shown on the as-built prints.

1.3 SUBMITTALS: Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only.

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES: SD-01 Data CADD Files; Shall consist of two sets of completed as-built contract drawings on separate media consisting of both CADD files (compatible with the Using Agency/Sponsor's system on electronic storage media identical to that supplied by the Government) and a CALS Type 1, Group 4, Raster Image File of each contract drawing.

SD-04 Drawings Progress Prints; GA|AR Preparation of two copies of as-built from the Contractor to the Contracting Officer for review and approval. Final Prints; GA Receipt by the Contractor of the approved marked as-built prints.

1.4 PRELIMINARY SUBMITTAL: At the time of final inspection, the Contractor shall prepare two copies of the progress as-built prints and these shall be delivered to the Contracting Officer for review and approval. These as-built marked prints shall be neat, legible and accurate. The review by Government personnel will be expedited to the maximum extent possible. Upon approval, one copy of the as-built marked prints will be returned to the Contractor for use in preparation of final as-built drawings. If upon review, the as-built marked prints are found to contain errors and/or omissions, they shall be returned to the Contractor for corrections. The Contractor shall complete the corrections and return the as-built marked prints to the Contracting Officer within ten (10) calendar days.

1.5 DRAWING PREPARATION:

1.5.1 AS-BUILT DRAWINGS APPROVAL: Upon approval of the as-built prints submitted, the Contractor will be furnished by the Government one set of contract drawings, with all amendments incorporated, to be used for as-built drawings. These contract drawings will be furnished on CD-ROM. These drawings shall be modified as may be necessary to correctly show all the features of the project as it has been constructed by bringing the contract set into agreement with the approved as-built prints, adding such additional drawings as may be necessary. These drawings are part of the permanent records of this project and the Contractor shall be responsible for the protection and safety thereof until returned to the Contracting Officer.

The Contractor at no expense to the Government shall satisfactorily replace any drawings damaged or lost by the Contractor.

1.5.2 PROFICIENT PERSONNEL: Only personnel proficient in the preparation of engineering CADD drawings to standards satisfactory and acceptable to the Government shall be employed to modify the contract drawings or prepare additional new drawings. All additions and corrections to the contract drawings shall be equal in quality to that of the originals. Line work, line weights, lettering, layering conventions, and symbols shall be the same as the original line work, line weights, lettering, layering conventions, and symbols. If additional drawings are required, they shall be prepared using the specified electronic file format applying the same guidance specified for original drawings. The title block and drawing border to be used for any new as-built drawings shall be identical to that used on the contract drawings. The Government shall accomplish all additions and corrections to the contract drawings using CADD media files supplied. These contract drawings will already be compatible with the Using Agency/Sponsor's system when received by the Contractor. The Using Agency/Sponsor uses [AutoCAD Release 14] CADD software system. The media files will be supplied on [ISO 9660 Format CD-ROM]. The Contractor is responsible for providing all program files and hardware necessary to prepare as-built drawings. The Contracting Officer will review all as-built drawings for accuracy and the Contractor shall make all required corrections, changes, additions, and deletions.

1.5.3 FINAL REVISIONS: When final revisions have been completed, the cover sheet drawing shall show the wording "RECORD DRAWING AS-BUILT" followed by the name of the General Contractor in letters at least 3/16 inch high. All other contract drawings shall be marked either "As-Built" drawing denoting no revisions on the sheet or "Revised As-Built" denoting one or more revisions. (See attachment 1).

All original contract drawings shall be dated in the revision block (SEE ATTACHMENTS 1 and 2) located at the end of this section. While the title block sample attachments do not depict the contract drawings' title blocks, the sample revision blocks above these attachments are to be used as guidance in completing the actual contract drawings' revision blocks).

1.6 FINAL REQUIREMENTS: After receipt by the Contractor of the approved marked as-built prints and the original contract drawing files the Contractor will, within 30 days for contracts less than $5 million or 60 days for contracts $5 million and above, make the final as-built submittal. The submittal shall consist of the following:

a) Two sets of the as-built contract drawings on separate CD's (ISO 9660 Format CD-ROM) consisting of the updated CADD files and a CALS Type 1 Group 4 Raster Image File of each contract drawing plate. The CALS files shall be exact duplicates of the full sized plots of the completed as-built contract drawings at a resolution of 400 dpi and may be either plotted to CALS files directly from the CADD files, or scanned to file from the prints.
b) Two sets of full size paper prints (plots) of the completed as-built contract drawings.
c) The return of the approved marked as-built prints.

They shall be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any translations or adjustments necessary to accomplish this are the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with its CADD system. All paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit as-built drawing files and marked prints as required herein shall be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final as-built drawings shall be accomplished before final payment is made to the Contractor.

1.7 PAYMENT: No separate payment will be made for the as-built drawings required under this contract, and all costs in connection therewith shall be considered a subsidiary obligation of the Contractor.

PART 2 PRODUCT (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 01720

RECORD DRAWING AS-BUILT

XYZ CONTRACTOR

Plate: 1

Sheet Number: T-1

FT. INDIANTOWN GAP PENNSYLVANIA

EQUIPMENT CONSENTRATION SITE

COVER SHEET

U.S. ARMY ENGINEER DISTRICT, BALTIMORE CORPS OF ENGINEERS BALTIMORE, MARYLAND	Designed by:	Date: JAN 2001	Rev.
	Dwn by: / Ckd by:	Design file no.	
A/E FIRM/CONTRACTOR 3 LINES PROVIDED OR LOGO	Reviewed by:	Drawing Number: F-XXX-XX-XX	
	Submitted by: Chief, Branch	File name: FILENAME Plot date: 12/25/00 Plot scale: 1=1	

Mark	Description	Date	Appr.	Mark	Description	Date	Appr.
	AS-BUILT	10 SEP 02					
3	REVISED SECTION A-A AND C-C	5 JAN 01	A.E. D.P.				
2	REVISED PER AMENDMENT NO. 2	30 DEC 00	A.E. D.P.				
1	REVISED PER AMENDMENT NO. 1	25 DEC 00	A.E. D.P.				

ATTACHMENT 1

SECTION 01800-COLOR DESIGN

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This section consists of the selections of colors, patterns and designs (including sizes and textures of certain items) for all visible surfaces of building materials, paints, equipment and any other items having color, interior and exterior.

B. Colors, textures, patterns and designs identified by Color Code within files this section are requirements for materials of which qualities and types are generally specified elsewhere in the specifications and/or on the drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Where specific manufacturer's materials are indicated within this section, similar colors, the Contracting Officer shall consider patterns and textures by other manufacturers acceptable, subject to approval.

B. In the event of acceptance of colors not indicated within this section, the Contracting Officer reserves the right to make necessary modifications to other colors specified within the areas involved in order insuring obtaining the desired aesthetic effect.

C. In the event of discrepancy between finishes on the Finish Schedule shown on the drawings and this section, the finishes on the drawings shall govern.

D. Doors requiring paint is to be painted Color Code number 95 except if located on an accent wall. When doors are located on accent wall, doors as well as door frames should be painted to match adjacent accent wall.

E. Submit samples of all colors for approval prior to commencement of work completion.

2.2 MANUFACTURER'S ABBREVIATIONS

AC	-	Armstrong Cork Co.	GD	-	Glidden-Durkee
AO	-	American Olean Tile Co.	GB	-	Gibraltar
ANC	-	Anchor Concrete Products	J	-	Johnsonite
ARM	-	Armstrong World Industries	KR	-	Kohler Co.
AV	-	Avonite	KT	-	Kentile Inc.
AZ	-	Azrock Floor Products	LAM	-	Laminart
BET	-	Betco Block & Products, Inc.	NV	-	Nevamar
BM	-	Benjamin Moore & Co.	NVC	-	Nevco
BP	-	Brunning Paint Co., Inc.	PP	-	Pittsburgh Paint
CAP	-	Capitol Partitions	SG	-	Spectra Glaze
CP	-	Comtec Plastic	SW	-	Sherwin-Williams Co.
DP	-	Devoe and Raynolds Co., Inc.	SWT	-	Swanstone Corp.
DT	-	Dal-Tile Corp.	TC	-	Tile Council of America, Inc.
DR	-	Duron Paints & Wall Covering	TR	-	Tremco Mfg. Co.
E	-	Eljer (Plumbing)	U	-	UPCO
F	-	Flexco	USG	-	United States Gypsum Prod.
FT	-	Florida Tile			

2.3 COLOR DESIGN

A. D.C. Color Codes are based on the following system:

10-19 Reds	40-49 Greens	70-79 Purples
20-29 Oranges	50-59 Blue-Greens	80-89 Browns
30-29 Yellows	60-69 Blues	90-99 Neutrals

Notes: Lower numbers indicate deeptones; higher numbers indicate pastel tones; e.g., 90 is black; 95 is medium grey, 99 is white.

2.4 ACOUSTICAL TREATMENT

A. Acoustical Tile: 98 AT..White, lay-in, semi-recessed, exposed grid 2'x4'x5/8". Rough tex. (moist-resist).

ARM - Armatuff II-Boy's & Girl's Toil. only.
- Ceramaguard-Concession only.
- Fine Fissured RH 90, Sq.- Press.

USG - Auratone/Olympia II, Sq.- Press.

2.5 CAULKING AND SEALANTS

A. Interior: 97c- Antique White

B. Exterior: 97c-Antique White
C. TR-Dymeric 511- Exterior
D. Acrylic Laxtex 834-Interior

2.6 SPLITFACE BLOCK

A. 98 SFB- Pale Gray

BET 800
ANC SD-33

2.7 GLAZED BLOCK

A. 10 GLB-Red-Lower Course Stripe
1. SG-S-2/Special LR-6
2. AG- Ebony

B. 90 GLB- Black-Upper Course Stripe

1. SG-S-2/Special LR-6
2. AG- Ebony

2.8 CERAMIC TILE

A. Ceramic Floor Tile-Natural Clay 2x2"x1/4"

1. Boy's Toilet - 84 CTF – Med. Brown, Cushion Edge, Straight jt.; color of grout shall be light gray:

AO - D28-Taupe Mist (3) Smooth Satin
DT - DK135 (1) Palomino Smooth Satin.

2. Girl's Toilet - 75 CTF-Med Purple Gray; Cushion Edge, Straight jt; color of grout shall be light gray.

AO - D31-Mauve Blush (3) Smooth Satin
DT - DK14 (1) Light Gray Smooth Satin.

B. Ceramic Wall Tile, Glazed-2"x2" x1/4"

1. Boy's Toilet - 83 CTF – Light Brown, Cushion Edge, Straight jt.; color of grout shall be light gray:

AO - Y65-FAWN (4) Smooth Gloss.
DT - DK135 (1) Palomino Smooth Gloss.

2. Girl's Toilet - 76 CTW-Light Purple Gray; Cushion Edge, Straight jt; color of grout shall be light gray.

AO - D20-Heather (3) Smooth High Gloss.
DT - DK14 (1) Light Gray Smooth High Gloss.

C. Ceramic Base Tile
84 CTB
75 CTB
Same as approved floor tile

2.9 CONCRETE FINISHES

A. 98-SFC-Structural Finish Concrete
B. 98-NFC-Natural Finish Concrete
C. 98-HC-Concrete with Hardener

2.10 CHAIN LINK FENCE GAE AND POST

A. 7 CLF-Galv. Steel.

2.11 DRINKING FOUNTAINS

A. 7 DF-Stainless Steel.

2.12 LAMINATED PLASTIC

A. 81 LP-Dark Brown Wood Texture.
B. NV-W8-294M Mirror Finish.
C. LAM-#2613-G Bronze Ribbon Mahogany Gloss

2.13 LIGHT POLES

A. 40 LP-Green
B. SW-Metalastic II, B53G11

2.14 POSTS-Concession Area

A. 10P-Red
B. SW-Metalastic II, B53R10
C. Score Board

a. 40P- Green
b. SW-Metalastic II, B53G11

2.15 PLUMBING FIXTURES

A. 99 PF- White
B. E- Eljer
C. KR-Kohler Co.

2.16 TUBLULAR POST-Press Rm.

A. 89TP-Sandy Brown
B. SW-Metalatex Semi-Gloss Enamel Sandstone B42.H6.
C. Maintenance Rm.
D. 89TP-Sandy Brown
E. SW-Metalatex Semi-Gloss Enamel Sandstone B42.H6.

2.17 TOILET PARTITIONS

A. 89TP-Medium Brown
CAP-#46 Mocha-Boys
CAP-#302 Garnet- Girls

2.18 VANITY

A. Boy's Toil-84V-Medium Brown
SWT-Bermuda Sand
GB-1531 MG Light Beige Mirage

B. Girl's Toil-75V-Medium Purple
SWT-Rose Galaxy
GB-D76-DU Mauve Blush Stardust

2.19 VINLY COMPOSITION TILE-12"x12"x1/8"

A. 98 VCT-Light Gray

B. AC- 51836 Shelter White
C. AZ-VL-10
D. KT-Egret White 509.

2.20 VINYL BASE

A. 98 VB-Medium Gray
B. AC-13118 Gray
C. FE-VC-600 Gray
D. J-Vinyl CB55 Silver Gray

2.21 SCOREBOARD

A. NVC-40 SB- Deep Green (General Background)
B. –99 SB-White (Numerals & Alphabets)
C. – 90 SB-Black (Background for Numerals & Alphabets)

2.22 OTHER EXTERIOR COLORS

Bleacher Railing	BR7	Galv.
Track & Other Run (Except High Jump)	TS15	Med. Red.
Start & Finish Line Posts	LP90&99	Black & White Horizontal Stripes
Markings	MG99	White
Met. Roof Standing Seam (Fac. Fin) Gutter Facia	MR10	Red
Downspout & Cast Iron Boot	DS98	Bone White
Logo- Background	LB89	Bronze
- Art Work	LB89	Bronze
	WF10	Red
Window Frame (Fac. Fin.)	SW S:394F185 (Fluropan)	

2.23 OTHER INTERIOR COLORS

Paint on DW for wall surface
97BT-Light Gray
SW-Lav. 75% BM 39-10
DR-79-40
76 GT-Purple Gray
SW-LRV 75% BM 38-17

DR-891W
GD-79-37

2.24 CMU PAINT

96IT Light Gray
SW-LRW 75% BM89-10 Lat. Gl.

2.25 EXPOSED FLOOR JOIST

10FJ-RED

2.26 HM DOORS AND FRAMES

95 HMDF-Gray
SW-Metalastic II,
B53 H10 Sandstone

2.27 ROLLING DOORS AND FRAMES

7 RDP-Galv.

2.28 FOLDING CLOSET DOOR

(Factory Fin) 95CD Gray

COLOR SCHEDULE

* Door color for Swing & Folding Door only.

Not for Roll-Up Doors

EXT/INT

RM NO.	ROOM NAME	FLOOR	BASE	WAINSCOT	WALL	CLG.	TRIM	* DOOR
None	Ticket Booth	98 VCT	98 VCT	None	97	98	96	95/95
None	Athletic Stor.	98 HC	None	None	96	None	None	95/95
None	Maint., Stor. & Utility	98 HC	None	None	96	None	None	/95
None	Utility Closet	98 VCT	None	None	96	None	None	95/95
None	Press Room	98 VB	98 VB	None	98	98	None	95/95
None	Powder Room (Press)	98 VCT	98VCT	None	97	97	None	/95
None	Closet (Press)	98 VCT	98 VB	None	97	97	None	/95
None	Boy's Toilet	84 CTF	84 CTB	83 CTW	97	98	None	95/95
None	Girl's Toilet	75 CTF	75 CTB	76 CTW	76	98	None	95/95
None	Concessions	98 VCT	98VB	98 CTW	97	98	None	95/95

END OF SECTION 1800

SECTION 02070 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected site elements.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Contract Closeout" for record document requirements.
2. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.

B. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

C. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Contracting Officer and/or Project Managers, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall

become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

B. Historical items indicated remain the Owner's property. Carefully remove and salvage each item in a manner to prevent damage and deliver promptly to the Owner.

C. Historical items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the Owner, which may be encountered during selective demolition, remain the Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the Owner.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.

B. Proposed dust-control measures.

C. Proposed noise-control measures.

D. Schedule of selective demolition activities indicating the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services.

E. Inventory of items to be removed and salvaged.

F. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.

G. Record drawings at project closeout according to Division 1 Section "Contract Closeout."

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

H. Landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.7 PROJECT CONDITIONS

A. Storage or sale of removed items or materials on-site will not be permitted.

1.8 WARRANTY

A. Existing Special Warranty: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

B. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

3.4 POLLUTION CONTROLS

A. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

B. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete work within limitations of governing regulations.

3.6 PATCHING AND REPAIRS

A. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

B. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.

C. Patch and repair floor and wall surfaces in the new space where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance.

D. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

END OF SECTION 02070

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Preparing and grading subgrades for slabs-on-grade, walks, pavements, and landscaping.
2. Excavating and backfilling for buildings and structures.
3. Drainage and moisture-control fill course for slabs-on-grade.
4. Subbase course for walks and pavements.
5. Subsurface drainage backfill for walls and trenches.
6. Excavating and backfilling for underground mechanical and electrical utilities and appurtenances.

B. Related Sections: The following Sections contain requirements that relate to this Section.
1. Division 2 Section “Landscape Work” for finishes grading, including placing and preparing topsoil for lawns and planting.
2. Division 3 Section "Cast-In-Place Concrete" for concrete encasing, cradles, and appurtenances for utility systems.

1.3 DEFINITIONS

A. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.

B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

D. Subbase Course: The layer placed between the subgrade and base course in a paving system or the layer placed between the subgrade and surface of a pavement or walk.

E. Base Course: The layer placed between the subbase and surface pavement in a

paving system.

F. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to cut off upward capillary flow of pore water.

G. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Contracting Officer and/or Project Managers. Unauthorized excavation, as well as remedial work directed by the Contracting Officer and/or Project Managers, shall be at the Contractor's expense.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

I. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for the following:

1. Filter fabric.

C. Samples of the following:

1. 20 lb (9 kg) samples, sealed in air-tight containers, of each proposed fill and backfill soil material from on-site or borrow sources.
2. 12 x 12 inch (300 x 300 mm) sample of filter fabric.

D. Test Reports: In addition to test reports required under field quality control, submit the following:

1. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrows sources.
2. One optimum moisture-maximum density curve for each soil material.
3. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.

E. Photographs of existing adjacent structures and site improvements.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

B. Comply with applicable requirements of NFPA 495-Explosive Materials Code.

. Testing and Inspection Service: Employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.

D. Preinstallation Conference: Conduct conference at project site to comply with requirements of Division 1 Section "Project Meetings."

1. Before commencing earthwork, meet with representatives of the governing authorities, Owner, Contracting Officer and/or Project Managers, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Contracting Officer and/or Project Managers and then only after acceptable temporary utility services have been provided.

1. Provide a minimum 48-hours' notice to the Contracting Officer and/or Project Managers and receive written notice to proceed before interrupting any utility.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide approved borrows soil materials from off-site when sufficient approved soil materials are not available from excavations.

B. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches (50 mm) in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

C. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

D. Backfill and Fill Materials: Satisfactory soil materials.

E. Subbase and Base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D 2940, with at least 95 percent passing a 1-1/2 inch (38 mm) sieve and not more than 8 percent passing a No. 200 (75 micrometer) sieve.

F. Engineered Fill: Subbase or base materials.

G. Bedding Material: Subbase or base materials with 100 percent passing a 1 inch (25 mm) sieve and not more than 8 percent passing a No. 200 (75 micrometer) sieve.

H. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate grading size 57, with 100 percent passing a 1-1/2 inch (38 mm) sieve and not more than 5 percent passing a No. 8 (2.36 mm) sieve.

I. Filtering Material: Evenly graded mixture of natural or crushed gravel or crushed stone and natural sand, with 100 percent passing a 1-1/2 inch (38 mm) sieve and 0 to 5 percent passing a No. 50 (300 micrometer) sieve.

J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility.

B. Filter Fabric: Manufacturer's standard non woven pervious geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.

1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:

a. Grab Tensile Strength (ASTM D 4632): 100 lb (45 kg).
b. Apparent Opening Size (ASTM D 4751): #100 U.S. Standard (150 micrometer) sieves.

c. Permeability (ASTM D 4491): 150 gallons per minute per sq. ft. (102 L/s per sq. m).

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Tree protection is specified in the Division 2 Section "Site Clearing."

3.2 DEWATERING

A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area.

B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

3.3 EXCAVATION

A. Explosives: Do not use explosives.

B. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.

1. Rock excavation includes removal and disposal of rock material and obstructions encountered that cannot be removed by the following heavy-duty rock excavating equipment without systematic drilling, blasting, or ripping.

a. Rock material includes boulder 1/2 cu. yd. (0.38 cu. m) or more in volume and rock in beds, ledges, unstratified masses, and conglomerate deposits.

3.4 STABILITY OF EXCAVATIONS

A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 12 inch (300 mm) each side of pipe or conduit.

B. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.

1. For pipes or conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Where encountering rock or another unyielding bearing surface, carry trench excavation 6 inches (150 mm) below invert elevation to receive bedding course.

3.6 APPROVAL OF SUBGRADE

A. Notify Contracting Officer and/or Project Managers when excavations have reached required subgrade.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Contracting Officer and/or Project Managers.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used

to bring elevations to proper position when acceptable to the Contracting Officer and/or Project Managers.

1. Fill unauthorized excavations under other construction as directed by the Contracting Officer and/or Project Managers.

B. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Contracting Officer and/or Project Managers.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 BACKFILL

A. Backfill excavations promptly, but not before completing the following:

1. Acceptance of construction below finishes grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for record documents.
3. Testing, inspecting, and approval of underground utilities.
4. Concrete formwork removal.
5. Removal of trash and debris from excavation.
6. Removal of temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.10 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches (450 mm) of footings. Place concrete to level of

bottom of footings.

C. Place and compact initial backfill of satisfactory soil material or subbase material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

D. Coordinate backfilling with utilities testing.

E. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.

F. Place and compact final backfill of satisfactory soil material to final subgrade.

G. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.11 SUBSURFACE DRAINAGE BACKFILL

A. Subsurface Drain: Place a layer of filter fabric around perimeter of drainage trench or at footing, as indicated. Place a 6 inch (150 mm) compacted course of filtering material on filter fabric to support drainage pipe. After installing and testing, encase drainage pipe in a minimum of 6 inches (150 mm) of compacted filtering material and wrap in filter fabric, overlapping edges at least 6 inches (150 mm).

B. Drainage Backfill: Place and compact drainage backfill of filtering material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade. Overlay drainage backfill with one layer of filter fabric, overlapping edges at least 6 inches (150 mm).

C. Impervious Fill: Place and compact impervious fill material over drainage backfill to final subgrade.

3.12 FILL

A. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.

1. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.

B. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil and recompact to required density.

C. Place fill material in layers to required elevations for each location listed below.

1. Under grass, use satisfactory excavated or borrows soil material.
2. Under walks and pavements, use subbase or base material or satisfactory excavated or borrow soil material.
3. Under steps and ramps, use subbase material.
4. Under building slabs, use drainage fills material.
5. Under footings and foundations, use engineered fills.

3.13 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.

a. Stockpile or spread and dry removed wet satisfactory soil material.

3.14 COMPACTION

A. Place backfill and fill materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure.

C. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, compact the top 12 inches (300 mm) below subgrade and each layer of backfill or fill

material at 95 percent maximum dry density.

2. Under walkways, compact the top 6 inches (150 mm) below subgrade and each layer of backfill or fill material at 95 percent maximum dry density.
3. Under lawn or unpaved areas, compact the top 6 inches (150 mm) below subgrade and each layer of backfill or fill material at 90 percent maximum dry density.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between existing adjacent grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1.2 inches (30 mm).
2. Walks: Plus or minus 1.2 inches (30 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

C. Grading Inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10 foot (3 m) straightedge.

3.16 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course material on prepared subgrades. Place base course material over subbases to pavements.

1. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 95 percent of ASTM D 4254 relative density.
2. Shape subbase and base to required crown elevations and cross-slope grades.
3. When thickness of compacted subbase or base courses is 6 inches (150 mm) or less, place materials in a single layer.
4. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when

compacted.

B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders at least 12 inches (300 mm) wide of acceptable soil materials and compact simultaneously with each subbase and base layer.

3.17 DRAINAGE FILL

A. Under slabs-on-grade, place drainage fills course on prepared subgrade.

1. Compact drainage fill to required cross sections and thickness.
2. When compacted thickness of drainage fill is 6 inches (150 mm) or less, places materials in a single layer.
3. When compacted thickness of drainage fill exceeds 6 inches (150 mm) thick place materials in equal layers, with no layer more than 6 inches (150 mm) thick nor less than 3 inches (75 mm) thick when compacted.

3.18 FIELD QUALITY CONTROL

A. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2937 (drive cylinder method), as applicable.

a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.

b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Contracting Officer and/or Project Managers.

2. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of each subgrade with related tested strata when

acceptable to the Contracting Officer and/or Project Managers.

3. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
4. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet (30 m) or less of wall length, but no fewer than two tests along a wall face.
5. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet (45 m) or less of trench, but no fewer than two tests.

B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

3.19 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace material to depth directed by the Contracting Officer and/or Project Managers; reshape and recompact at optimum moisture content to the required density.

C. Settling: Where settling occurs during the project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

B. Disposal: Transport surplus satisfactory soil to designated storage areas on the Owner's property. Stockpile or spread soil as directed by Contracting Officer and/or Project Managers.

1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION 02200

SECTION 02511 - HOT-MIXED ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Hot-mixed asphalt paving.
2. Pavement-marking paint.
3. Wheel stops.

B. Related Sections includes the following:

1. Division 2 Section "Earthwork" for aggregate subbase and base course and aggregate pavement shoulders.
2. Division 7 Section "Paving Joint Sealant" for joint sealants and fillers at paving termination.

1.3 SYSTEM DESCRIPTIONS

A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard Specifications of the local authorities having jurisdiction.

1. Standard Specification: DC Department of Highway Standard Specifications for Highway.

1.4 SUBMITTALS

A. Product Data: For each product specified. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the work.

C. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate dedicated handicapped spaces with international graphics symbol.

D. Samples: 12 by 12 inches (300 by 300 mm) minimum, of paving fabric.

E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article

to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Contracting Officer and/or Project Managers and Owner, and other information specified.

F. Material Test Reports: Indicate and interpret test results for compliance of material complies with requirements.

G. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this project and with a record of successful in-service performance.

1. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with DOT of the state in which project is located.

C. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.

D. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:

1. Prime and Tack Coats: Minimum surface temperature of 60 deg F (15.5 deg C)
2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
3. Asphalt Surface Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.
4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.5 deg C) and rising at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4 deg C) for oil-based materials, 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactory in previous installations.

B. Coarse Aggregate: Sound, angular crushed stone, crushed gravel, or properly cured crushed blast furnace slag, complying with ASTM D 692-88.

C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone, properly cured blast furnace slag, gravel, or combinations thereof, complying with ASTM D 1073.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

2.2 ASPHALT MATERIALS

A. Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.

B. Undersealing Asphalt: ASTMD 3141, pump consistency

C. Prime Coat: ASTM D 2027; medium-curing cutback asphalt: MC-30, MC-70 or MC-250.

D. Tack Coat: ASTM D 977 emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

E. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Herbicide Treatment: Commercial chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid, or wettable powder form.

B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

C. Pavement-Marking Paint: Latex, water-base emulsion, ready-mixed complying with FS TT-P-1952.

D. Glass Beads: AASHTO M-247

E. Wheel Stops: Precast, air-entrained concrete, 2500 psi (17.2 Mpa) minimum compressive strength approximately 6 inches (150 mm) high, 9 inches (225 mm) wide, and 84 inches (2130 mm) long. Provide chamfered corners and drainage slots on underside and provide holes for anchoring to substrate.

1. Dowels: Galvanized steel, diameter ¾ (19 mm), minimum length 10 inches (254 mm).

2.4 MIX

A. Hot-Mix Asphalt: Provide dense, hot-laid hot-mix asphalt plant mixes approved by authorities having jurisdiction and designed according to procedures in AI MS- 2, " Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."

1. Provide mixes with a history if satisfactory performance in geographical area where project is located.

2. Provide mixes complying with the composition, grading, and tolerance requirements of ASTM D 3515 for the following nominal, maximum aggregate sizes:

a. Base Course: road way wearing course "Hot Mix Asphalt Class C", 1 inch (25 mm).
b. Surface Course: ½ inch (13 mm).
c.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
B. Proof-roll subbases using heavy, pneumatic-tried rollers to locate areas that are unstable

or that require further compaction.

C. Notify Contracting Officer and/or Project Managers in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particle from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface or base course.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.

D. Prime Coat: Apply uniformly over surface of compacted-aggregate base at rate of 0.15 to 0.50 gallons per sq. yd. (0.7 to 2.3 liters per sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.

1. If prime coat is not entirely absorbed within 24 hours after application spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

3.3 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strikes off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.

1. Place hot-mix asphalt base course in numbers of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lifts.
3. Spread mix at minimum temperature of 250 deg F (121 deg C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.

5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide, except where infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat.
2. Offset longitudinal joints in successive course minimum of 6 inches (150 mm).
3. Offset transverse joints in successive courses a minimum of 24 inches (600 mm).

4. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.

3.5 COMPACTION

A. General: Begin compaction as soon as place hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cool to 185 deg F (85 deg C).

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.

D. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density.

1. Average Density: 92 percent of reference maximum theoretical density

according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

F. Repairs: Remove pave areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling do not permit vehicular traffic on pavement until it has been cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus ½ inch (13 mm).
2. Surface Course: Plus ¼ inch (6 mm), no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: ¼ inch (6 mm).
2. Surface Course: 1/8 inch (3 mm).
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is ¼ inch (6 mm)

3.7 PAVEMENT MARKINGS

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Contracting Officer and/or Project Managers.

B. Allow paving to cure for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide minimum 12 to 15 mils (0.3 to 0.4 mm) dry thickness.

1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determined compliance of corrected work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt course will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.

1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.
2. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specification.
3. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, but in no case will fewer than 3 cores be taken.
b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicated that it does not comply with specified requirements.

END OF SECTION 02511

SECTION 02665 - WATER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes water systems piping for potable water service and fire protection service outside the building.

B. This Section does not include tapping of utility company water main by utility company and charged directly to Owner.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 15 Sections for fire protection systems inside building.
2. Division 15 Sections for water distribution systems inside building.

D. Utility-furnished products include water meters that will be furnished to the site and ready for installation.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure Ratings: Except where otherwise indicated, the following are minimum pressure requirements for water system piping.

1. Underground Piping: 150 psig (1035 kPa).

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product data, including pressure rating, rated capacity, and settings of selected models for the following:

1. Backflow preventers.

2. Valves.
3. Identification materials and devices.

C. Shop drawings for precast concrete pits. Include frames and covers. Include drains when indicated.

D. Shop drawings for cast-in-place concrete valve and meter pits. Include frames and covers. Include drains when indicated.

E. Wiring diagrams for alarm devices.

F. Coordination drawings showing pipe sizes and valves, meter and specialty locations and elevations. Include details of underground structures, connections, anchors, and reaction backing. Show other piping in same trench and clearances from water system piping. Indicate interface and spatial relationship between piping and proximate structures.

G. Record drawings at project closeout of installed water system piping and products according to Division 1 Section "Project Closeout."

H. Test reports specified in "Field Quality Control" Article in Part 3.

I. Maintenance data for inclusion in "Operating and Maintenance Manual" specified in Division 1 Section "Project Closeout." Include data for the following:

1. Backflow preventers.
2. Valves.

1.5 QUALITY ASSURANCE

A. Comply with requirements of utility supplying water. Include tapping of water mains and backflow prevention.

B. Comply with standards of authorities having jurisdiction for fire protection systems. Include materials, hose threads, installation, and testing.

C. Comply with standards of authorities having jurisdiction for potable water piping and plumbing systems. Include materials, installation, testing, and disinfection.

D. Comply with NFPA 24 "Standard for the Installation of Private Fire Service Mains and Their Appurtenances" for materials, installations, tests, and flushing.

E. Comply with NFPA 70 "National Electrical Code" for electrical connections between wiring and electrically operated devices.

F. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.

G. Listing and Labeling: Provide equipment and accessories that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

H. Product Options: Water systems specialties and accessories are based on specific types, manufacturers, and models indicated. Components by other manufacturers but having equal performance characteristics may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by Contracting Officer and/or Project Managers. The burden of proof of equality of products is on Contractor. Refer to Division 1 Section "Product Substitutions."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, for shipping as follows:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends, flange faces, and weld ends.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. Storage: Use the following precautions for valves, including fire hydrants, during storage:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect valves from weather. Store valves indoors and maintain temperature higher than ambient dew point temperature. Support valves off ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants whose size requires

handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

D. 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.

E. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and piping specialties from moisture and dirt.

G. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where project is located.

B. Verify that water system piping may be installed in compliance with original design and referenced standards.

C. Site Information: Reports on subsurface condition investigations made during the design of the project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate connection to water main with utility company.

B. Coordinate with pipe materials, sizes, entry locations, and pressure requirements of building water distribution systems piping.

C. Coordinate with other utility work.

D. Coordinate electrical requirements of actual equipment furnished with requirements specified in Division 16.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Gate Valves:
   a. American Darling Valve Div., American Cast Iron Pipe Co.
   b. Gem Sprinkler Co. Div., Grinnell Corp.
   c. U.S. Pipe & Foundry Co.

2. Drains:
   a. Ancon, Inc.
   b. Josam Co.
   c. Zurn Hydromechanics Div., Zurn Industries, Inc.

3. Detector Check Valves:
   a. Ames Co., Inc.
   b. Hersey Products, Inc., Grinnell Corp.
   c. Kennedy Valve Div., McWane, Inc.

4. Backflow Preventers:
   a. Cla-Val Co. Div., Griswold Industries.
   b. Hersey Products, Inc., Grinnell Corp.
   c. Wilkins Regulator Div., Zurn Industries, Inc.

2.2 PIPES AND TUBES

A. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube materials specified below are used.

B. Ductile-Iron Pipe: AWWA C151, Classes 150, 200, and 250.

1. Lining: AWWA C104, cement mortar, seal coated.
2. Gaskets, Glands, and Bolts and Nuts: AWWA C111.
3. Push-On-Joint-Type Pipe: AWWA C111, rubber gaskets.
4. Mechanical-Joint-Type Pipe: AWWA C111, rubber gaskets, ductile- or cast-iron glands, and steel bolts and nuts.
5. Encasement: AWWA C105, polyethylene film tube.

. Polyvinyl Chloride (PVC) Pipe: AWWA C900; Classes 150 and 200; with bell end and elastomeric gasket, with plain end for cast-iron or ductile-iron fittings, or with plain end for PVC elastomeric gasket fittings.

1. Pipe Marking: NSF 14, "NSF-pvc cto only."
2. Gaskets: ASTM F 477, elastomeric seal.

D. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 1785, Schedules 40 and 80.

1. Pipe Marking: NSF 14, "NSF-pw" or "NSF-pvc cto only."

2.3 PIPE AND TUBE FITTINGS

A. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube fitting materials specified below are used.

B. Ductile-Iron and Cast-Iron Pipe Fittings: AWWA C110, ductile-iron or cast-iron, 250-psig (1725-kPa) minimum pressure rating; or AWWA C153, ductile-iron compact fittings, 350-psig (2400-kPa) pressure rating.

1. Lining: AWWA C104, cement mortar.
2. Gaskets: AWWA C111, rubber.

C. Polyvinyl Chloride (PVC) Pipe Couplings and Fittings: AWWA C900, with ASTM F 477 elastomeric seal gaskets.

D. Polyvinyl Chloride (PVC) Plastic, Schedule 80, Socket-Type Pipe Fittings: ASTM D 2467.

1. Pipe Marking: NSF 14, "NSF-pw" or "NSF-pvc cto only."

E. Polyvinyl Chloride (PVC) Plastic, Schedule 40, Socket-Type Pipe Fittings: ASTM D 2466.

1. Pipe Marking: NSF 14, "NSF-PW" or "NSF-PVC to only."

F. Polyvinyl Chloride (PVC) Pipe Fittings: Schedule 40 socket-type, solvent cement joint, or elastomeric gasketed joint.

1. Pipe Marking: NSF 14, "NSF-PW" or "NSF-PVC to only."
2. Gaskets: ASTM F 477, elastomeric seal.

2.4 JOINING MATERIALS

A. Refer to Part 3 Article "Piping Applications" for identification of systems where joining materials specified below are used.

B. Ductile-Iron Pipe and Ductile-Iron or Cast-Iron Fittings: The following materials apply:

1. Push-On Joints: AWWA C111 rubber gaskets and lubricant.

2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.

    a. Gaskets: Rubber, flat face, 1/8 inch (3 mm) thick except where other thickness is indicated; and full-face or ring type except where other type is indicated.
    b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.

C. Couplings for Grooved-End Ductile-Iron Pipe and Fittings: AWWA C606, consisting of ASTM A 536 ductile-iron housing having enamel finish, with synthetic-rubber gasket having central-cavity, pressure-responsive design, with ASTM A 183 carbon-steel bolts and nuts to secure grooved pipe and fittings and gasket suitable for hot water, except where otherwise indicated.

D. Brazing Filler Metals: AWS A5.8, BCuP (copper-phosphorus) Series.

E. Solder Filler Metal: ASTM B 32, Alloy Sn95; tin (approximately 95 percent), silver (approximately 4.5 percent), with 0.10 percent maximum lead content.

F. Solder Filler Metal: ASTM B 32, Alloy Sn95, Alloy Sn94, or Alloy E; tin (approximately 95 percent), silver or copper (approximately 5 percent), with 0.10 percent maximum lead content.

G. Primers for PVC Piping Solvent-Cement Joints: ASTM F 656.

H. Solvent Cement for PVC Piping Solvent-Cement Joints: ASTM D 2564.

I. Pipe Couplings: Iron-body sleeve assembly, fabricated to match outside diameters of pipes to be joined.

1. Sleeve: ASTM A 126, Class B, gray iron.
2. Followers: ASTM A 47, Grade 32510, or ASTM A 536 ductile iron.
3. Gaskets: Rubber.

J. Plastic Pipe Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, except where other type or material is indicated.

2.5 PIPING SPECIALTIES

A. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.

1. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C). Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.
2. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150-psig (1035-kPa) or 300-psig (2070-kPa) minimum pressure to suit system pressures.
3. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

    a. Provide separate companion flanges and steel bolts and nuts for 150-psig (1035-kPa) or 300-psig (2070-kPa) minimum working pressure to suit system pressures.

4. Dielectric Couplings: Galvanized-steel couplings having inert and noncorrosive thermoplastic lining, with threaded ends and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
5. Dielectric Nipples: Electroplated steel nipples having inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig (2070-kPa) working pressure at 225 deg F (107 deg C).

2.6 VALVES

A Rising Stem Gate Valves, 2 Inches (DN 50) and Smaller: UL 262, FM-approved, bronze body and bonnet, OS&Y, bronze stem, 175-psig (1200-kPa) working pressure, with threaded ends.

B. Valve Boxes: Cast-iron box having top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches (124 mm) in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

1. Provide a steel tee-handle operating wrench with each valve box. Wrench shall have tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.

. Service Boxes for Curb Stops: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover having lettering "WATER," and bottom section with base of size to fit over curb stop and barrel approximately 3 inches (75 mm) in diameter.

2. Provide steel tee-handle shutoff rod with each service box. Shutoff rod shall have tee handle with 1 pointed end, stem of length to operate curb stop, and slotted end fitting curb stop head.

2.7 BACKFLOW PREVENTERS

A. General: ASSE Standard backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

1. Working Pressure: 150 psig (1035 kPa) minimum except where indicated otherwise.
2. 2 Inches (DN 50) and Smaller: Bronze body with threaded ends.
3. 2-1/2 Inches (DN 65) and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.

    a. Interior Lining: FDA-approved epoxy coating for backflow preventers having cast-iron or steel body.

4. Interior Components: Corrosion-resistant materials.
5. Exterior Finish: Polished chrome plate when used in chrome-plated piping system.
6. Strainer on inlet where strainer is indicated.

B. Hose Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

C. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve having ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous-pressure application.

1. Pressure Loss: 12 psig (83 kPa) maximum through middle third of flow range.

D. Double-Check Backflow Prevention Assemblies: ASSE 1015, with valves on inlet and outlet and strainer on inlet. Include test cocks with 2 positive-seating check valves for continuous-pressure application.

1. Pressure Loss: 5 psig (34 kPa) maximum through middle third of flow range.

E. Antisiphon, Pressure-Type Vacuum Breakers: ASSE 1020, with valves, spring-loaded check valve, and spring-loaded floating disc. Include test cocks and atmospheric vent for continuous-pressure application.

1. Pressure Loss: 5 psig (34 kPa) maximum through middle third of flow range.

F. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM-approved or UL-listed, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include 2 positive-seating check valves and test cocks, and bypass with displacement-type water meter, valves, and double-check backflow preventer, for continuous-pressure application.

1. Pressure Loss: 5 psig (34 kPa) maximum through middle third of flow range.

2.8 ANCHORAGES

A. Clamps, Straps, and Washers: ASTM A 506, steel.

B. Rods: ASTM A 575, steel.

C. Rod Couplings: ASTM A 197, malleable iron.

D. Bolts: ASTM A 307, steel.

E. Cast-Iron Washers: ASTM A 126, gray iron.

F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psi (20.7 MPa).

1. Cement: ASTM C 150, Type I.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

2.9 IDENTIFICATION

A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches (150 mm) wide by 4 mils (0.1 mm) thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."

B. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches (150 mm) wide by 4 mils (0.1 mm) thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."

C. Nonmetallic Piping Label: Engraved plastic-laminate label, for installation on main electrical meter panel; not less than 1 inch (25 mm) by 3 inches (75 mm), with caption "CAUTION - THIS STRUCTURE HAS A NONMETALLIC WATER SERVICE."

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PIPING APPLICATIONS

A. Refer to Part 2 of this Section for detailed specifications for pipe and fittings products listed below. Use pipe, tube, fittings, and joining methods according to the following applications. Piping in pits and inside building may be joined with flanges or couplings, instead of joints indicated, for grooved-end AWWA-size piping.

B. Use pipe, tube, fittings, and joining methods according to following applications.

1. 2 Inches (DN 50) and Smaller: Schedule 40 polyvinyl chloride (PVC) plastic pipe, Schedule 40 PVC fittings, and solvent-cemented joints.
2. 2-1/2 Inches (DN 65) to 3-1/2 Inches (DN 90): Schedule 40 polyvinyl chloride (PVC) plastic pipe, Schedule 40 PVC fittings, and solvent-cemented joints.
3. 4 Inches (DN 100) to 8 Inches (DN 200): AWWA C900, Class 150 polyvinyl chloride (PVC) plastic pipe, AWWA C900 PVC fittings, and gasketed joints.

    a. Use standard pattern pipe fitting for sizes larger than 16 inches (DN 400).

4. 10 Inches (DN 250) and Larger: AWWA C900, Class 200 polyvinyl chloride (PVC) plastic pipe, AWWA C900 PVC fittings, and gasketed joints.

    a. Use AWWA C905, Class 200 polyvinyl chloride (PVC) pipe and fittings for sizes larger than 12 inches (DN 300).

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Buried Valves 3 Inches (DN 80) and Larger: AWWA, gate valves, nonrising stem, with valve box.

2. Pit and Aboveground Installation, Valves 2 Inches (DN 50) and Smaller: MSS, nonrising stem gate valves.

3.4 JOINT CONSTRUCTION

A. Ductile-Iron Piping Gasketed Joints: Construct joints according to AWWA C600.

B. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads.

C. Threaded Joints: Thread pipes with tapered pipe threads according to ASME B1.20.1, apply tape or joint compound, and apply wrench to valve ends into which pipes are being threaded.

D. Ductile-Iron, Grooved-End Pipe and Fitting Joints: Cut-groove pipes. Assemble joints with grooved couplings, gaskets, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

E. AWWA Polyvinyl Chloride (PVC) Piping Gasketed Joints: Use AWWA C900 joining materials. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.

F. Dissimilar Materials Piping Joints: Construct joints using adapters that are compatible with both piping materials, outside diameters, and system working pressure. Refer to "Piping Systems - Common Requirements" Article for joining piping of dissimilar metals.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General Locations and Arrangements: Drawings 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 except where deviations to layout are approved on coordination drawings.

B. Install piping at indicated slope.

C. Install components having pressure rating equal to or greater than system operating pressure.

D. Install piping free of sags and bends.

E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

F. Install fittings for changes in direction and branch connections.

G. Piping Connections: Except as otherwise indicated, make piping connections as specified below.

1. Install unions, in piping 2 inches (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inch (DN 50) or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2 inches (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
3. Install dielectric fittings to connect piping of dissimilar metals.

3.6 PIPING INSTALLATION

A. Water Main Connection: Tap water main with size and in location as indicated according to requirements of water utility.

1. Install tapping sleeve and tapping valve according to manufacturer's installation instructions.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water service piping.
5. Install service clamps and corporation stops in size, quantity, and arrangement required by utility company standards and according to manufacturer's installation instructions.
6. Install service clamps on pipe to be tapped. Position outlet for corporation stop.
7. Install curb stop in service piping with head pointing up and with cast-iron service box.
8. Use drilling machine compatible with service clamp and corporate stop. Drill hole in main. Remove drilling machine and connect water service piping.

B. Comply with requirements of NFPA 24 for materials and installation.

C. Install ductile-iron pipe and ductile-iron and cast-iron fittings according to AWWA C600.

1. Install polyethylene encasement according to AWWA C105 on ductile-

iron pipe, ductile-iron and cast-iron pipe fittings, and ferrous couplings where specified.

D. Install AWWA polyvinyl chloride (PVC) plastic pipe according to AWWA M23.

E. Bury piping at minimum depth of 36 inches (1000 mm) below finished grade and not less than 18 inches (500 mm) below average local frost depth.

F. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.7 ANCHORAGE INSTALLATION

A. Anchorages: Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

2. Gasketed-Joint, Ductile-Iron Piping: According to AWWA C600.
3. Gasketed-Joint, Polyvinyl Chloride (PVC) Piping: According to AWWA M23.

B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.8 VALVE INSTALLATION

A. General Application: Use mechanical-joint-end valves for 3-inch (80-mm) and larger buried installation. Use threaded- and flanged-end valves for installation in pits and inside building. Use nonrising stem UL/FM gate valves for installation with indicator posts. Use bronze corporation stops and valves, with ends compatible with piping, for 2-inch (50-mm) and smaller installation.

B. AWWA-Type Gate Valves: Comply with AWWA C600. Install buried valves with stem pointing up and with cast-iron valve box.

C. UL/FM-Type Gate Valves: Comply with NFPA 24.

1. Install buried valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.

D. Bronze Corporation Stops and Curb Stops: Comply with manufacturer's installation instructions. Install buried curb stops with head pointed up and with cast-iron curb box.

3.9 WATER METER INSTALLATION (EXISTING RELOCATED)

A. Install water meters, piping, and specialties according to utility company's

requirements.

3.10 ROUGHING-IN FOR WATER METERS

A. Install roughing-in piping and specialties for water meter installation according to utility company's instructions and requirements.

3.11 PIT CONSTRUCTION AND INSTALLATION

A. Construct pits of poured-in-place concrete or provide precast concrete pits of dimensions indicated, with manhole frame and cover, ladder, and drain. Include sleeves with waterproof mechanical sleeve seals for pipe entry and exit.

B. Connect area drain outlet to storm drain. Storm drainage is specified in Division 2 Section "Storm Sewerage."

3.12 DETECTOR CHECK VALVE INSTALLATION

A. Install detector check valves in pits for proper direction of flow. Install bypass with water meter, gate valves on each side of meter and check valve downstream from meter.

B. Support detector check valves, meters, shutoff valves, and piping on 3000-psi (20.7-MPa) minimum, portland-cement-mix concrete piers as indicated.

3.13 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to plumbing and health department authorities having jurisdiction.

B. Do not install bypass around backflow preventer.

C. Do not install reduced-pressure-principle-type in pit.

D. Support backflow preventers, valves, and piping on 3000-psi (20.7-MPa) minimum, portland-cement-mix concrete piers as indicated.

3.16 IDENTIFICATION INSTALLATION

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 inches (150 mm) to 8 inches (200 mm) below finished grade, directly over piping.

B. Attach nonmetallic piping label permanently to main electrical meter panel.

3.17 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours prior to testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.

3.18 CLEANING

A. Clean and disinfect water distribution piping as follows:

1. Purge new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired prior to use.
2. Use purging and disinfecting procedure prescribed by authority having jurisdiction or, if method is not prescribed by that authority, use procedure described in AWWA C651 or as described below:

a. Comply with NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
b. Fill system or part of system with water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) system or part thereof and allow to stand for 24 hours.
c. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 parts per million of chlorine; isolate and allow to stand for 3 hours.
d. Following allowed standing time, flush system with clean, potable water until chlorine does not remain in water coming from system.
e. Submit water samples in sterile bottles to authority having jurisdiction. Repeat procedure if biological examination made by authority shows evidence of contamination.

B. Prepare reports for purging and disinfecting activities.

END OF SECTION 02665

SECTION 02700 - SEWERAGE AND DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes sewerage and drainage systems outside the building. Systems include the following:

1. Sanitary sewerage.
2. Storm drainage.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Division 3 Section "Cast-in-Place Concrete" for cast-in-place concrete structures.
2. Division 15 Section "Plumbing Piping" for building drains.
3. Division 15 Section "Drainage and Vent Systems" for building drains.

1.3 DEFINITIONS

A. Drainage Piping: System of sewer pipe, fittings, and appurtenances for gravity flow of storm drainage.

B. Sewerage Piping: System of sewer pipe, fittings, and appurtenances for gravity flow of sanitary sewage.

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for the following:

1. Polymer-concrete, channel drainage systems.
2. Plastic, channel drainage systems.
3. Backwater valves, cleanouts, and drains.

C. Shop drawings for precast concrete manholes and other structures. Include frames, covers, and grates.

D. Shop drawings for cast-in-place concrete or field-erected masonry manholes and other structures. Include frames, covers, and grates.

E. Reports and calculations for design mixes for each class of cast-in-place concrete.

F. Coordination drawings showing manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.

G. Coordination profile drawings showing systems piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:500 metric ratio) and vertical scale of not less than 1 inch equals 5 feet (1:50 metric ratio). Indicate underground structures and pipe. Show types, sizes, materials, and elevations of other utility crossing system piping. Include drawings for the following piping systems:

1. Sanitary sewerage.
2. Storm drainage.

H. Inspection and test reports specified in the "Field Quality Control" Article.

1.6 QUALITY ASSURANCE

A. Environmental Agency Compliance: Comply with regulations pertaining to sanitary sewerage and storm drainage systems.

B. Utility Compliance: Comply with regulations pertaining to sanitary sewerage and storm drainage systems. Include standards of water and other utilities where appropriate.

C. Product Options: Drawings indicate sizes, profiles, connections, and dimensional requirements of system components and are based on specific manufacturer types indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Product Substitutions."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures in direct sunlight.

B. Do not store plastic pipe or fittings in direct sunlight.

C. Protect pipe, pipe fittings, and seals from dirt and damage.

D. Handle precast concrete manholes and other structures according to manufacturer's rigging instructions.

1.8 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.
   1. Notify Contracting Officer and/or Project Managers not less than 48 hours in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without receiving Contracting Officer and/or Project Manager's written permission.

1.9 SEQUENCING AND SCHEDULING

A. Coordinate sanitary sewerage system connections to utility company's sanitary sewer.

B. Coordinate storm drainage system connections to utility company's storm sewer.

C. Coordinate sanitary sewerage system connections to existing on-site sanitary sewer.

D. Coordinate storm drainage system connections to existing on-site storm sewer.

E. Coordinate combined sanitary sewerage and storm drainage system connections to Owner's existing on-site combined sewer.

F. Coordinate with interior building drainage systems.

G. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Polymer-Concrete, Channel Drainage Systems:

   a. ABT, Inc.
   b. ACO Polymer Products, Inc.
   c. Innovative Plastic Products, Inc.
   d. Quazite Div., Morrison Molded Fiber Glass Co.

2. Plastic Channel Drainage Systems:

   a. ACO Polymer Products, Inc.
   b. National Diversified Sales, Inc.
   c. Zurn Industries, Inc., Hydromechanics Div.

3. Backwater Valves, Cleanouts, and Drains:

   a. Josam Co.
   b. Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
   c. Zurn Industries, Inc., Hydromechanics Div.

2.2 PIPES AND FITTINGS

A. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A 74, service and extra-heavy classes, gray cast iron, for gasketed joints.

1. Gaskets: ASTM C 564, rubber, compression type, thickness to match class of pipe.

B. Hubless, Cast-Iron Soil Pipe and Fittings: CISPI 301 or ASTM A 888, gray cast iron, for coupling joints.

1. Couplings: CISPI 310, corrugated, stainless-steel shield and clamp assembly, with ASTM C 564 rubber sealing sleeve.
2. Heavy-Duty Couplings: ASTM A 48, cast-iron housing and stainless-steel bolt assembly, with ASTM C 564 rubber sealing gasket.

C. Ductile-Iron Pipe: AWWA C151, Class 150 minimum, for push-on joints.

1. Standard-Pattern, Ductile-Iron and Cast-Iron Fittings: AWWA C110, for push-on joints.
2. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
3. Pipe and Fitting Interior Coating: AWWA C104, asphaltic-material seal coat, minimum 1-mil (0.025-mm) thickness.
4. Gaskets: AWWA C111, rubber.

. Corrugated-Steel Pipe: ASTM A 760 (ASTM A 760M), Type I, made from ASTM A 444 (ASTM A 444M), zinc-coated steel sheet for banded joints.

1. Fittings: Fabricated to types indicated and according to same standards as pipe.
2. Connecting Bands: Standard couplings made for corrugated-steel pipe to form soil tight joints.

E. Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.

1. Gaskets: ASTM F 477, elastomeric seal.

D. Nonreinforced-Concrete Sewer Pipe and Fittings: ASTM C 14 (ASTM C 14M), Class 2, for gasketed joints.

2. Gaskets: ASTM C 443 (ASTM C 443M), rubber.

2.3 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined, for nonpressure joints.

1. Sleeves for Concrete Pipe: ASTM C 443 (ASTM C 443M), rubber.
2. Sleeves for Cast-Iron Soil Pipe: ASTM C 564, rubber.
3. Sleeves for Plastic Pipe: ASTM F 477, elastomeric seal.
4. Sleeves for Dissimilar Pipes: Compatible with pipe materials being joined.
5. Bands: Stainless steel, at least one at each pipe insert.

B. Gasket-Type Pipe Couplings: Rubber or elastomeric compression gasket, made to match outside diameter of smaller pipe and inside diameter or hub of adjoining larger pipe, for nonpressure joints.

1. Gaskets for Concrete Pipe: ASTM C 443 (ASTM C 443M), rubber.
2. Gaskets for Cast-Iron Soil Pipe: ASTM C 564, rubber.
3. Gaskets for Plastic Pipe: ASTM F 477, elastomeric seal.
4. Gaskets for Dissimilar Pipes: Compatible with pipe materials being joined.

C. Internal, Expansion-Type Pipe Couplings: Stainless-steel expansion band with ethylene-propylene-diene-monomer (EPDM), rubber-compound sealing sleeve, made to match inside diameter of pipes for nonpressure joints. Use nitrile rubber-compound sealing sleeve for fluids containing oil or gasoline.

D. Pressure-Type Pipe Couplings: Iron-body sleeve assembly, matching outside diameters of pipes to be joined, for pressure joints. Include polyethylene (PE) film encasement.

1. Sleeve: ASTM A 126, Class B, gray iron with enamel paint finish.
2. Followers: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010), or ASTM A 536 ductile iron.
3. Gaskets, Bolts, and Nuts: AWWA C111.

E. Ductile-Iron, Flexible Expansion Joints: Compound fitting with a combination of flanged and mechanical-joint ends conforming to AWWA C110 or AWWA C153. Include 2 gasketed ball-joint sections and 1 or more gasketed sleeve sections, rated for 250-psig (1725-kPa) minimum working pressure and FDA-approved epoxy interior coating for offset and expansion indicated. Include polyethylene (PE) film encasement.

F. Ductile-Iron Expansion Joints: 3-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections conforming to AWWA C110 or AWWA C153. Include rating for 250-psig (1725-kPa) minimum working pressure, and cement lining or FDA-approved epoxy interior coating for expansion indicated. Include polyethylene (PE) film encasement.

2.4 PIPE ENCASEMENT

A. Include AWWA C105, polyethylene film tube and sheet, 8-mil (0.2-mm) thickness for the following:

1. Cast-iron soil pipe and fittings.
2. Ductile-iron piping.
3. Pressure-type pipe couplings.
4. Ductile-iron, special pipe fittings.

2.5 MANHOLES

A. Precast Concrete Manholes: ASTM C 858, precast, reinforced concrete, designed according to ASTM C 857 for structural loading. Include depth, shape, and dimensions indicated, with provision for rubber gasket joints.

1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure as required to prevent floatation.
2. Gaskets: Rubber.
3. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch (152- to 229-mm) total thickness, that match a 24-inch- (610-mm-) diameter frame and cover.
4. Steps: Fiberglass, individual steps or ladder. Include a width that allows a worker to place both feet on one step and is designed to prevent lateral slippage off the step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for manholes less than 60 inches (1500 mm) deep.
5. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

B. Brick Manholes: Brick and mortar, of depth indicated.

1. Base, Channel, and Bench: Concrete.

   a. Ballast: Increase thickness of or add concrete to base, as required to prevent floatation.

2. Wall: ASTM C 32, Grade MS, manhole brick; 8-inch (200-mm) minimum thickness and an inside diameter of 48 inches (1220 mm) with tapered top for a 24-inch (610-mm) frame and cover. Include 12-inch (305-mm) minimum wall thickness for section of manhole deeper than 96 inches (2400 mm).

   a. Option: ASTM C 139, concrete masonry units may be used instead of brick.

3. Mortar and Parging: ASTM C 270, Type S, using ASTM C 150, Type II, portland cement, 1/2-inch (13-mm) minimum thickness on exterior surface.

4. Steps: Fiberglass, individual steps or ladder. Include a width that allows a worker to place both feet on one step and is designed to prevent lateral slippage off the step. Cast steps or anchor ladder into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for manholes less than 60 inches (1500 mm) deep.

C. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom,

walls, and top, designed according to ASTM C 857 for loading. Include depth, shape, dimensions, and appurtenances indicated.

1. Ballast: Increase thickness of concrete, as required to prevent floatation.
2. Steps: Fiberglass, individual steps or ladder. Include a width that allows a worker to place both feet on one step and is designed to prevent lateral slippage off the step. Cast steps or anchor ladder into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for manholes less than 60 inches (1500 mm) deep.

D. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, heavy-duty ductile iron. Include 24-inch (610-mm) inside diameter by 7- to 9-inch (178- to 229-mm) riser with 4-inch (100-mm) minimum width flange, and 26-inch-(660-mm-) diameter cover. Include indented top design with lettering, equivalent to the following, cast into cover:

1. Sanitary Sewerage Piping Systems: SANITARY SEWER.
2. Storm Drainage Piping Systems: STORM SEWER.
3. Piping Systems Containing Sanitary Sewage: SANITARY SEWER.

2.6 CATCH BASINS

A. Precast Concrete Catch Basins: ASTM C 858, precast, reinforced concrete, designed according to ASTM C 857 for structural loading. Include depth,

shape, and dimensions indicated, with provision for rubber gasket joints.

1. Gaskets: Rubber.
2. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch (152- to 229-mm) total thickness, that match a 24-inch- (610-mm-) diameter frame and grate.
3. Steps: Fiberglass, individual steps or ladder. Include a width that allows a worker to place both feet on one step and is designed to prevent lateral slippage off the step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for catch basins less than 60 inches (1500 mm) deep.
4. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

B. Brick Catch Basins: Brick and mortar, of depth, shape, and dimensions indicated.

1. Base, Channel, and Bench: Concrete.
2. Wall: ASTM C 32, Grade MS, manhole brick; 8-inch (200-mm)

minimum thickness with tapered top for a 24-inch (610-mm) frame and cover.

a. Option: ASTM C 139, concrete masonry units may be used instead of brick.

3. Mortar: ASTM C 270, Type S, using ASTM C 150, Type II, portland cement.
4. Steps: Fiberglass, individual steps or ladder. Include a width that allows a worker to place both feet on one step and is designed to prevent lateral slippage off the step. Cast steps or anchor ladder into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for catch basins less than 60 inches (1500 mm) deep.

C. Cast-in-Place Concrete Catch Basins: Construct of reinforced-concrete, designed according to ASTM C 857 for structural loading. Include depth, shape, dimensions, and appurtenances indicated.

1. Bottom, Walls, and Top: Reinforced concrete.
2. Channels and Benches: Concrete.
3. Steps: Fiberglass, individual steps or ladder. Include a width that allows a worker to place both feet on one step and is designed to prevent lateral slippage off the step. Cast steps or anchor ladder into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for catch basins less than 60 inches (1500 mm) deep.

D. Frames and Grates: ASTM A 536, Grade 60-40-18, heavy-duty ductile iron. Include 24-by-24-inch (610-by-610-mm) minimum flat grate with small square or short-slotted drainage openings.

E. Frames and Grates: ASTM A 536, Grade 60-40-18, heavy-duty ductile iron, 24-inch (610-mm) inside diameter by 7- to 9-inch (178- to 229-mm) riser with 4-inch (100-mm) minimum width flange, and 26-inch- (660-mm-) diameter flat grate having small square or short-slotted drainage openings.

2.7 STORM-WATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.

B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy-duty frames and grates according to utility standards.

E. Curb Inlets: Vertical, curb-opening type, of materials and dimensions indicated.

F. Gutter Inlets: Horizontal, gutter-opening type, of materials and dimensions indicated. Include heavy-duty frames and grates.

G. Combination Inlets: Vertical, curb-opening and horizontal, gutter-opening type, of materials and dimensions indicated. Include heavy-duty frames and grates.

H. Frames and Grates: ASTM A 536, Grade 60-40-18, heavy-duty ductile iron, frames and flat grates, of dimensions indicated. Include small square or short-slotted drainage openings in grates.

2.8 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Structures: Portland-cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cement ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60 (ASTM A 615M, Grade 400), deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland-cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cement ratio.

1. Include channels and benches in manholes.
2. Include channels and benches in sanitary sewerage manholes.

a. Manhole Channels: Concrete invert, formed to same width as connected piping, with height of the vertical sides to 3/4 of the pipe diameter. Form curved channels with smooth, uniform radius and slope.

1) Invert Slope: 1.2 inches (30 mm) through manhole.

b. Manhole Benches: Concrete, sloped to drain into channel.

1) Slope: 1 inch per foot (1:12).
2) Slope: 0.5 inch per foot (1:24).

3. Include channels and benches in storm drainage catch basins.

a. Catch Basin Channels: Concrete invert, formed to same width as connected piping, with height of the vertical sides to 3/4 of the pipe diameter. Form curved channels with smooth, uniform radius and slope.

1) Invert Slope: 1.2 inches (30 mm) through catch basin.

b. Catch Basin Benches: Concrete, sloped to drain into channel.

1) Slope: 1 inch per foot (1:12).

D. Ballast and Pipe Supports: Portland-cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water-cement ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60 (ASTM A 615M, Grade 400), deformed steel.

2.9 PROTECTIVE COATINGS

A. General: Include factory- or field-applied protective coatings to structures and appurtenances according to the following:

B. Coating: 1- or 2-coat, coal-tar epoxy, 15-mil (0.381-mm) minimum thickness, except where otherwise indicated.

1. Manholes: On exterior and interior surfaces.
2. Brick Manholes: On interior surface.
3. Brick Manholes: Over parging on exterior surface.
4. Brick Manholes: Over parging on exterior surface and on interior surface.
5. Manhole Frames and Covers: On surfaces that will be exposed to sewer gases.
6. Catch Basins: On interior surface.
7. Catch Basin Frames and Grates: On entire surfaces.
8. Storm-Water Inlets: On interior surface.
9. Storm-Water Inlets: On exterior and interior surfaces.
10. Storm-Water Inlet Frames and Grates: On entire surfaces.

2.8 BACKWATER VALVES

A. Horizontal Backwater Valve Type: ASME A112.14.1, cast-iron body and bolted cover, with bronze seat, swing check valve, and hub-and-spigot ends.

B. Combination Horizontal Backwater Valve and Manual Gate Valve Type: ASME A112.14.1, cast-iron body and bolted cover, with bronze seat, swing check valve, and hub-and-spigot ends.

C. Terminal Backwater Valve Type: ASME A112.14.1, cast-iron body and bolted cover, with bronze seat, swing check valve, and hub inlet.

2.9 CLEANOUTS

A. Description: ASME A112.36.2M, round, cast-iron housing with clamping device and round, secured, scoriated, cast-iron cover. Include cast-iron ferrule with inside caulk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:

1. Light Duty: In earth or grass, foot-traffic areas.
2. Medium Duty: In paved, foot-traffic areas.
3. Heavy Duty: In vehicle-traffic service areas.

B. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, service class, cast-iron soil pipe and fittings.

2.10 DRAINS

A. Area Drains: ASME A112.21.1M, round, cast-iron body with anchor flange and round, secured, cast-iron grate. Include bottom outlet with inside caulk or spigot connection, of sizes indicated. Use units with top-loading classifications according to the following applications:

1. Medium Duty: In paved, foot-traffic areas.

B. Cast-Iron Trench Drains: ASME A112.21.1M, 6-inch- (152-mm-) wide top surface, rectangular body with anchor flange or other anchoring device and rectangular, secured grate. Include units of total lengths indicated and number of bottom outlets with inside caulk or spigot connections, of sizes indicated. Use units with top-loading classifications according to the following applications:

1. Heavy Duty: In vehicle-traffic service areas.

2.11 OUTFALLS

A. Construct headwall, apron, and tapered sides of cast-in-place, reinforced concrete.

B. Riprap: Broken stone, irregular size and shape, weighing 15 to 50 pounds (7 to 23 kg) each.

C. Energy Dissipators: Construction as indicated, from materials indicated.

2.12 STORM-WATER DISPOSAL SYSTEMS

A. Storage and Leaching Chambers: Molded polyethylene (PE) with perforated sides and open bottom. Include distribution piping, end plates, and other standard components as required for system.

1. Chamber Type 3: Size 150-gal (568-L) storage capacity, 36 inches (914 mm) wide by 90 inches (2286 mm) long by 20.5 inches (521 mm) high.

B. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch- (19- to 63-mm-) size, washed, crushed stone or gravel.

C. Filter Mat: Geotextile woven or spun filter fabric, in one or more layers, for minimum total unit weight of 4.0 oz. per sq. yd. (148 g/sq. m).

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installation of green warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tapes or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 SEWERAGE PIPING APPLICATIONS

A. General: Include watertight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to the following applications.

C. Pipe Sizes 4 and 6 Inches (100 and 150 mm): ASTM D 3034, polyvinyl chloride (PVC) sewer pipe and fittings; solvent-cemented joints; or with gaskets and gasketed joints.

D. Pipe Sizes 12 and 15 Inches (300 and 375 mm): Hub-and-spigot, extra-heavy class, cast-iron soil pipe and fittings; compression-type gaskets; and gasketed joints.

E. Pipe Sizes 12 and 15 Inches (300 and 375 mm): ASTM D 3034, polyvinyl chloride (PVC) sewer pipe and fittings; solvent-cemented joints; or with gaskets and gasketed joints.

F. Pipe Sizes 12 and 15 Inches (300 and 375 mm): Reinforced-concrete sewer pipe and fittings; rubber gaskets; and gasketed joints.

3.4 DRAINAGE PIPING APPLICATIONS

A. General: Include watertight, silttight, or soiltight joints, except where watertight or silttight joints are indicated.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to the following applications.

C. Pipe Sizes 8 to 15 Inches (200 to 375 mm): ASTM D 3034, polyvinyl chloride (PVC) sewer pipe and fittings; solvent-cemented joints; or with gaskets and gasketed joints.

3.5 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of underground sewerage and drainage systems piping. Location and arrangement of piping layout take into account many design considerations. Install piping as indicated, to extent practical.

B. Install piping beginning at low point of systems, true to grades and alignment

indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use manholes for changes in direction, except where fittings are indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings, where different sizes or materials of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install gravity-flow-systems piping at constant slope between points and elevations indicated. Install straight piping runs at constant slope, not less than that specified, where slope is not indicated.

F. Extend sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

G. Install sewerage piping pitched down in direction of flow, at minimum slope of 2 percent (1:50) and 36-inch (1000-mm) minimum cover, except where otherwise indicated.

H. Extend drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

I. Install drainage piping pitched down in direction of flow, at minimum slope of 1 percent (1:100) and 36-inch (1000-mm) minimum cover, except where otherwise indicated.

J. Tunneling: Install pipe under streets or other obstructions, that cannot be disturbed, by tunneling, jacking, or a combination of both.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to the following.

B. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: With rubber compression gaskets according to CISPI "Cast Iron Soil Pipe and Fittings Handbook," Volume I. Use gaskets that match class of pipe and fittings.
   1. Install polyethylene film encasement over cast-iron soil pipe and fittings according to ASTM A 674 or AWWA C105.

C. Hubless, Cast-Iron Soil Pipe and Fittings: With CISPI-type couplings according

to CISPI 310 and CISPI "Cast Iron Soil Pipe and Fittings Handbook," Volume I.

1. Install polyethylene film encasement over hubless, cast-iron soil pipe and fittings according to ASTM A 674 or AWWA C105.

D. Ductile-Iron Pipe with Ductile-Iron or Cast-Iron Fittings: With push-on-joint, rubber gaskets according to AWWA C600.

1. Install polyethylene film encasement over ductile-iron pipe and ductile- and cast-iron fittings according to ASTM A 674 or AWWA C105.

E. Install with top surfaces of components, except piping, flush with final finished surface.

G. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings: As follows:

1. Join solvent-cement-joint pipe and fittings with solvent cement according to ASTM D 2855 and ASTM F 402.
2. Join pipe and gasketed fittings with elastomeric seals according to ASTM D 2321.
3. Join profile sewer pipe and ribbed drain pipe and gasketed fittings with elastomeric seals according to ASTM D 2321 and manufacturer's written instruction.
4. Install according to ASTM D 2321.

H. Concrete Pipe and Fittings: Install according to ACPA "Concrete Pipe Handbook." Use the following seals:

1. Round Pipe and Fittings: ASTM C 443 (ASTM C 443M), rubber gaskets.
2. Elliptical Pipe: ASTM C 877 (ASTM C 877M), Type I, sealing bands.
3. Arch Pipe: ASTM C 877 (ASTM C 877M), Type I, sealing bands.

I. System Piping Joints: Make joints using system manufacturer's couplings, except where otherwise specified.

J. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and fit both systems' materials and dimensions.

3.7 MANHOLE INSTALLATION

A. General: Install manholes, complete with accessories, as indicated.

B. Form continuous concrete channels and benches between inlets and outlet,

where indicated.

C. Set tops of frames and covers flush with finished surface where manholes occur in pavements. Set tops 3 inches (76 mm) above finished surface elsewhere, except where otherwise indicated.

D. Place precast concrete manhole sections as indicated, and install according to ASTM C 891.

1. Provide rubber joint gasket complying with ASTM C 443 (ASTM C 443M), at joints of sections.
2. Apply bituminous mastic coating at joints of sections.

E. Construct brick manholes as indicated.

F. Construct cast-in-place manholes as indicated.

3.8 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.9 STORM DRAINAGE INLET AND OUTFALL INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct outlet head walls, aprons, and sides of reinforced concrete, as indicated.

C. Construct riprap of broken stone, as indicated.

D. Install outlets that spill onto grade, anchored with concrete, where indicated.

E. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

F. Construct energy dissipators at outlets, as indicated.

3.10 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318, ACI 350R, and as indicated.

3.14 DRAINAGE SYSTEM INSTALLATION

A. Assemble and install components according to manufacturer's written instructions, ASME A112.3.1, and as indicated.

B. Install with top surfaces of components, except piping, flush with final finished surface.

C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

D. Embed channel sections and appurtenances in a 4-inch (100-mm) minimum depth of concrete around bottom and sides.

E. Fasten grates to channel sections if indicated.

F. Assemble trench sections with flanged joints.

G. Embed trench sections and appurtenances in a 4-inch (100-mm) minimum depth of concrete around bottom and sides.

H. Make piping connections and install stainless-steel piping with gasketed joints between system components.

3.11 BACKWATER VALVE INSTALLATION

A. Install horizontal units in piping where indicated.

B. Install combination units in piping and in structures where indicated.

C. Install terminal units on end of piping and in structures where indicated. Secure units to structure walls.

3.12 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers in earth in a cast-in-place concrete block, 18 by 18 by 12 inches (450 by 450 by 300 mm) deep. Set with tops 1 inch (25 mm) above surrounding earth grade.

C. Set cleanout frames and covers in concrete paving with tops flush with surface of paving.

3.13 DRAIN INSTALLATION

A. Install type drains in locations indicated.

B. Embed drains in a 4-inch (100-mm) minimum depth of concrete around bottom and sides.

C. Fasten grates to drains if indicated.

D. Set drain frames and covers with tops flush with surface of paving.

3.14 STORM-WATER DISPOSAL SYSTEM INSTALLATION

A. Excavate trenches of width and depth, and install system and backfill according to chamber manufacturer's written instructions. Include storage and leaching chambers, filtering material, and filter mat.

3.15 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished work conforms as nearly as practical to requirements specified for new work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of 3000-psi (20.7-MPa), 28-day, compressive-strength concrete.

C. Make branch connections from side into existing piping, sizes 4 to 20 inches (100 to 500 mm) by removing a section of existing pipe and installing a wye fitting into existing piping. Encase entire wye with not less than 6 inches (150 mm) of 3000-psi (20.7-MPa), 28-day, compressive-strength concrete.

D. Make branch connections from side into existing piping, sizes 24 inches (600 mm) or larger or to underground structures by cutting an opening into existing unit large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering

connection in 6 inches (150 mm) of concrete for a minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.

1. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa), unless otherwise indicated.
2. Use epoxy bonding compound as an interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.16 CLOSING ABANDONED SEWERAGE AND DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping that is indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either of the following procedures:

1. Close open ends of piping with at least 8-inch- (200-mm-) thick brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Structures: Excavate around structure as required and use either of the following procedures:

1. Remove structure and close open ends of remaining piping.
2. Remove top of structure down to at least 36 inches (1000 mm) below final grade. Fill to within 12 inches (300 mm) of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
3. Backfill to grade according to Division 2 Section "Earthwork."

3.17 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as the work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plug in end of incomplete piping at end of day and whenever work stops.
3. Flush piping between manholes and other structures, if required by

authorities having jurisdiction, to remove collected debris.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of the Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visual between structures.

b. Deflection: Flexible piping with deflection that prevents passage of a ball or cylinder of a size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems and parts of existing systems that have been altered, extended, or repaired for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests, and their inspections by authorities having jurisdiction, with at least 24 hours' advance notice.
4. Submit separate reports for each test.
5. Where authorities having jurisdiction do not have published procedures, perform tests as follows:

a. Sanitary Sewerage: Perform hydrostatic test.

1) Allowable leakage is a maximum of 50 gallons per inch (4.6 L per mm dimension) nominal pipe size, for every mile (km) of pipe, during a 24-hour period
2) Close openings in system and fill with water.
3) Purge air and refill with water.
4) Disconnect water supply.
5) Test and inspect joints for leaks.
6) Option: Test ductile-iron piping according to AWWA

C600, Section 4 "Hydrostatic Testing." Use test pressure of at least 10 psig (69.0 kPa).

b. Sanitary Sewerage: Perform air test according to UNI-B-6.

1) Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).

c. Storm Drainage: Perform hydrostatic test.

1) Allowable leakage is a maximum of 200 gallons per inch (18.4 L per mm dimension) nominal pipe size, for every mile (km) of pipe, during a 24-hour period.
2) Close openings in system and fill with water.
3) Purge air and refill with water.
4) Disconnect water supply.
5) Test and inspect joints for leaks.
6) Option: Test ductile-iron piping according to AWWA C600, Section 4 "Hydrostatic Testing." Use test pressure of at least 5 psig (34.5 kPa).
7) Option: Test concrete piping according to ASTM C 969 (ASTM C 969M).
8) Option: Test concrete arch piping and elliptical piping according to authorities having jurisdiction.

d. Storm Drainage: Perform hydrostatic test. Close openings in system and fill with water to not less than 10-foot (3-m) head of water. Disconnect water supply. Water level must not drop for 15 minutes. Inspect joints for leaks.

1) Option: Test concrete arch piping and elliptical piping according to authorities having jurisdiction.

e. Storm Drainage: Perform air test according to UNI-B-6.

1) Option: Test round concrete piping, 24 inches (600 mm) and smaller, according to ASTM C 924 (ASTM C 924M).
2) Option: Test concrete arch piping and elliptical piping according to authorities having jurisdiction.

6. Manholes: Perform hydraulic test according to ASTM C 969 (ASTM C 969M).
7. Leaks and loss in test pressure constitute defects that must be repaired.

8. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.

END OF SECTION 02700

SECTION 02810 - IRRIGATION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes valves, piping, sprinklers, specialties, accessories, controls, and wiring for lawn irrigation systems.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Water Systems" for water supply.
2. Division 16 Sections for electrical power materials and installations.

1.3 DEFINITIONS

A. Pipe sizes used in this Section are nominal pipe size (NPS) in inches. Tube sizes are Standard size in inches. Equivalent SI (metric) sizes are indicated in millimeters (mm) in parentheses.

B. Supply Piping: Piping from water source to connection to irrigation system pressure piping. Piping is under same pressure as water supply. Piping in this category is not included in this Section.

C. Circuit Piping: Piping downstream from control valves to irrigation system sprinklers, emitters, devices, and drain valves. Piping is under pressure (less than pressure piping) during flow.

D. Control Valve: Manual or automatic (electrically operated) valve for control water flow to irrigation system zone.

E. Drain Piping: Downstream from circuit piping drain valves. Piping is not under pressure.

F. Drain Valve: Manual or automatic (pressure operated) drain valve for draining of irrigation system circuit piping.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Location of Sprinklers and Devices: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards.

B. Minimum Water Coverage: Not less than:

1. Turf Areas: 100 percent.
2. Other Planting Areas: 100 percent.

C. Components and Installation: Capable of producing piping systems with the following minimum working pressure ratings except where indicated otherwise.

1. Pressure Piping: 150 psig (1035 kPa).
2. Circuit and Drain Piping: 100 psig (690 kPa).

1.5 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data including pressure rating, rated capacity, settings, and electrical data of selected models for the following:

1. Water meters.
2. Backflow preventers, including test equipment.
3. Pressure regulators.
4. Valves, including general-duty, underground, manual and automatic control, and quick-coupler types, and valve boxes.
5. Sprinklers, including emitters, drip tubes, and devices.
6. Controls, including controller wiring diagrams.
7. Wiring.
8. Water hammer arresters.
9. Area drains.

C. Wiring diagrams for electrical controllers, valves, and devices.

D. Shop drawings showing irrigation system, including plan layout and locations, types, sizes, capacities, and flow characteristics of irrigation system components. Include water meters, backflow preventers, valves, piping, sprinklers and devices, accessories, controls, and wiring. Show areas of sprinkler spray and overspray.

E. Coordination drawings showing piping and major system components. Indicate interface and spatial relationship between piping, system components, adjacent utilities, and proximate structures.

F. Maintenance data for inclusion in "Operating and Maintenance Manual" specified in Division 1 Section "Project Closeout" for the following:

1. Water meters.
2. Backflow preventers, including instructions for testing.
3. Pressure regulators.
4. Automatic control valves.
5. Sprinklers.
6. Controllers.

1.6 QUALITY ASSURANCE

A. Comply with requirements of utility supplying water for prevention of backflow and backsiphonage.

B. Comply with requirements of authority with jurisdiction for irrigation systems.

C. Installer Qualifications: Engage an experienced Installer who has completed irrigation systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

D. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.

E. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

F. Product Options: Irrigation system piping, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components with equal performance characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by the Contracting Officer and/or Project Managers. The burden of proof of product equality is on the Contractor. Refer to Division 1 Section "Product Substitutions."

1.7 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility

locations. Verify that irrigation system piping may be installed in compliance with original design and referenced standards.

B. Site Information: Reports on subsurface condition investigations made during design of the project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.8 SEQUENCING AND SCHEDULING

A. Maintain uninterrupted water service to building during normal working hours. Arrange for temporary water shutoff with Owner.

B. Coordinate irrigation systems work with landscape work specified in Division 2 Section "Landscape Work."

1.9 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and label clearly describing contents.

1. Quick Couplers: Furnish quantity of units equal to 10 percent of amount of each size installed.
2. Sprinklers: Furnish quantity of units equal to 10 percent of amount of each type installed.
3. Emitters, Drip Tube, and Devices: Furnish quantity of units equal to 10 percent of amount of each type installed.
4. Valve Keys: Furnish quantity of tee-handle units equal to 25 percent of amount of each type key-operated, control valve installed.
5. Quick-Coupler Hose Swivels: Furnish quantity of units equal to 25 percent of amount of each type quick coupler installed.
6. Quick-Coupler Operating Keys: Furnish quantity of units equal to 25 percent of amount of each type quick coupler installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Water Meters:

a. Badger Meter, Inc.
b. Hersey Products, Inc., Grinnell Corp.
c. Kent Meters, Inc.

2. Backflow Preventers:

a. Febco.
b. Rain Bird Sprinkler Mfg. Corp.
c. Wilkins Regulator Div., Zurn Industries, Inc.

3. Pressure Regulators:

a. Conbraco Industries, Inc.
b. Honeywell Braukmann.
c. Wilkins Regulator Div., Zurn Industries, Inc.

4. Gate Valves for Underground Installation:

a. American Darling Valve Div., American Cast Iron Pipe Co.
b. Stockham Valves & Fittings, Inc.
c. Waterous Co.

5. Corporation Stops for Underground Installation:

a. Ford Meter Box Co., Inc.
b. Hays Div., Romac Industries.
c. Mueller Co., Grinnell Corp.

6. Valves for Aboveground and Pit Installation:

a. Grinnell Supply Sales Co., Grinnell Corp.
b. Nibco, Inc.
c. Hammond Valve Div., Prairie Manufacturing Corp.

7. Automatic Control Valves:

a. Lawnlife by Ceres Products Corp.
b. L.R. Nelson Corp.
c. Rain Bird Sprinkler Mfg. Corp.

d. Valcon by Automatic Irrigation Equipment Co.
e. Weather-matic Sprinkler Div., Telsco Industries.

8. Control Valve Boxes:

a. Brooks Products, Inc., Polyplastics Div.
b. Carson Industries, Inc.
c. DFW/HPI by Hefco Plastics, Inc.
d. National Diversified Sales, Inc.
e. Pepco Water Conservation Products, Inc.

9. Quick Couplers:

a. Buckner, Inc.
b. Champion Irrigation Products.
c. Lawnlife by Ceres Products Corp.
d. L.R. Nelson Corp.
e. Rain Bird Sprinkler Mfg. Corp.
f. Toro Co.
g. Weather-matic Sprinkler Div., Telsco Industries.

10. Sprinklers:

a. Rain Bird Sprinkler Mfg. Corp.
b. Toro Co.
c. Weather-matic Sprinkler Div., Telsco Industries.

11. Emitters, Drip Tubes, and Devices:

a. Tornado by Plastro Irrigation, Inc.
b. Toro Co.
c. Weather-matic Sprinkler Div., Telsco Industries.

12. Controllers:

a. Rain Bird Sprinkler Mfg. Corp.
b. Superior Controls Co., Inc.
c. Weather-matic Sprinkler Div., Telsco Industries.

13. Water Hammer Arresters and Area Drains:

a. Josam Co.
b. Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
d. Zurn Hydromechanics Div., Zurn Industries, Inc.

2.2 PIPES AND TUBES

A. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube materials specified below are used.

B. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 1785, PVC 1120, Schedule 40, 160 psig (1100 kPa) minimum pressure rating for 8-inch (200-mm) and smaller sizes, with plain ends.

2.3 PIPE AND TUBE FITTINGS

A. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube fitting materials specified below are used.

1. Threaded Ends: Threads conforming to ASME B1.20.1.

B Polyvinyl Chloride (PVC) Plastic Pipe Fittings: ASTM D 2464, Schedule 80, threaded.

C. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion. These devices are a combination of copper alloy and ferrous metal; threaded- and solder-end types, matching piping system materials.

1. Dielectric Unions: Factory-fabricated, union assembly, designed for 250 psig (1725 kPa) minimum working pressure at 180 deg F (82 deg C). Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.
2. Dielectric Flanges: Factory-fabricated, companion-flange assembly for 150 psig (1035 kPa) or 300 psig (2070 kPa) minimum pressure to suit system pressures.
3. Transition Fittings: Manufactured assembly or fitting, with pressure rating at least equal to that of system and with ends compatible to piping where fitting is to be installed.

2.4 JOINING MATERIALS

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joining materials not included in this Section.

B. Solvent Cement: ASTM F 656 primer and ASTM D 2564 solvent cement in color other than orange.

C. Gaskets for Plastic Flanged Joints: Materials recommended by plastic pipe and fittings manufacturer.

2.5 BACKFLOW PREVENTERS

A. Description: ASSE Standard backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

1. Working Pressure: 150 psig (1035 kPa) minimum except where otherwise indicated.
2. 2 Inches (DN 50) and Smaller: Bronze body with threaded ends.
3. 2-1/2 Inches (DN 65) and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.

    a. Interior Protective Coating: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.

4. Interior Components: Corrosion-resistant materials.
5. Strainer supplied with and compatible for size and capacity with unit, on inlet, where strainer is indicated.

B. Hose Connection Vacuum Breakers: ASSE 1011, nickel-plated, with non-removable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

C. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, with (OS&Y) gate valves on inlet and outlet and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous pressure application.

1. Pressure Loss: 15 psig (103 kPa) maximum, through middle third of flow range.
2. Gate valves supplied with and compatible for size and testing of unit on inlet and outlet. Valves 2 inches (DN 50) and smaller may be ball valves if these are unit manufacturer's standard valve for this application.
3. Test Kit: Unit manufacturer supplied, complete calibrated backflow preventer testing equipment kit with carrying case.

D. Double-Check Backflow Prevention Assemblies: ASSE 1015, with shutoff valves on inlet and outlet and strainer on inlet. Include test cocks with 2 positive-seating check valves for continuous pressure application.

1. Pressure Loss: 12 psig (83 kPa) maximum, through middle third of flow range.
2. Gate valves supplied with and compatible for size and testing of unit on inlet and outlet. Valves 2 inches (DN 50) and smaller may be ball valves if these are unit manufacturer's standard valve for this application.

3. Test Kit: Unit manufacturer supplied, complete calibrated backflow preventer testing equipment kit with carrying case.

E. Antisiphon, Pressure-Type Vacuum Breakers: ASSE 1020, with valves, spring-loaded check valve, and spring-loaded floating disc. Include test cocks and atmospheric vent for continuous pressure application.

1. Pressure Loss: 6 psig (41 kPa) maximum, through middle third of flow range.
2. Gate valves supplied with and compatible for size and testing of unit on inlet and outlet. Valves 2 inches (DN 50) and smaller may be ball valves if these are unit manufacturer's standard valve for this application.
3. Test Kit: Unit manufacturer supplied, complete calibrated backflow preventer testing equipment kit with carrying case.

2.6 PRESSURE REGULATORS

A. Description: ASSE 1003, single-seated, direct-operated-type water pressure regulators, rated for initial working pressure of 150 psig (1035 kPa) minimum, with size, flow rate, and inlet and outlet pressures indicated. Include integral factory-installed or separate field-installed Y-pattern strainer that is compatible with unit for size and capacity.

1. 2 Inches (DN 50) and Smaller: Bronze body with threaded ends.
2. 2-1/2 Inches (DN 65) and Larger: Bronze or cast-iron body with flanged ends.

a. Interior Protective Coating: AWWA C550, epoxy coating, for regulators with a cast-iron body.

3. Interior Components: Corrosion-resistant materials.

B. Description: ASSE 1003, pilot-operated-type, single- or double-seated, water pressure regulators, rated for initial working pressure of 150 psig (1035 kPa) minimum, with size, flow rate, and inlet and outlet pressures indicated. Include cast-iron body main valve, bronze-body pilot valve, integral factory-installed or separate field-installed Y-pattern strainer that is compatible with unit for size and capacity.

1. 2-1/2 Inches (DN 65) and Larger: Cast-iron body with AWWA C550, epoxy coating, and flanged ends.
2. Interior Components: Corrosion-resistant materials.

2.7 VALVES

A. General: Valves are for general-duty and underground applications. Refer to "Valve Applications" Article for locations of various valve types specified in this Article. Refer to "Control Valves" Article for control valves and accessories and "Backflow Preventers" Article for backflow preventer valves.

B. Nonrising Stem Gate Valves 3 Inches (DN 80) and Larger: AWWA C500, cast-iron double disc, bronze disc and seat rings or AWWA C509, resilient seated; bronze stem, cast-iron, or ductile-iron body and bonnet, stem nut, 200 psig (1380 kPa) working pressure; and ends that fit NPS dimension, PVC pipe. Include elastomeric gaskets.

C. Plastic Valves: Polyvinyl chloride (PVC) plastic, with 150 psig (1035 kPa) minimum pressure rating, ends compatible with piping where valve is to be installed, and stem nut.

D. Valve Boxes: Cast-iron box with top section and cover with lettering "WATER," bottom section with base to fit over valve and barrel approximately 5 inches (127 mm) in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

1. Provide steel tee-handle shutoff rod with each valve box. Include tee-handle, shutoff rod with one pointed end, stem of length to operate valve, and end fitting valve operating nut.

E. Curb Stops 2 Inches (DN 50) and Smaller: Bronze body, ground key plug or ball, 150 psig (1035 kPa) minimum pressure rating, wide tee head, with inlet and outlet to match service piping material.

F. Service Boxes for Curb Stops: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover with lettering "WATER" and bottom section with base of size to fit over curb stop and barrel approximately 3 inches (75 mm) in diameter.

1. Provide steel tee-handle shutoff rod with each service box. Include tee-handle, shutoff rod with one pointed end, stem of length to operate curb stop, and slotted end fitting curb stop head.

G. Cast-Iron, Nonrising Stem Gate Valves, 2-1/2 Inches (DN 65) and Larger: MSS SP-70, Type I, solid wedge disc; nonrising stem and flanged ends. Include all bronze trim; Class 125, ASTM A 126, cast-iron body; and handwheel.

H. Plastic Valves: Polyvinyl chloride (PVC) plastic, with 150 psig (1035 kPa) minimum pressure rating, ends compatible to piping where valve is to be installed, and tee handle.

2.8 CONTROL VALVES

A. Description: Manufacturer's standard control valves for circuits, of type and size indicated, and as follows:

1. Provide cast-bronze bodies, unless otherwise indicated.
2. Manual Control Valves: MSS SP-80, Class 125, globe valves.
3. Key-Operated, Manual Control Valves: MSS SP-80, Class 125, globe valves, fitted for key operation.
4. Automatic Control Valves: Diaphragm-type, normally closed, with manual flow adjustment, and operated by 24-volt-a.c. solenoid.
5. Automatic Drain Valves: Designed to open for drainage when line pressure drops below 3 psig (20 kPa).
6. Quick-Couplers: Factory-fabricated, 2-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

    a. Locking Top Option: Include vandal-resistant, locking feature with 2 matching keys.

B. Control Valve Boxes: Polyethylene (PE), acrylonitrile-butadiene- styrene (ABS), fiberglass, polymer concrete, or precast concrete box and cover. Size as required for application.

1. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3 inches (75 mm) maximum to 3/4 inch (19 mm) minimum.

C. Service Boxes for Key-Operated Control Valves: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover with lettering "WATER," and bottom section with base of size to fit over curb stop and barrel approximately 3 inches (75 mm) in diameter.

1. Include valve key, 36 inches (915 mm) long with tee handle and key end to fit valve.

2.9 SPRINKLERS

A. Description: Manufacturer's standard sprinklers designed to provide uniform coverage over entire area of spray shown on drawings at available water pressure, as follows:

1. Housings: Brass or plastic, except where material is specified.
2. Flush, Surface: Fixed pattern, with screw-type flow adjustment.
3. Interior Parts: Brass or other corrosion-resistant materials.

4. Bubbler: Fixed pattern, with screw-type flow adjustment.
5. Shrubbery: Fixed pattern, with screw-type flow adjustment.
6. Pop-Up, Spray: Fixed pattern, with screw-type flow adjustment and stainless-steel retraction spring.
7. Pop-Up, Rotary Spray: Gear drive, full-circle and adjustable part-circle type.
8. Pop-Up, Rotary Impact: Impact drive, full circle and part circle as indicated.

2.10 EMITTERS, DRIP TUBES, AND DEVICES

A. Description: Manufacturer's standard units as shown on Drawings and as follows:

1. Application Pressure Regulators: Brass or plastic housing, 3/4-inch (20-mm) size, with corrosion-resistant internal parts, and capable of controlling outlet pressure to approximately 20 psig (138 kPa).
2. Strainer/Filter Units: Brass or plastic housing, with corrosion-resistant internal parts, of size and capacity required for emitters, drip tubes, and devices downstream of unit.
3. Emitters: Plastic body with single outlet, to deliver the following flow at approximately 20 psig (138 kPa):

   a. Flow: 1/2 gallon per hour (1.9 L/hour).
   b. Flow: 1 gallon per hour (3.8 L/hour).
   c. Flow: 2 gallons per hour (7.6 L/hour).
   d. Tubing: Include 120 inches (3000 mm), 1/8-inch (3-mm) inside diameter polyethylene (PE) tubing.

4. Emitters: Plastic body with 6 outlets, to deliver the following flow at approximately 20 psig (138 kPa):

   a. Flow Each Outlet: 1/2 gallon per hour (1.9 L/hour).
   b. Flow Each Outlet: 1 gallon per hour (3.8 L/hour).
   c. Flow Each Outlet: 2 gallons per hour (7.6 L/hour).

   d. Tubing: Include 60 feet (18 m), 1/8-inch (3-mm) inside diameter polyethylene (PE) tubing.
   e. Outlet Caps: Include 6 plastic outlet caps.

5. Drip Tubes: Flexible polyvinyl chloride (PVC) plastic tube for emitters or other devices indicated, of length indicated, and with plugged end.

   a. Size: 1/2-inch (DN 15) NPS.
   b. Size: 3/4-inch (DN 20) NPS.

c. Size: 1-inch (DN 25) NPS.

6. Other Devices: As specified and as indicated.

2.11 AUTOMATIC CONTROL SYSTEM

A. Description: Low-voltage controller system made for control of irrigation system automatic control valves. Controller operates on 120 volts a.c. building power system, provides 24 volts a.c. power to control valves, and includes stations for at least the number of control valves indicated.

B. Exterior Control Enclosures: Weatherproof enclosure with locking cover and 2 matching keys. Enclosure construction complies with NFPA 70 and NEMA 250, Type 4, and includes provision for grounding.

1. Material: Enameled-steel, sheet metal.
2. Material: Stainless-steel, sheet metal.
3. Material: Molded plastic.
4. Mounting: Free-standing-type for concrete-pad mounting.
5. Mounting: Surface-type for wall mounting.

C. Interior Control Enclosures: Drip-proof enclosure with locking cover and 2 matching keys. Enclosure construction complies with NFPA 70 and NEMA 250, Type 12.

1. Material: Enameled-steel, sheet metal.
2. Material: Stainless-steel, sheet metal.
3. Material: Molded plastic.
4. Mounting: Free-standing-type for concrete-pad mounting.
5. Mounting: Surface-type for wall mounting.

D. Transformer: Internal-type, and suitable for converting 120 volts a.c. building power to 24 volts a.c. power.

E. Controller Stations for Automatic Control Valves: Each station is variable from approximately 5 to 60 minutes. Include switch for manual or automatic operation of each station.

F. Timing Device: Adjustable, 24-hour, 14-day clock to operate any time of day. Include provision for the following settings:

1. Setting to skip operation any day in timer period.
2. Setting for operation every other day.
3. Settings for operation 2 or more times daily.
4. Include manual or semi-automatic operation without disturbing preset automatic operation.

5. Provide NI-CAD battery and trickle charger to automatically power the timing device during power outages.

G. Wiring: UL 493, solid copper conductor, insulated cable, suitable for direct burial.

1. Feeder Circuit Cables: Type UF, No. 12 AWG minimum, between building and controllers.
2. Low-Voltage, Branch Circuit Cables: Type UF, No. 14 AWG minimum, between controllers and automatic control valves. Jacket color is other than feeder-circuit-cable jacket color. Furnish cables with jackets of different colors for multiple cable installation in same trench.
3. Splicing Materials: Pressure-sensitive thermoplastic tape and other materials required to make specified connections.

2.12 WATER HAMMER ARRESTERS

A. Water Hammer Arresters: ASME A112.26.1M, ASSE 1010, or PDI WH-201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M sizes "A" through "F" and PDI WH-201 sizes "A" through "F."

2.13 PRESSURE GAGES

A. Pressure Gages: ASME B40.1, 4-1/2-inch (115-mm) diameter dial, with dial range of 2 times system operating pressure and bottom outlet.

2.14 PITS

A. Concrete: Portland cement mix, 3000 psi (20.7 MPa).

1. Cement: ASTM C 150, Type I.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Reinforcement: Steel conforming to the following:

1. Fabric: ASTM A 185, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60 (ASTM A 615M Grade 400) deformed.

C. Ladder: ASTM A 36, steel or polyethylene-encased steel-steps.

D. Manhole: ASTM A 48, Class 35, gray iron, 24-inch (610-mm) minimum

diameter traffic frame and cover, of size and weight indicated.

E. Manhole: ASTM A 536, Grade 60-40-18, ductile-iron, 24-inch (610-mm) minimum diameter traffic frame and cover, of size and weight indicated.

F. Drain: ASME A112.21.1M, cast-iron, area drain, of size indicated. Include body-anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.15 CONCRETE BASES

A. Refer to Division 3 Section "Cast-In-Place Concrete" for concrete bases for controllers.

B. Concrete: Portland cement mix, 3000 psi (20.7 MPa).

1. Cement: ASTM C 150, Type I.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

C. Reinforcement: Steel conforming to the following:

1. Fabric: ASTM A 185, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615 Grade 60 (ASTM A 615M Grade 400), deformed.

2.16 IDENTIFICATION

A. Refer to Division 2 Section "Earthwork" for plastic underground warning tapes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Investigate and determine available water supply water pressure and flow characteristics.

3.2 PREPARATION

A. Set stakes to identify proposed sprinkler locations. Obtain Contracting Officer and/or Project Manager's approval before excavation.

3.3 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 2 Section "Earthwork."

B. Underground warning tape installation is specified in Division 2 Section "Earthwork."

3.4 PAVING WORK

A. Cutting and patching of asphalt paving is specified in Division 2 Section "Hot-Mixed Asphalt Paving."

B. Cutting and patching of concrete paving is specified in Division 2 Section "Portland Cement Concrete Paving."

C. Install piping in sleeves where crossing sidewalks, roadways, parking lots, and railroads.

1. Install piping sleeves by boring or jacking under existing paving, where possible.

3.5 PIPING APPLICATIONS

A. Refer to Part 2 of this Section for detailed specifications for pipe and fittings products listed below. Use pipe, tube, fittings, and joining methods according to the following applications. Piping in pits and aboveground may be joined with flanges instead of joints indicated.

B. Use pipe, tube, fittings, and joining methods according to the following applications.

C. Pressure Piping Aboveground: Use the following:

1. 4 Inches (DN 100) and Smaller: Copper tube, Type L (Metric designation: Type B), drawn temper; copper tube fittings; and soldered joints.
2. 4 Inches (DN 100) and Smaller: ASTM D 1785, Schedule 80, polyvinyl chloride (PVC) plastic pipe; ASTM D 2464, Schedule 80, PVC plastic, threaded pipe fittings; and threaded joints.
3. 4 Inches (DN 100) and Smaller: ASTM D 1785, Schedule 80, polyvinyl chloride (PVC) plastic pipe; ASTM D 2467, Schedule 80, PVC plastic, socket-type pipe fittings; and solvent-cemented joints.
4. 5 Inches (DN 125) and Larger: ASTM D 1785, Schedule 80, polyvinyl

chloride (PVC) plastic pipe; ASTM D 2464, Schedule 80, PVC plastic, threaded pipe fittings; and threaded joints.

5. 5 Inches (DN 125) and Larger: ASTM D 1785, Schedule 80, polyvinyl chloride (PVC) plastic pipe; ASTM D 2467, Schedule 80, PVC plastic, socket-type pipe fittings; and solvent-cemented joints.

D. Pressure Piping Underground: Use the following:

1. 3 Inches (DN 80) and Smaller: Copper tube, Type L (Metric designation: Type B), annealed temper; wrought-copper tube fittings; and soldered joints.
2. 3 Inches (DN 80) and Smaller: ASTM D 1785, Schedule 80, polyvinyl chloride (PVC) plastic pipe; ASTM D 2467, Schedule 80, PVC plastic, socket-type pipe fittings; and solvent-cemented joints.
3. 3 Inches (DN 80) and Smaller: ASTM D 2241, SDR 17, polyvinyl chloride (PVC) plastic pipe; ASTM D 2467, Schedule 80, PVC plastic, socket-type pipe fittings; and solvent-cemented joints.
4. 4 Inches (DN 100) and Larger: ASTM D 1785, Schedule 80, polyvinyl chloride (PVC) plastic pipe; ASTM D 2467, Schedule 80, PVC plastic, socket-type pipe fittings; and solvent-cemented joints.
5. 4 Inches (DN 100) and Larger: ASTM D 2241, SDR 17, polyvinyl chloride (PVC) plastic pipe; ASTM D 2467, Schedule 80, PVC plastic, socket-type pipe fittings; and solvent-cemented joints.

E. Circuit Piping: Use the following:

1. All Sizes: Copper tube, Type L (Metric designation: Type B), drawn temper; wrought-copper fittings; and soldered joints.
2. All Sizes: Copper tube, Type M (Metric designation: Type C), drawn temper; wrought-copper fittings; and soldered joints.
3. All Sizes: ASTM D 1785, Schedule 80, polyvinyl chloride (PVC) plastic pipe; ASTM D 2467, Schedule 80, PVC plastic, socket-type pipe fittings; and solvent-cemented joints.
4. All Sizes: ASTM D 1785, Schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent cemented joints.
5. All Sizes: ASTM D 2241, SDR 17, polyvinyl chloride (PVC) plastic pipe; ASTM D 2467, Schedule 80, PVC plastic, socket-type fittings; and solvent-cemented joints.
6. All Sizes: ASTM D 2241, SDR 17 or 21, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent-cemented joints.

F. Branches and Offsets at Sprinklers and Devices: ASTM D 1785, Schedule 80, polyvinyl chloride (PVC) plastic pipe with threaded ends; ASTM D 2464, Schedule 80, PVC plastic, threaded fittings; and threaded joints.

1. Option: Plastic piping made for this application may be used instead of pipe and fittings specified.

G. Drain Piping: Copper tube, Type M (Metric designation: Type C); wrought-copper fittings; and soldered joints.

H. Drain Piping: ASTM D 1785, Schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent-cemented joints.

I. Drain Piping: ASTM D 2241, SDR 21 or 26, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent-cemented joints.

J. Sleeves: ASTM D 1785, Schedule 80, polyvinyl chloride (PVC) plastic pipe; ASTM D 2467, Schedule 80, PVC plastic, socket-type fittings; and solvent-cemented joints.

K. Sleeves: ASTM D 1785, Schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent-cemented joints.

3.6 JOINT CONSTRUCTION

A. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads.

B. Threaded Joints: Thread pipes with tapered pipe threads according to ASME B1.20.1, apply tape or joint compound, and apply wrench to valve ends into which pipes are being threaded.

C. Copper Tube and Fittings, Soldered Joints: Construct joints according to CDA No. 404/0 Products Handbook "Copper Tube Handbook."

D. Polyvinyl Chloride (PVC) Piping Gasketed Joints: Construct joints between underground AWWA-type, cast-iron valves and NPS PVC pipe; with elastomeric seals that fit pipe diameter and valve ends; and lubricant, according to ASTM D 3139.

E. Polyvinyl Chloride (PVC) Piping Solvent-Cemented Joints: Construct joints according to ASTM D 2672 and ASTM D 2855.

1. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F 402 for safe handling when joining plastic pipe

and fittings with solvent cements.

F. Dissimilar Materials Piping Joints: Construct joints using adapters that are compatible with both piping materials, outside diameters, and system working pressure. Refer to "Piping Systems - Common Requirements" Article for joining dissimilar metal piping.

3.7 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, and in other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

B. Install piping at a uniform slope of 6 inches per 100 feet (1:200) minimum, down to drain points.

C. Install components having pressure rating equal to or greater than system operating pressure.

D. Install piping free of sags and bends.

E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

F. Install fittings for changes in direction and branch connections.

G. Piping Connections: Except as otherwise indicated make piping connections as specified below.

1. Install unions, in piping 2 inches (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inch (DN 50) or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2 inches (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
3. Install dielectric fittings to connect piping of dissimilar metals.

3.8 PIPING INSTALLATION

A. Install copper tube and copper tube fittings, according to CDA No. 404/0 Products Handbook "Copper Tube Handbook."

B. Install underground polyvinyl chloride (PVC) plastic pipe according to

ASTM D 2774.

C. Lay piping on solid subbase, uniformly sloped without humps or depressions.

1. Slope circuit piping down toward drain valve minimum of 1/2 inch in 10 feet (1:240).
2. Install polyvinyl chloride (PVC) plastic pipe in dry weather when temperature is above 40 deg F (4 deg C). Allow joints to cure at least 24 hours at temperature above 40 deg F (4 deg C) before testing, unless otherwise recommended by manufacturer.

D. Drain Pockets: Excavate to sizes indicated. Backfill with cleaned gravel or crushed stone, graded from 3 inches (75 mm) to 3/4 inch (19 mm) minimum, drain material to 12 inches (300 mm) below grade. Cover drain material with sheet of ASTM D 226, Type II, asphalt-saturated felt and backfill remainder with excavated material.

E. Minimum Cover: Provide following minimum cover over top of buried piping:

1. Pressure Piping: Greater depth of minimum of 36 inches (915 mm) below finished grade, or not less than 18 inches (460 mm) below average local frost depth.
2. Circuit Piping: 12 inches (300 mm).
3. Drain Piping: 12 inches (300 mm).
4. Sleeves: 24 inches (600 mm).

F. Water Hammer Arrester: Install between connection to building main and circuit valves, inside building or in valve box as indicated.

G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, boring, or jacking.

H. Install piping under sidewalks and paving in sleeves.

3.9 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, following requirements apply:

1. Buried Valves 3 Inches (DN 80) and Larger: AWWA, gate valves, nonrising stem, with stem nut and valve box.
2. Buried Valves 2 Inches (DN 50) and Smaller: Bronze-body, curb stop, with tee head, service box and shutoff rod.

3. Buried Circuit and Drain Valves: Plastic valves, nonrising stem, with stem nut, valve or service box, and tee-handle shutoff rod.
4. Pit and Aboveground Installation, Valves 2-1/2 Inches (DN 65) and Larger: MSS, rising stem, gate valves.
5. Pit and Aboveground Installation, Valves 2-1/2 Inches (DN 65) and Larger: MSS, nonrising stem, gate valves.
6. Pit and Aboveground Installation, Valves 2 Inches (DN 50) and Smaller: MSS, rising stem gate valves.
7. Pit and Aboveground Installation, Valves 2 Inches (DN 50) and Smaller: MSS, nonrising stem gate valves.
8. Pit Installation Circuit and Drain Valves: Plastic valves with tee handle.

3.10 VALVE INSTALLATION

A. Valves: Install underground valves in valve boxes or pits.

1. Install valves and polyvinyl chloride (PVC) pipe with restrained, gasketed joints.

B. Curb Stops: Install underground curb stops in service boxes.

C. Control Valves: Install in valve control valve boxes, arranged for easy adjustment and removal. Install union on downstream side.

3.11 WATER METER INSTALLATION

A. Install water meters 2-inch (DN 50) size and smaller in meter boxes with shutoff valve on meter inlet. Include valve on meter outlet and valved bypass around meter when indicated.

B. Install water meters 3-inch (DN 80) size and larger in meter pits. Include shutoff valves on meter inlet and outlet, and valved bypass around meter. Support meters, valves, and piping on 3000-psi (20.7-MPa) minimum, portland-cement-mix concrete piers.

3.12 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to plumbing code and health department authorities with jurisdiction.

B. Install pressure-type vacuum breakers minimum of 12 inches (300 mm) above downstream piping system.

C. Do not install bypass around backflow preventer.

D. Do not install backflow preventers with drains or vents in pits or areas subject to flooding.

E. Support backflow preventers, valves, and piping on 3000-psi (20.7-MPa) minimum, portland-cement-mix concrete piers.

3.13 PRESSURE REGULATOR INSTALLATION

A. Install pressure regulators with shutoff valve and strainer on inlet and pressure gage on outlet. Install shutoff valve on outlet and valved bypass where indicated.

3.14 PIT CONSTRUCTION AND INSTALLATION

A. Construct pits of cast-in-place concrete or provide precast concrete pits of dimensions indicated, with manhole frame and cover, ladder, and drain. Include sleeves with waterproof mechanical sleeve seals for pipe entry and exit.

B. Connect area drain outlet to storm drain. Storm drainage is specified in Division 2 Section "Storm Sewerage."

3.15 SPRINKLER INSTALLATION

A. Sprinklers: Flush circuit piping with full head of water and install sprinklers after hydrostatic test is completed.

1. Install lawn sprinklers at manufacturer's recommended heights.
2. Install shrubbery sprinklers at heights indicated.
3. Locate part-circle sprinklers to maintain a minimum distance of 4 inches (100 mm) from walls and 2 inches (50 mm) from other boundaries, unless otherwise indicated.

3.16 AUTOMATIC CONTROL SYSTEM INSTALLATION

A. Install controllers according to manufacturer's written instructions and as indicated.

B. Install free-standing controllers on concrete pads. Where dimensions are not indicated, furnish bases not less than 36 inches by 24 inches by 4 inches (915 mm by 610 mm by 100 mm) thick, and not less than 6 inches (150 mm) greater in each direction than overall dimensions of controller.

C. Install control wiring in same trench with piping.

3.17 CONNECTIONS

A. Connect piping to sprinklers, devices, valves, control valves, specialties, and accessories.

B. Connect water supplies to irrigation systems. Include backflow preventers on potable water supplies.

C. Electrical Connections: Connect to power source, controllers, and automatic control valves.

D. Minimum requirements for electrical installations are specified in Division 16.

E. Ground systems according to Division 16 Section "Grounding."

3.18 FIELD QUALITY CONTROL

A. Testing: Perform hydrostatic test of piping and valves before backfilling trenches. Piping may be tested in sections to expedite work.

1. Cap and subject the piping system to a static water pressure of 50 psig (345 kPa) above the operating pressure without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
2. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.

3.19 CLEANING AND ADJUSTING

A. Flush dirt and debris from piping before installing sprinklers and other devices.

B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.

C. Carefully adjust lawn sprinklers so they will be flush with, or not more than 1/2 inch (13 mm) above, finish grade after completion of landscape work.

D. Adjust settings of controllers and automatic control valves.

3.20 COMMISSIONING

A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturers, proceed as follows:

1. Verify that specialty valves and their accessories have been installed correctly and operate correctly.
2. Verify that specified tests of piping are complete.
3. Check that sprinklers and devices are correct type.
4. Check that damaged sprinklers and devices have been replaced with new materials.
5. Check that potable water supplies have correct type backflow preventers.
6. Energize circuits to electrical equipment and devices.
7. Adjust operating controls.

B. Operational Testing: Perform operational testing after hydrostatic testing is completed, backfill is in place, and sprinklers are adjusted to final position.

3.21 DEMONSTRATION

A. Demonstrate to Contracting Officer and/or Project Managers that system meets coverage requirements and that automatic controls function properly.

B. Demonstrate to Owner's maintenance personnel operation of equipment, sprinklers, specialties, and accessories. Review operating and maintenance information.

C. Provide 7 days' written notice in advance of demonstration.

END OF SECTION 02810

SECTION 02831 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Galvanized-steel chain link fabric.
2. Polyvinyl chloride (PVC)-coated steel chain link fabric.
3. Galvanized-steel framework.
4. Polymer-coated steel framework.
5. Gate operator.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Earthwork" for filling and grading work.
2. Division 3 Section "Cast-in-Place Concrete" for concrete for post footings.
3. Division 16 Sections for electric power for electric gate operators.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data in the form of manufacturer's technical data, specifications, and installation instructions for fence and gate posts, fabric, gates, gate operators, and accessories.

C. Shop drawings showing location of fence, gates, each post, and details of post installation, extension arms, gate swing, hardware, and accessories.

D. Wiring diagrams from manufacturer for electrically operated gates.

E. Samples for initial selection of PVC color in form of manufacturer's color charts or 6-inch lengths of actual fabric wire showing colors available.

F. Samples for verification of PVC color in form of 6-inch lengths of actual fabric wire to be used in color selected.

1. Include similar samples of polymer coating applied on posts, rails, and accessories in color selected.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has at least three years' experience and has completed at least five chain link fence projects with same material and of similar scope to that indicated for this project with a successful construction record of in-service performance.

B. Single-Source Responsibility: Obtain chain link fences and gates, including accessories, fittings, and fastenings, from a single source.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for fences and gates shown on the drawings in relation to the property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 FABRIC

A. Selvage: Knuckled on both selvages.

B. Steel Chain-Link Fence Fabric: Fabricated in one-piece widths for fencing 12 feet and less in height to comply with Chain Link Fence Manufacturers Institute (CLFMI) "Product Manual" and with requirements indicated below:

1. Mesh and Wire Size: 2-inch mesh, 0.148-inch diameter (9 gage).
2. Coating: ASTM A 817, Type 2, Class 1, zinc-coated (galvanized) applied after weaving.
3. PVC Coating Color: As selected by Contracting Officer and/or Project Managers from manufacturers' standard colors of green, olive green, brown, or black complying with ASTM F 934.

2.2 FRAMING

A. Round member sizes are given in actual outside diameter (OD) to the nearest thousandth of inches. Round fence posts and rails are often referred to in ASTM standard specifications by nominal pipe sizes (NPS) or the equivalent trade sizes in inches. The following indicates these equivalents all measured in inches:

Actual OD	NPS Size	Trade Size
1.900	1-1/2	2
2.375	2	2-1/2

. Type I Round Posts: Standard weight (schedule 40) galvanized-steel pipe conforming to ASTM F 1083, according to heavy industrial requirements of ASTM F 669, Group IA, with minimum yield strength of 25,000 psi, not less than 1.8 oz. of zinc per sq. ft. Type A coating inside and outside according to ASTM F 1234, as determined by ASTM A 90, and weights per foot as follows:

Actual OD	Weight (lb/ft)	NPS Size
2.375	3.65	2
2.875	5.79	2-1/2

C. Roll-Formed Steel: Rolled form steel shapes (e.g., C section) produced from structural-quality steel conforming to ASTM A 570, grade 45, or ASTM A 446, grade D, galvanized, conforming to heavy industrial requirements of ASTM F 669, Group II, with a minimum yield strength of 45,000 psi. Protective coating system according to ASTM F 1234, Type A, hot-dip galvanized with a minimum of 2.0 oz. of zinc per sq. ft. according to ASTM A 123, 4.0 oz. of zinc per sq. ft. according to ASTM A 525; or Type C, a minimum of 1.0 oz. of zinc-5 percent aluminum-mischmetal alloy per sq. ft. according to ASTM A 875.

D. Supplemental Color Coating: In addition to above metallic coatings, provide posts and rails with manufacturer's standard polymer coating according to ASTM F 1234, 10-mil minimum polyvinyl chloride (PVC) or 3-mil minimum polyester plastic resin finish applied to exterior surfaces and, except for tubular shapes, to exposed interior surfaces. Color to match chain link fabric.

E. Aluminum Framework: Round members, alloy 6063-T6, mill-finished aluminum conforming to ASTM B 429, schedule 40 aluminum pipe. Other members, alloy 6061-T6, mill-finished aluminum conforming to ASTM B 221. Weights per foot for pipe as follows:

Actual OD	Weight (lb/ft)	NPS Size
2.375	1.264	2

F. Top Rail: Manufacturer's longest lengths (17 to 21 feet) with swedged-end or expansion-type coupling, approximately 6 inches long for joining. Provide rail ends or other means for attaching top rail securely to each gate corner, pull, and end post.

1. Round Steel: 1.660-inch OD Type I or II steel pipe.
2. Roll-Formed Steel: 1-1/4-by-1-5/8-inch C section weighing a minimum of 1.40 lb per linear ft.
3. Round Aluminum: 1.660-inch OD aluminum pipe.
4. Square Aluminum: 1-1/2-inch-square aluminum tubing with 0.125-inch minimum walls.

G. Steel posts for fabric heights over 6 feet:

1. Round Line or Intermediate Posts: 2.375-inch OD Type I or II steel pipe.
2. Round End, Corner, and Pull Posts: 2.875-inch OD Type I or II steel pipe.
3. Roll-Formed Line or Intermediate Posts: 2.25-by-1.70-inch C section weighing a minimum of 2.70 lb per linear ft.
4. Hot-Formed Line or Intermediate Posts: 2.25-by-1.70-inch galvanized-steel H section weighing a minimum of 3.26 lb per linear ft.
5. Roll-Formed End, Corner, and Pull Posts: 3-1/2-by-1-1/2-inch roll-formed galvanized-steel sections weighing a minimum of 5.10 lb per linear ft.

H. Aluminum posts for fabric heights over 6 feet:

1. Round Line or Intermediate Posts: 2.375-inch OD aluminum pipe.
2. Round End, Corner, and Pull Posts: 2.875-inch OD aluminum pipe.
3. Shape and Material: Square aluminum.
4. H-Section Line or Intermediate Posts: 2-1/4-by-2-inch aluminum H section weighing a minimum of 1.22 lb per linear ft.

I. Swing Gate Posts: Furnish posts to support single gate leaf, or one leaf of a double-gate installation, according to ASTM F 900, sized as follows for steel and aluminum pipe posts:

1. Steel posts for fabric height of 6 feet or less and gate leaf width:

   a. Over 4 to 10 Feet: 2.875-inch OD pipe weighing at least 4.64 lb per ft.

2. Steel posts for fabric height over 6 feet and gate leaf width:

   a. Over 6 to 12 Feet: 4.000-inch OD pipe weighing at least 8.65 lb per ft.

3. Aluminum posts for fabric height of 6 feet or less and gate leaf width:

a. Over 4 to 10 Feet: 2.875-inch OD pipe weighing at least 1.94 lb per ft.

4. Aluminum posts for fabric height over 6 feet and gate leaf width:

a. Over 6 to 12 Feet: 4.000-inch OD pipe weighing at least 2.99 lb per ft.

J. Horizontal Slide Gate Posts: Provide steel pipe gate posts sized as follows, according to ASTM F 1184, for Type I, overhead slide gates:

1. Overhead Clearance: Up to 14 feet with opening width:

a. Not More Than 10 Feet: 2.875-inch OD pipe weighing not less than 4.64 lb per ft.

2. Overhead Clearance: Up to 22 feet with opening width:

a. Between 10 and 24 Feet: 4.000-inch OD pipe weighing not less than 6.56 lb per ft.

K. Horizontal Slide Gate Posts: Provide steel pipe gate posts sized as follows, according to ASTM F 1184, for Type II, cantilever slide gates:

L. Opening Width Over 12 feet: 4.000-inch OD pipe weighing not less than 6.56 lb per ft.

2.3 FITTINGS AND ACCESSORIES

A. Material: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel to suit manufacturer's standards.

1. Steel and Iron: Unless specified otherwise, hot-dip galvanize pressed steel or cast-iron fence fittings and accessories with at least 1.2 oz. zinc per sq. ft. as determined by ASTM A 90.
2. Aluminum: Die cast conforming to ASTM B 26, aluminum-alloy 360 or sand cast conforming to ASTM B 85, aluminum-alloy 365, ZG61A, or Tenzalloy.
3. Supplemental Color Coating: In addition to above metallic coatings, provide a 10-mil minimum polyvinyl chloride (PVC) plastic resin finish applied to exterior surfaces and, except inside cap shapes, to exposed interior surfaces. Color to match chain link fabric.

B. Post and Line Caps: Provide weathertight closure cap for each post. Provide line post caps with loop to receive tension wire or top rail.

C. Post Brace Assembly: Manufacturer's standard adjustable brace. Use material specified below for brace, and truss to line posts with 3/8-inch-diameter rod and adjustable tightener. Provide manufacturer's standard galvanized-steel, cast-iron or cast-aluminum cap for each end.

1. Round Steel: 1.660-inch OD Type I or II steel pipe.
2. Roll-Formed Steel: 1-1/4-by-1-5/8-inch C section weighing a minimum of 1.40 lb per linear ft.
3. Round Aluminum: 1.660-inch OD aluminum pipe.

D. Bottom and Center Rail: Same material as top rail. Provide manufacturer's standard galvanized-steel, cast-iron or cast-aluminum cap for each end.

E. Tension or Stretcher Bars: Hot-dip galvanized steel with a minimum length 2 inches less than the full height of fabric, a minimum cross section of 3/16 inch by 3/4 inch, and a minimum of 1.2 oz. of zinc coating per sq. ft. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into the post.

F. Tension and Brace Bands: 3/4-inch-wide minimum hot-dip galvanized steel with a minimum of 1.2 oz. of zinc coating per sq. ft.

1. Tension Bands: 0.074 inch thick (14 gage) minimum.
2. Brace Bands: 0.105 inch thick (12 gage) minimum.
. Coating Type I aluminum with a minimum coating weight of 0.40 oz. per sq. ft. as determined by ASTM A 428.

G. Tension Wire: 0.192-inch-diameter (6-gage) mill-finished aluminum wires, ASTM B 211, alloy 6061-T94 with 50,000-psi minimum tensile strength.

H. Tie Wires: 0.106-inch-diameter (12-gage) galvanized steel with a minimum of 0.80 oz. per sq. ft. of zinc coating according to ASTM A 641, Class 3 or 0.148-inch-diameter (9-gage) aluminum wire alloy 1350-H19 or equal, to match fabric wire.

2.4 CONCRETE

A. Concrete: Provide concrete consisting of portland cement per ASTM C 150, aggregates per ASTM C 33, and potable water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3000 psi. Use at least four sacks of cement per cu. yd., 1-inch maximum size aggregate, 3-inch maximum slump.

B. Packaged Concrete Mix: Mix dry-packaged normal-weight concrete conforming to ASTM C 387 with clean water to obtain a 2- to 3-inch slump.

2.5 GATES

A. Swing Gates: Comply with ASTM F 900.

1. Steel: Gates up to 8 feet wide:

a. Up to 6 Feet High: Fabricate perimeter frames of 1.660-inch minimum OD Type I or II steel pipe or 1-1/2-inch-square galvanized-steel tubing weighing 1.84 lb per sq. ft.

2. Aluminum: Fabricate perimeter frames of 1.90-inch-OD minimum aluminum pipe or 2-inch-square aluminum tubing.
3. Gate Hardware: Provide galvanized hardware and accessories for each gate according to the following:

a. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180-degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6-foot nominal height.
b. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as an integral part of latch.
c. Keeper: Provide a keeper for vehicle gates that automatically engages gate leaf and holds it in the open position until manually released.
d. Gate Stops: Provide gate stops for double gates consisting of mushroom-type flush plate with anchors, set in concrete, and designed to engage a center drop rod or plunger bar. Include a locking device and padlock eyes as an integral part of the latch, permitting both gate leaves to be locked with a single padlock.

B. Sliding Gates: Comply with ASTM F 1184.

1. Type I, Overhead Slide: Manufacturer's standard heavy-duty gate with inverted channel track, ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, hardware, and accessories as required.
2. Type II, Cantilever: Manufacturer's standard top rail gate incorporating a track for the top roller. Brace frame to prevent sagging and apply fabric to entire gate. Provide a lockable positive latch and other hardware and accessories as required.

a. Class 2: Provide internal rollers with sealed lubricant ball bearings.

2.6 GATE OPERATOR

A. General: Manufacturer's standard design and construction, suitable for gates specified. Select operator size and features according to manufacturer's published data, taking into consideration size, type, weight, and construction of gate, as well as Project conditions and specified requirements.

B. Type: Electric motor with pulley and belt drive.

C. Speed: Minimum 45 feet per minute.

D. Features: Continuous duty without overloading or overheating. Rated by manufacturer at 30 or more complete cycles per hour. All components UL approved. Furnish disconnect switch with NEMA KS 1; Type 3R enclosure.

1. Provide equipment with suitable electrical characteristics including phase, voltage, branch circuit wire size, overcurrent protection, and connection devices coordinated with Division 16.
2. Self-locking.
3. Weather-resistant steel enclosure protecting all operating parts.
4. Automatic reversing upon obstruction during closing cycle and automatic stop upon obstruction during opening cycle.

E. Controls: Electric and electronic programmable controls separated from motor and drive mechanism, sealed from water and insects, with space for additional optional equipment. Provide adjustable automatic closing timer and the following remote control device:

1. Three-button open/close/stop switch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install fence to comply with ASTM F 567. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

1. Apply fabric to outside of framework. Install fencing on boundary lines inside of property line established by survey as required by Division 1.

B. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.

2. If not indicated on drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than four times the largest cross section of post.

C. Setting Posts: Center and align posts in holes 3 inches above bottom of

excavation. Space a maximum of 10 feet o.c., unless otherwise indicated.

1. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

   a. Unless otherwise indicated, extend concrete footings 2 inches above grade and trowel to a crown to shed water.

D. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

E. Center Rails: Install center rails in one piece between posts and flush with post on fabric side, using rail ends and special offset fittings where necessary.

F. Brace Assemblies: Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric on fences with top rail and at two thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

G. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter (11-gage) hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c.

H. Top Tension Wire: Install tension wire through post cap loops before stretching fabric. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter (11-gage) hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c.

I. Fabric: Leave approximately 2 inches between finish grade and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains under tension after pulling force is released.

J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not over 15 inches o.c.

K. Tie Wires: Use wire of proper length to secure fabric firmly to posts and rails. Bend ends of wire to minimize hazard to persons or clothing.

1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to rails

and braces 24 inches o.c.

L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts for added security.

3.2 GATE INSTALLATION

A. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary. Install gates according to manufacturer's instructions, plumb, level, and secure.

3.3 GATE OPERATOR INSTALLATION

A. Install gate operators according to manufacturer's instructions. Adjust for smooth, trouble-free operation.

3.4 ADJUSTING

A. Gates and Gate Operators: After repeated operation of completed installation equivalent to 3 days' use by normal traffic, readjust gates and gate operators and controls for optimum operating condition and safety. Lubricate operating equipment and clean exposed surfaces.

3.5 DEMONSTRATION

A. Instruct the Owner's personnel on proper operation and maintenance of gate operators.

END OF SECTION 02831

SECTION 02900 - LANDSCAPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. OMITTED

1.2 SUMMARY

A. This Section includes the following:

1. Shrubs.
2. Ground covers.
3. Lawns.
4. Topsoil and soil amendments.
5. Fertilizers and mulches.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Earthwork" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.

1. Manufacturer's certified analysis for standard products.
2. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
3. Label data substantiating that plants, trees, shrubs, and planting materials comply with specified requirements.

C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for sod, identifying sod source, including name and telephone number of supplier.

D. Samples of each of the following:

1. 5 lb (2 kg) of mineral mulch for each color and texture of stone required for project, in labeled plastic bags.
2. Edging materials and accessories to verify color selected.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.

F. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.

1. Analysis of existing surface soil.
2. Analysis of imported topsoil.

G. Planting schedule indicating anticipated dates and locations for each type of planting.

H. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this project and with a record of successful landscape establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the project site during times that landscaping is in progress.

B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the work.

C. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."

1. Selection of trees and shrubs purchased under allowances will be made by Architect, who will tag stock at their place of growth before they are

prepared for transplanting.

D. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for growth of applicable planting material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory topsoil.

E. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

C. Sod: Harvest, deliver, store, and handle sod according to the requirements of the American Sod Producers Association's (ASPA) "Specifications for Turfgrass Sod Materials and Transplanting/Installing."

D. Trees and Shrubs: Deliver freshly dug trees and shrubs. Do not prune before delivery, except as approved by Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery.

1. Immediately after digging bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

E. Handle balled and burlapped stock by the root ball.

F. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than

6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots in water for 2 hours if dried out.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.6 PROJECT CONDITIONS

A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

1.7 COORDINATION AND SCHEDULING

A. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season.

C. Replace planting materials that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

D. A limit of one replacement of each plant material will be required, except for losses or replacements due to failure to comply with requirements.

1.9 TREE AND SHRUB MAINTENANCE

A. Maintain trees and shrubs by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings. Maintain trees and shrubs for the following period:

1. Maintenance Period: 12 months following Substantial Completion.

1.10 GROUND COVER AND PLANT MAINTENANCE

A. Maintain ground cover and plants by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings for the following period:

1. Maintenance Period: 6 months following Substantial Completion.

1.11 LAWN MAINTENANCE

A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Seeded Lawns: 60 days after date of Substantial Completion.

a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season.

2. Sodded Lawns: 30 days after date of Substantial Completion.

B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches (100 mm).

1. Water lawn at the minimum rate of 1 inch (25 mm) per week.

D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.

E. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of lawn area.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Label at least 1 tree and 1 shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

2.3 GROUND COVERS AND PLANTS

A. Provide ground covers and plants established and well rooted in removable containers or integral peat pots and with not less than the minimum number and length of runners required by ANSI Z60.1 for the pot size indicated.

2.4 GRASS MATERIALS

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.

1. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on Schedules at the end of this Section.

B. Sod: Certified turfgrass sod complying with ASPA specifications for machine-cut thickness, size, strength, moisture content, and mowed height, and free of weeds and undesirable native grasses. Provide viable sod of uniform density, color, and texture of the following turfgrass species, strongly rooted, and capable of vigorous growth and development when planted.

1. Species: Provide sod of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on Schedules at the end of this Section.

2.6 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1 inch (25 mm) or larger in any dimension, and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
2. Topsoil Source: Import topsoil from off-site sources. Obtain topsoil from naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from bogs or marshes.
3. Topsoil Source: Amend existing surface soil to produce topsoil. Supplement with imported topsoil when required.

2.7 SOIL AMENDMENTS

A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 (2.36 mm) sieve and a minimum 75 percent passing a No. 60 (250 micrometer) sieve.

1. Provide lime in the form of dolomitic limestone.

B. Aluminum Sulfate: Commercial grade, unadulterated.

C. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Peat Humus: For acid-tolerant trees and shrubs, provide moss peat, with a pH range of 3.2 to 4.5, coarse fibrous texture, medium-divided sphagnum moss peat or reed-sedge peat.

F. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

1. When site treated, mix with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cu. ft. (cu. m) of loose sawdust or ground bark.

G. Manure: Well-rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

H. Herbicides: EPA registered and approved, of type recommended by manufacturer.

I. Water: Potable.

2.8 FERTILIZER

A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:

1. Composition: 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

D. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 5 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight.
2. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
3. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.9 MULCHES

A. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.
2. Type: Wood and bark chips.

B. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other

foreign substances, of following type, size range, and color:

1. Type: Rounded riverbed gravel or smooth-faced stone.
2. Size Range: 3/4 inch (19 mm) maximum, 1/4 inch (6 mm) minimum.
3. Color: Readily available natural gravel color range.

2.10 EROSION-CONTROL MATERIALS

A. Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

B. Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, 0.92 lb per sq. yd. (0.5 kg per sq. m) minimum, with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

2.11 MISCELLANEOUS MATERIALS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, and secure Architect's acceptance before the start of planting work. Make minor adjustments as may be required.

3.3 PLANTING SOIL PREPARATION

A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

B. Mix soil amendments and fertilizers with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.

1. A "Planting Soil Amendments Schedule" is included at the end of this Section.

C. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

2. Mix lime with dry soil prior to mixing fertilizer. Prevent lime from contacting roots of acid-tolerant plants.
3. Apply phosphoric acid fertilizer, other than that constituting a portion of complete fertilizers, directly to subgrade before applying planting soil and tilling.

3.4 LAWN PLANTING PREPARATION

A. Limit subgrade preparation to areas that will be planted in the immediate future.

B. Loosen subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials.

C. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen.

1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
2. Allow for sod thickness in areas to be sodded.

D. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:

1. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.
2. Till surface soil to a depth of at least 6 inches (150 mm). Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.
3. Clean surface soil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
4. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.

E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.

F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.5 GROUND COVER AND PLANT BED PREPARATION

A. Loosen subgrade of planting bed areas to a minimum depth of 6 inches (150 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials.

B. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.

C. Till soil in beds to a minimum depth of 8 inches (200 mm) and mix with specified soil amendments and fertilizers.

D. Remove soil to a minimum depth of 8 inches (200 mm) and replace with prepared planting soil mixture.

3.6 PLANTERS

A. Planters: Place at least a 4-inch (100-mm) layer of gravel in bottom of planters, cover with nonwoven fabric, and fill with planter soil mixture. Place soil in lightly compacted layers to an elevation of 1-1/2 inches (38 mm) below top of planter, allowing natural settlement.

1. Planter Soil Mixture: 1 part topsoil, 1 part coarse sand, 1 part peat humus, and 3 lb (1.4 kg) dolomitic limestone per cu. yd. (cu. m) of mix.

3.7 EXCAVATION FOR TREES AND SHRUBS

A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.

a. Setting Layer: Allow 9 inches (225 mm) of planting soil.

1. Balled and Burlapped Trees and Shrubs: Excavate approximately 1-1/2 times as wide as ball diameter and equal to ball depth, plus the

following setting layer depth:

a. Setting Layer: Allow 9 inches (225 mm) of planting soil.

B. Dispose of subsoil removed from landscape excavations. Do not mix with planting soil or use as backfill.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

E. Fill excavations with water and allow to percolate out, before placing setting layer and positioning trees and shrubs.

3.8 PLANTING TREES AND SHRUBS

A. Set balled and burlapped stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.

1. Place stock on setting layer of compacted planting soil.
2. Remove burlap and wire baskets from tops of balls and partially from sides, but do not remove from under balls. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation.
3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

B. Dish and tamp top of backfill to form a 3-inch- (75-mm-) high mound around the rim of the pit. Do not cover top of root ball with backfill.

C. Wrap trees of 2-inch (50-mm) caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation and take corrective measures required before wrapping.

3.9 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs according to standard horticultural

practice. Prune trees to retain required height and spread. Unless otherwise directed by Architect, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are size after pruning.

3.10 PLANTING GROUND COVER AND PLANTS

A. Space ground cover and plants not more than 24 inches (600 mm) apart.

B. Dig holes large enough to allow spreading of roots, and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.11 MULCHING

A. Mulch backfilled surfaces of pits, trenches, planted areas, and other areas indicated.

B. Weed-Control Barriers: Install the following weed-control barriers according to manufacturer's recommendations, before mulching. Completely cover area to be mulched, lapping edges a minimum of 6 inches (150 mm).

1. Material and Seam Treatment: Composite fabric with seams pinned.

C. Organic Mulch: Apply the following average thickness of organic mulch and finish level with adjacent finish grades. Do not place mulch against trunks or stems.

1. Thickness: 3 inches (75 mm).

3.12 SEEDING NEW LAWNS

A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.

B. Sow seed at the following rates:

1. Seeding Rate: 2 lb per 1000 sq. ft. (1 kg per 100 sq. m).

C. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.

D. Protect seeded slopes exceeding 1:4 against erosion with erosion-control blankets installed and stapled according to manufacturer's recommendations.

E. Protect seeded slopes exceeding 1:6 against erosion with jute or coir-fiber erosion-control mesh installed and stapled according to manufacturer's recommendations.

F. Protect seeded areas against hot, dry weather or drying winds by applying peat mulch within 24 hours after completion of seeding operations. Soak and scatter uniformly to a depth of 3/16 inch (4.8 mm) thick and roll to a smooth surface.

3.13 HYDROSEEDING NEW LAWNS

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.

1. Mix slurry with nonasphaltic tackifier.
2. Apply slurry uniformly to all areas to be seeded in a 1-step process. Apply mulch at the minimum rate of 1500 lb per acre (16.5 kg per 100 sq. m) dry weight but not less than the rate required to obtain specified seed-sowing rate.

3.14 SODDING NEW LAWNS

A. Lay sod within 24 hours of stripping. Do not lay sod if dormant or if ground is frozen.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across angle of slopes exceeding 1:3.
2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within 2 hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below the sod.

3.15 INSTALLATION OF MISCELLANEOUS MATERIALS

A. Apply antidesiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.

1. When deciduous trees or shrubs are moved in full-leaf, spray with antidesiccant at nursery before moving and again 2 weeks after planting.

3.16 CLEANUP AND PROTECTION

A. During landscaping, keep pavements clean and work area in an orderly condition.

B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

3.18 SEED MIXTURES SCHEDULE

A. Full-Sun Mixture: Provide certified grass-seed blends or mixes, proportioned by weight, as follows:

Proportion	Name	Min. Pct. Germ.	Min. Pct. Pure Sd.	Max. Pct. Weed Sd.
100 pct.	Bermudagrass (Cynodon dactylon)	80	85	0.50

B. Sun and Partial Shade: Provide certified grass-seed blends or mixes, proportioned by weight, as follows:

Proportion	Name	Min. Pct. Germ.	Min. Pct. Pure Sd.	Max. Pct. Weed Sd.
50 pct.	Kentucky bluegrass (Poa pratensis)	80	85	0.50
30 pct.	Chewings red fescue (Festuca rubra variety)	85	98	0.50
10 pct.	Perennial rye grass (Lolium perenne)	90	98	0.50

10 pct.	Redtop (Agrostis alba)	85	92	1.00

C. Heavy Shade: Provide certified grass-seed blends or mixes, proportioned by weight, as follows:

Proportion	Name	Min. Pct. Germ.	Min. Pct. Pure Sd.	Max. Pct. Weed Sd.
50 pct.	Chewings red fescue (Festuca rubra variety)	85	98	0.50
35 pct.	Rough bluegrass (Poa trivialis)	80	85	1.00
15 pct.	Redtop (Agrostis alba)	85	92	1.00

END OF SECTION 02900

SECTION 02990-ATHLETIC TRACK AND FIELD FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

B. The synthetic-surfacing Contractor shall furnish all labor, materials, equipment, supervision and services necessary for the proper completion of all Dual-Durometer synthetic Track Surfacing and related work indicated on the drawings and specified herein.

C. The synthetic-surfacing Contractor shall refer to the drawings for the required locations of synthetic track surfacing to be installed. All quantities and dimensions shall be field verified by the synthetic-surfacing Contractor.

1.2 SUMMARY

A. Installs full depth poured-in-place two component UV stabilized and mercury-free elastomic polyurethane Dual Burometer Synthetic Surfacing System with encapsulated textured finish. Track system shall adhere to performance standards for synthetic athletic surfacing according to IAAF Standards.

B. Layout and paint all track lines and event markings as required and specified by current IAAF and NCAA rules.

1.3 COORDINATION

A. The synthetic surfacing Contractor shall coordinate the work specified with an authorized and appointed representative of the owner so as to perform the work during a period and in a manner acceptable to the owner.

1.4 CODES AND STANDARDS

A. Applicable Publications: Codes and standards follow the current guidelines set forth by the International Amateur Athletic Association (IAAF), the National Collegiate Athletic Federation (NCAA) along with the current material testing guidelines as published by the American Society of Testing and Materials (ASTM).

B. Performance Standards: The new synthetic track surfacing system shall

exhibit the following minimum performance standards.

1.	Thickness	Average ≥ 12 mm Minimum 10 mm
2.	Force Reduction	35 to 50N
3.	Modified Vertical Deformation	0.6 to 1.8mm
4.	Friction TRRL Skid Resistance	≥ 47
5.	Tensile Strength	≥ 0.5N/m^2
6.	Elongation at break	≥ 4.0GN/m^2

1.5 CONTRACTOR QUALIFICATIONS

A. The synthetic surfacing Contractor and the polyurethane manufacturer shall be the same company.

B. The synthetic-surfacing Contractor must have a minimum of five years experience in the installation of full depth poured in place two component elastomeric polyurethane synthetic track system.

C. The polyurethane manufacturer must have a minimum of 10 years of uninterrupted experience with the compound two-part polyurethane for athletic surfaces.

D. The supervisor for the installation must have installed a minimum of 5 full depth two component polyurethane tracks with encapsulated texture in the last 3 years. A reference list must be submitted.

1.6 SUBMITTALS

A. The following submittals must be received with bid submittal.

1. Standard printed specifications of the synthetic track surfacing system to be installed on this project.
2. An affidavit attesting that the synthetic track surfacing material to be installed meets the requirements defined by the manufacturer's currently published specifications and any modifications outlined in those technical specifications.

B. A synthetic track surfacing sample, 12"x12" in size, color, texture, thickness, etc. of the same synthetic track surfacing system specified herein.

C. A list of facilities installed, including the installing supervisor of the exact dual-durometer system.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Elastomeric Polyurethane: Two components UV stabilized elastomeric polyurethane compounded from polyol and isocyanate components, based on 100% MDI and Mercury-Free System. No Mercury.

B. The elastomertic polyurethane shall be red in color.

C. EPDM Granulate:

1. .5 to1.5 millimeter peroxide cured EPDM granulate.

D. The EPDM granulate shall be red in color and match the UV stabilized elastomeric polyurethane.

E. Rubber Granulate:

1. Fine mesh Styrene Butadiene Rubber (SBR) processed ground to a graded size not to exceed 20 mesh in size.
2. A maximum of fourteen percent, by weight of the synthetic track system, of SBR will be allowed.

2.2 ALIPHATIC COATING

A. Two component aliphatic coating mixed with solvent for spray ability.

B. Aliphatic coating shall be red in color matching the UV stabilized elastomeric polyurethane.

C. No clear coatings will be allowed.

D. Line Marking Paint.

1. Single component moisture cured aliphatic paint.

PART 3 - EXECUTION

3.1 INSTALLATION-GENERAL

A. Subbase: The Synthetic Track Surfacing System shall be laid on an approved subbase. The General Contractor shall provide compaction test results of 95% or greater for the installed subbase and asphalt surface.

B. For NCAA and IAAF certification the following criteria must be followed.

The track surface i.e., asphalt substrate, shall not vary from planned cross slope by more than ±.1% with a maximum lateral scope outside of 1% and a maximum slope of .1% in any running direction. The finished asphalt shall not vary under a 10' straightedge more than 1/8".

It should be the responsibility of the asphalt-paving Contractor to flood the surface immediately after the asphalt is capable of handling traffic, but within 24 hours. If, after 20 minutes of drying time, there are birdbaths evident, it shall be the responsibility of the Architect, in conjunction with the surfacing Contractor to determine the method of correction. No cold tar patching, skin patching or sand mix patching will be acceptable.

Any oil spills (hydraulic, diesel, motor oil, etc.) must be completely removed, ether by chipping out or removing and replacing with new, keyed in asphalt. The minimum curing time for asphalt base is 28 days. It shall be the responsibility of the surfacing Contractor to determine if the asphalt substrate has cured sufficiently prior to the application of polyurethane surfacing system.

It shall be the responsibility of the general Contractor to determine if the asphalt substrate meets all design specifications, i.e. cross slopes, planarity and specific project criteria. After all the above conditions are met, the synthetic-surfacing Contractor must, in writing, accept the planarity of the asphalt-receiving base, before work can commence.

C. Thickness:

1. Total thickness of the Dual-Durometer synthetic Track Surfacing System shall be 10 mm minimum.

D. Equipment:

1. The Dual-Durometer Synthetic Track Surfacing System components shall be processed and installed by specially designed machinery with automatic electronic portioning, which provides continuous mixing, feeding and finishing for accurate quality controlled installation.
2. No hand mixing will be allowed.

3.3 MATERIALS

A. Base Course:

1. The fine mesh SBR granules and UV stabilized elastomeric polyurethane shall be metered and mixed together on site to regulate the ratio/quantity of SBR, not to exceed fourteen percent in the

system and insure an even distribution of the granules throughout the eight millimeter base course. No multi-layerd system allowed.

B. Resilient Wearing Course:

1. The .5 to 1.5 millimeter EPDM granules shall be mechanically integrated with an UV stabilized elastomeric polyurethane to the full depth of the five-millimeter wearing course. The resilient textured finish shall be a dense matrix of encapsulated EPDM granules.
2. The homogeneous wearing course shall be applied in situ with the base course.
3. No structural spray applications of any type will be allowed.

C. Protective Coating:

1. The initial red pigmented aliphatic polyurethane coating shall be spray applied over the entire synthetic surfaced area at a rate of 125 square feet per gallon.
2. The second red pigmented aliphatic polyurethane coating shall be spray applied over the initial application at a rate of 125 square feet gallon in the opposite direction.

D. Site Conditions:

1. Installation shall not take place if adjacent or concurrent construction generates excessive dust, abrasives or any other by-product that, in the opinion of the installer, would be harmful to the track material, until completion of such works.
2. If in the opinion of the installer of the synthetic material that weather and/or climatic conditions are detrimental to the proper installation of the surfacing materials, work shall be delayed until conditions are acceptable. Preferred installation temperature is fifty degrees Fahrenheit and rising. Installation shall be executed only in dry conditions.

3.4 LINE STRIPPING AND EVENT MARKINGS

A. Layout:

1. Line stripping and event markings shall be laid out in accordance with current IAAF and NCAA rules.

B. Certification:

1. Upon completion the owner shall be supplied with all necessary computations and drawings as well as a letter of certification attesting to the accuracy of the markings.

3.5 GUARANTEE

A. Synthetic Track Surfacing System shall be fully guaranteed against faulty workmanship and material failure for a period of five (5) years from the date of acceptance.

B. Synthetic surfacing material found to be defective as a result of faulty workmanship and/or material failure shall be replaced or repaired at no charge, upon written notification within the guarantee period.

END OF SECTION 02990

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

B. Cast-in-place concrete includes the following:

1. Foundations and footings.
2. Slabs-on-grade.
3. Foundation walls.
4. Load-bearing building walls.
5. Equipment pads and bases.
6. Concrete sills.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Portland Cement Concrete Paving" for concrete paving and walks.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials and others if requested by Contracting Officer/Project Manager.

C. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.

D. Samples of materials as requested by Contracting Officer/Project Manager, including names, sources, and descriptions, as follows:

1. Color finishes.
2. Normal weight aggregates.
3. Fiber reinforcement.
4. Reglets.
5. Waterstops.
6. Vapor retarder/barrier.
7. Form liners.

E. Laboratory test reports for concrete materials and mix design test.

F. Material certificates in lieu of material laboratory test reports when permitted by Contracting Officer/Project Manager. Manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements shall sign material certificates. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
2. ACI 318, "Building Code Requirements for Reinforced Concrete."
3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

B. Concrete Testing Service: Engage a testing agency acceptable to Architect to perform material evaluation tests and to design concrete mixes.

C. Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.
2. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches (38 mm) to the plane of the exposed concrete surface.

1. Provide ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in the concrete surface.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615 Grade 60 (ASTM A 615M Grade 400), deformed.

B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

1. Use one brand of cement throughout project unless otherwise acceptable to Architect.

B. Fly Ash: ASTM C 618, Type F.

C. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.

1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
2. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Contracting Officer/Project Manager.

D. Lightweight Aggregates: ASTM C 330.

E. Water: Potable.

F. Fiber Reinforcement: Polypropylene fibers engineered and designed for secondary reinforcement of concrete slabs, complying with ASTM C 1116, Type III, not less than 3/4 inch long.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Durafiber, Durafiber Corp.
b. Fibermesh, Fibermesh Co., Div. Synthetic Industries, Inc.
c. Grace Fibers, W.R. Grace & Co.

G. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.

H. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Air-Mix or Perma-Air, Euclid Chemical Co.
b. Darex AEA or Daravair, W.R. Grace & Co.
c. MB-VR or Micro-Air, Master Builders, Inc.
d. Sealtight AEA, W.R. Meadows, Inc.

I. Water-Reducing Admixture: ASTM C 494, Type A.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Chemtard, ChemMasters Corp.
b. WRDA, W.R. Grace & Co.

2.4 RELATED MATERIALS

A. Reglets: Where sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 0.0217- inch- (0.46-mm-) thick galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

B. Dovetail Anchor Slots: Hot-dip galvanized sheet steel, not less than 0.0336 inch thick (0.76 mm) with bent tab anchors. Fill slot with temporary filler or cover face opening to prevent intrusion of concrete or debris.

C. Waterstops: Provide flat, dumbbell-type or centerbulb-type waterstops at construction joints and other joints as indicated. Size to suit joints.

D. Polyvinyl Chloride Waterstops: Corps of Engineers CRD-C 572.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to, the following:

a. The Burke Co.
b. Greenstreak Plastic Products Co.
c. W.R. Meadows, Inc.

E. Sand Cushion: Clean, manufactured or natural sand.

F. Vapor Retarder: Provide vapor retarder that is resistant to deterioration when tested according to ASTM E 154, as follows:

1. Polyethylene sheet not less than 8 mils (0.2 mm) thick.
2. Water-resistant barrier consisting of heavy kraft papers laminated together with glass-fiber reinforcement and overcoated with black polyethylene on each side.

a. Product: Subject to compliance with requirements, provide Moistop by Fortifiber Corporation.

G. Vapor Barrier: Premolded seven-ply membrane consisting of reinforced core and carrier sheet with fortified bitumen layers, protective weathercoating, and plastic antistick sheet. Water vapor transmission rate of 1 perm when tested according to ASTM E 96, Method B. Provide manufacturer's recommended mastics and gusset tape.

1. Product: Subject to compliance with requirements, provide Sealtight Premoulded Membrane by W.R. Meadows, Inc.

H. Nonslip Aggregate Finish: Provide fused aluminum oxide granules or crushed emery as the abrasive aggregate for a nonslip finish, with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide. Use material that is factory-graded, packaged, rustproof, nonglazing, and unaffected by freezing, moisture, and cleaning materials.

I. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m), complying with AASHTO M 182, Class 2.

J. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Polyethylene film.

K. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Aquafilm, Conspec Marketing and Mfg. Co.
b. Eucobar, Euclid Chemical Co.
c. Confilm, Master Builders, Inc.

L. Underlayment Compound: Free-flowing, self-leveling, pumpable, cement-based compound for applications from 1 inch (25 mm) thick to feathered edges.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Self-Leveling Wear Topping, W.R. Bonsal Co.
b. LevelLayer II, Dayton Superior Corp.
c. Gyp-Crete, Gyp-Crete Corp.

d. Underlayment 110, Master Builders, Inc.
e. Thoro Underlayment Self-Leveling, Thoro System Products.

M. Bonding Agent: Polyvinyl acetate or acrylic base.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Polyvinyl Acetate (Interior Only):

1) Superior Concrete Bonder, Dayton Superior Corp.
2) Weld-Crete, Larsen Products Corp.
3) Ready Bond, Symons Corp.

N. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit project requirements.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Burke Epoxy M.V., The Burke Co.
b. Resi-Bond (J-58), Dayton Superior.
c. Concresive Standard Liquid, Master Builders, Inc.
d. Rezi-Weld 1000, W.R. Meadows, Inc.

2.5 PROPORTIONING AND DESIGNING MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

1. Do not use the same testing agency for field quality control testing.
2. Limit use of fly ash to not exceed 25 percent of cement content by weight.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.

C. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:

1. 3000 psi (20.7 MPa), 28-day compressive strength; water-cement ratio, 0.58 maximum (non-air-entrained), 0.46 maximum (air-entrained).

D. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:

1. Subjected to Freezing and Thawing: W/C 0.45.

E. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Reinforced Foundation Systems: Not less than 1 inch (25 mm) and not more than 3 inches (75 mm).
2. Other Concrete: Not more than 4 inches (100 mm).

F. Lightweight Structural Concrete: Lightweight aggregate and concrete shall conform to ASTM C 330. Proportion mix to produce concrete with a minimum compressive strength of 3000 psi (20.7) at 28 days and a calculated equilibrium unit weight of 110 pcf (1762 kg/cu. m) plus or minus 3 pcf (48.1 kg/cu. m) as determined by ASTM C 567. Concrete slump at the point of placement shall be the minimum necessary for efficient mixing, placing, and finishing. Maximum slump shall be 6 inches (150 mm) for pumped concrete and 5 inches (125 mm) elsewhere. Air entrains concrete exposed to weather according to ACI 301 requirements.

G. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Contracting Officer/Project Manager. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Contracting Officer/Project Managers before using in work.

2.6 ADMIXTURES

A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).

2.7 CONCRETE MIXING

A. Job-Site Mixing: Mix concrete materials in appropriate drum-type batch machine mixer.

For mixers of 1 cu. yd. (0.76 cu. m) or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than 1 cu. yd. (0.76 cu. m), increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).

1. Provide batch ticket for each batch discharged and used in the work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

B. Ready-Mixed Concrete: Comply with requirements of ASTM C 94 and as specified.

1. When air temperature is between 85 deg F (29 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

3.2 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concretes members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:

1. Provide Class A tolerances for concrete surfaces exposed to view.
2. Provide Class C tolerances for other concrete surfaces.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustication's, reglets, chamfers, blocking, screeds, bulkheads, anchorage's and inserts, and other features required in the work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.

E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.3 VAPOR RETARDER/BARRIER INSTALLATION

A. General: Place vapor retarder/barrier sheeting in position with longest dimension parallel with direction of pour.

B. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended mastic or pressure-sensitive tape.

1. Cover vapors retarder/barrier with sand cushion and compact to depth indicated.

3.4 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

1. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement placement and concretizing operations. Repair damages before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Contracting Officer.

D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.

B. Provide keyways at least 1-1/2 inches (38 mm) deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.

D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

E. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Support and protect exposed waterstops during progress of work. Field-fabricate joints in waterstops according to manufacturer's printed instructions.

F. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Joint fillers and sealant are specified in Division 7 Section "Joint Sealant."

G. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8 inch (3 mm) wide by one-fourth of slab depth or inserts 1/4 inch (6 mm) wide by one-fourth of slab depth, unless otherwise indicated.

1. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
2. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
3. If joint pattern is not shown, provide joints not exceeding 15 ft. (4.5 m) in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
4. Joint fillers and sealant are specified in Division 7 Section "Joint Sealant."

3.6 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.

C. Install dovetail anchor slots in concrete structures as indicated on drawings.

D. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.7 PREPARING FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.8 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.

1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

3. Maintain reinforcing in proper position on chairs during concrete placement.

F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

G. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Contracting Officer/Project Manager.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch (6 mm) in height rubbed down or chipped off.

B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces.

Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 MONOLITHIC SLAB FINISHES

A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.

1. After screeding, consolidating, and leveling concrete slabs, does not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F (F) 18 (floor flatness) and F (L) 15 (floor levelness) measured according to ASTM E 1155 (ASTM E 1155M). Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and termination's slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.

D. Provide moisture curing by the following methods:

1. Keep concrete surface continuously wet by covering with water.
2. Use continuous water-fog spray.
3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch (100-mm) lap over adjacent absorptive covers.

E. Provide moisture-retaining cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches (75 mm) and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

F. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:

1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
2. Use membrane-curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

G. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

H. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.

1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.13 SHORES AND SUPPORTS

A. General: Comply with ACI 347 for shoring and reshoring in multistory construction and as specified.

B. Extend shoring from ground to roof for structures four stories or less, unless otherwise permitted.

C. Extend shoring at least three floors under floor or roof being placed for structures over four stories. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this levels in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.

D. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.

E. Keep reshores in place a minimum of 15 days after placing upper tier, or longer, if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.14 REMOVING FORMS

A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.15 REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Contracting Officer/Project Manager.

3.16 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Contracting Officer/Project Manager.

B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh (1.2 mm) sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch (6 mm) in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch (25 mm). Make edges of cuts perpendicular to the concrete surface.

Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.

2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discoloration's that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.

4. Repair defective areas, except random cracks and single holes not exceeding 1 inch (25 mm) in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

E. Repair isolated random cracks and single holes 1 inch (25 mm) or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

F. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

G. Repair methods not specified above may be used, subject to acceptance of Architect.

3.17 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: The Owner will employ a testing agency to perform tests and to submit test reports.

B. Sampling and testing for quality control during concrete placement may include the following, as directed by Architect.

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

a. Testing is required for every truckload of concrete and every batch mixed on site.

C. Test results will be reported in writing to Contracting Officer/Project Manager, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Contracting Officer/Project Manager.

Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION 03300

SECTION 03350 - CONCRETE TOPPINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes concrete floor toppings applied over previously placed base slabs.

B. Types of concrete floor toppings include:

1. Standard aggregate toppings.

1.3 REFERENCES

A. Comply with requirements of Section "Cast-In-Place Concrete" and as herein specified.

1.4 SUBMITTALS

A. Furnish product data, samples, laboratory test reports, and materials certificates as specified in Section "Cast-In-Place Concrete."

PART 2 - PRODUCTS

2.1 CEMENT AND AGGREGATES

A. Portland Cement: ASTM C 150, Type I or Type III.

1. Furnish white cement if required to obtain finish color to match Contracting Officer and/or Project Managers's sample.

B. Normal Weight Aggregate: ASTM C 33, and as follows:

1. Fine aggregate, consisting of sand or crushed stone screenings, clean, hard, free of deleterious matter. Grade by weight to pass sieves as follows:

a. No. 8 (2.4 mm): 80-90 percent

C. Reinforcement: ASTM A 185, welded steel wire fabric.

2.2 TOPPING MIX

A. Standard Topping: Design mix to produce topping material with the following characteristics:

1. Compressive strength: 3500 psi (24 MPa) at 28 days.
2. Slump: 8 inches (200 mm) maximum at point of placement for concrete containing high-range water-reducing admixture (super-plasticizer) and 3 inches (75 mm) maximum for other concrete.
3. Maximum W/C ratio: 0.51.

2.3 MIXING

A. Provide batch type mechanical mixer for mixing topping material at project site. Equip batch mixer with a suitable charging hopper, water storage tank, and a water measuring device. Use only mixers that are capable of mixing aggregates, cement, and water into a uniform mix within specified time, and of discharging mix without segregation.

B. Mix each batch of 2 cu. yd. (1.5 cu. m) or less for at least 1-1/2 minutes after ingredients are in mixer. Increase mixing time 15 seconds for each additional cubic yard (meter) or fraction thereof.

1. Ready-mixed topping may be used when acceptable to Contracting Officer and/or Project Managers. When acceptable, furnish ready-mixed topping complying with requirements of ASTM C 94.

PART 3 - EXECUTION

3.1 CONDITION OF SURFACES

A. Topping Applied to Fresh Concrete: Do not begin placement of topping until water ceases to rise to surface, and water and laitance have been removed from base slab surface.

B. Topping Applied to Hardened Concrete: Remove dirt, loose material, oil, grease, paint, or other contaminants, leaving a clean surface.

1. When base slab surface is unacceptable for good bonding, roughen surface by chipping or scarifying before cleaning. Prior to placing topping mixture, thoroughly dampen slab surface but do not leave standing water. Over dampened surface apply specified bonding compound (rewettable or nonrewettable) or epoxy adhesive. Place topping mix after rewettable bonding compound has dried or while nonrewettable bonding compound or epoxy adhesive is still tacky.

C. For reinforced toppings, provide necessary chairs or supports, and maintain position of reinforcing mesh as shown on drawings.

D. Joints: Mark locations of joints in base slab so that joints in top course will be placed directly over them.

3.2 PLACING AND FINISHING

A. Float Finish: Spread topping mixture evenly over prepared base to the required elevation and strike off. Use highway straightedge, bull float, or darby to level surface. After the topping has stiffened sufficiently to permit the operation, and water sheen has disappeared, float the surface at least twice to a uniform sandy texture. Restraighten where necessary with highway straightedge. The surface shall achieve an F/F of 20 and F/L of 17 tolerance when tested in accordance with ASTM E 1155 (ASTM E 1155M). Uniformly slope surface to drains.

B. Where joints are required, construct to match and coincide with joints in base slab. Provide other joints as shown.

C. Trowel Finish: After floating, begin first trowel finish operation using power driven trowels. Continue troweling until surface is ready to receive final troweling. Begin final troweling when a ringing sound is produced as trowel is moved over surface.

D. Continue final trowel operation to produce finished surface free of trowel marks, uniform in texture and appearance, and achieving an F/F of 25 and F/L of 20 tolerance when tested in accordance with ASTM E 1155 (ASTM E 1155M).

E. Ground Surface Finish: Begin surface grinding, using power-driven, abrasive stone floor grinders, after wearing course has hardened sufficiently to prevent displacing aggregate particles. Keep floor wet during grinding process. Remove ground-off material with squeegee and flush with water.

F. Fill air holes, pits, and other blemishes with cement grout of same materials as used for topping. Spread grout over surface and work into openings with a steel straight edge. Rub grout into floor surface by using grinding machine. Keep floor moist an additional 3 days before final grinding.

G. When topping surface is in proper condition, begin second or final grinding to remove grout film and polish surface. After final grinding and polishing, wash thoroughly and remove surplus material.

1. Conduct grinding operations and use such techniques as required to provide surface finish to match Contracting Officer and/or Project Managers's sample.

3.3 CURING AND PROTECTION

A. Cure and protect topping applications and finishes as specified in Section "Cast-In-Place Concrete."

3.4 PERFORMANCES

A. Failure of concrete topping to bond to substrate (as evidenced by a hollow sound when tapped), or disintegration or other failure of topping to perform as a floor finish, will be considered failure of materials and workmanship. Repair or replace toppings in areas of such failures, as directed.

END OF SECTION 03350

SECTION 03520 - INSULATING CONCRETE DECKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes cast-in-place lightweight insulating concrete, placed over structural subbase installed by others.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data describing products and methods of mixing and application instructions.

C. Certificates by an independent testing laboratory stating that materials and mix intended to be used meet specified requirements.

1.4 QUALITY ASSURANCE

A. Insulating Concrete Supplier: Regularly engaged in production of lightweight insulating concrete materials.

B. Insulating Concrete Applicator: Regularly engaged and properly equipped for application of lightweight insulating concrete, and as acceptable by aggregate producer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original undamaged packages or acceptable bulk containers.

B. Store packaged materials to protect them from elements or physical damage.

C. Do not use cement that shows indications of moisture damage, caking, or other deterioration.

1.6 JOB CONDITIONS

A. Do not place lightweight insulating concrete when ambient temperature is at or below freezing (32 deg F (0 deg C)).

B. When air temperature has fallen or is expected to fall below 40 deg F (4 deg C), heat water to a maximum 120 deg F (49 deg C) before mixing to attain lightweight concrete at point of placement with temperature of 50 deg F (10 deg C) min. and 80 deg F (27 deg C) max.

C. Do not place lightweight insulating concrete on surfaces covered with standing water, snow, or ice.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III.

B. Mineral Aggregate: ASTM C 332, Group I.

C. Sand Aggregate: ASTM C 33.

D. Water: Clean, potable.

E. Air-Entraining Admixture: ASTM C 260.

F. Control Joint Filler: ASTM C 612, Class 2, glass fiber type, Compressing to one-half thickness under a load of 25 psi (172 kPa).

G. Reinforcing Mesh: Welded wire fabric, ASTM A 185, galvanized.

H. Insulation Board: Rigid polystyrene boards or formed units with minimum density of 1 pcf (16 kg/cu. m) complying with ASTM C 578. Provide units with keying holes of approximately 3 percent of board gross surface area.

2.2 DESIGN MIX

A. General: Design lightweight insulating concrete mix to produce the following minimum physical properties.

1. Wet Density at Point of Placement: 38 to 40 pcf (610 to 640 kg/cu. m), when tested in accordance with ASTM C 138.
2. Oven-Dry Density: 24 to 30 pcf (385 to 480 kg/cu. m), when tested in accordance with ASTM C 495.

3. Compressive Strength: Minimum 125 psi (860 kPa), when tested in accordance with ASTM C 495.
4. Wet Density at Point of Placement: 44 to 60 pcf (705 to 960 kg/cu. m), when tested in accordance with ASTM C 138.
5. Oven-Dry Density: 22 to 28 pcf (350 to 450 kg/cu. m), when tested in accordance with ASTM C 495.
6. Compressive Strength: Minimum 125 psi (860 kPa), when tested in accordance with ASTM C 495.

B. Do not exceed maximum air content recommended by aggregate manufacturer.

C. Use minimum amount of water necessary to produce a workable mix.

PART 3 - EXECUTION

3.1 PREPARATION

A. Control Joints: Install control joints at perimeter of roof deck and at junctures with vertical surfaces, including curbs, walls, and vents, for full depth of insulating concrete.

1. Provide 1 inch (25 mm) wide expansion joint material for roof areas with dimensions up to 100 ft. (30 m) in length; 1-1/2 inches (38 mm) thick for roof area dimensions exceeding 100 ft. (30 m).

B. Reinforcing Mesh: Place reinforcing mesh at right angles to structural supports; end laps at least 6 inches (150 mm) and no side laps. Cut to fit around roof openings and projections. Terminate mesh at control joints.

3.2 PLACEMENT

A. Place lightweight insulating concrete in accordance with manufacturer's instructions, using equipment and procedures to avoid segregation of mix and loss of air content. Deposit and screed in a continuous operation until an entire panel or section of roof area is completed. Do not vibrate or work mix except for screeding or floating. Place lightweight insulating concrete to depths and slopes as shown on drawings. Leave top surface in acceptable condition to receive subsequent roofing application.

B. Begin curing operations immediately after placement, and air cure for not less than 3 days in accordance with manufacturer's recommendations.

C. Provide temporary protection of removable waterproof covering to prevent direct exposure to moisture if roofing application is not started immediately after completion of curing.

2.3 FIELD QUALITY CONTROL

A. Engage an independent testing laboratory acceptable to Contracting Officer and/or Project Managers to take samples and conduct tests to evaluate lightweight insulating concrete. Do not use same testing service that provided initial mix designs.

B. Owner will engage an independent testing laboratory to take samples and conduct tests to evaluate lightweight insulating concrete.

1. Take samples in accordance with ASTM C 172, except as modified by ASTM C 495.
2. Determine wet density in accordance with ASTM C 138.
3. Determine compressive strength and oven-dry density in accordance with ASTM C 495. Make at least 6 molds during each placement.

C. Report test results to Contracting Officer and/or Project Managers and lightweight insulating concrete producer within 24 hours of completion of each test.

2.4 DEFECTIVE WORK

A. General: Refinish, or remove and replace lightweight insulating concrete surfaces that are too rough to receive finish roofing, or where physical properties do not meet specified requirements, as determined by Contracting Officer and/or Project Managers.

END OF SECTION 03520

SECTION 04200 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Concrete unit masonry.
2. Masonry waste disposal.
3. Glazed CMU 4 split faced CMU.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Flashing and Sheet Metal" for exposed sheet-metal flashing installed in masonry.
2. Division 10 Section "Louvers and Vents" for wall vents.

C. Products furnished but not installed under this Section include the following:

1. Dovetail slots for masonry anchors installed under Division 3 Section "Cast-in-Place Concrete."
2. Anchor sections of adjustable masonry anchors for connecting to structural frame installed under Division 5 Section "Structural Steel."

D. Products installed but not furnished under this Section include the following:

1. Steel lintels for unit masonry specified in Division 5 Section "Metal Fabrications."
2. Steel shelf angles for unit masonry specified in Division 5 Section "Metal Fabrications."
3. Wood nailers and blocking built into unit masonry specified in Division 6 Section "Rough Carpentry."
4. Manufactured reglets in masonry joints for metal flashing specified in Division 7 Section "Flashing and Sheet Metal."
5. Hollow metal frames in unit masonry openings specified in Division 8 Section "Standard Steel Doors and Frames."

1.3 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm) at 28 days.

1. For Concrete Unit Masonry: As follows, based on net area:

a. f'm = 1500 psi (10.3 MPa).

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each different masonry unit, accessory, and other manufactured product specified.

C. Shop drawings for stone trim in the form of cutting and setting drawings showing sizes, profiles, and locations of each stone trim unit required.

D. Samples for initial selection of the following:

1. Unit masonry samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.
2. Colored-masonry mortar samples showing the full range of colors available.

E. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.

1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
2. Each material and grade indicated for reinforcing bars.
3. Each type and size of joint reinforcement.
4. Each type and size of anchors, ties, and metal accessories.

F. Material test reports from a qualified independent testing agency, employed and paid by Contractor or manufacturer, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:

1. Mortar complying with property requirements of ASTM C 270.
2. Mortar complying with BIA M1.
3. Grout mixes. Include description of type and proportions of grout ingredients.
4. Masonry units.

G. Qualification data for firms and persons specified in the "Quality Assurance" Article to

demonstrate their capabilities and experience.

Include lists of completed projects with project names and addresses, names and addresses of Contracting Officer and/or Project Managers and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Contractor shall employ and pay a qualified professional engineer to provide a survey and inspection of foundations for compliance with dimensional tolerances.

B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Contracting Officer and/or Project Manager's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM C 1093, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the work.

C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

D. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

E. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:

1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:

a. 40 to 32 deg F (4 to 0 deg C): Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C).
b. 32 to 25 deg F (0 to -4 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry.
c. 25 to 20 deg F (-4 to -7 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49

deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C) if grouting. Use heat on both sides of walls under construction.

d. 20 deg F (-7 deg C) and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C). Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F (0 deg C) within the enclosures.

2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:

a. 40 to 25 deg F (4 to -4 deg C): Cover masonry with a weather-resistant membrane for 48 hours after construction.
b. 25 to 20 deg F (-4 to -7 deg C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h (25 km/h).
c. 20 deg F (-7 deg C) and Below: Provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 48 hours after construction.

3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Concrete Masonry Units:
2. Prefaced Concrete Masonry Units:

a. Burns & Russell Co. (The).

b. Trenwyth Industries, Inc.
c. Oldcastle, Inc.

3. Portland Cement, Mortar Cement, Masonry Cement, and Lime:

a. Essroc Materials, Inc.
b. Glen-Gery Corporation.
c. Riverton Corporation (The).

4. Mortar Pigments:

a. Davis Colors.
b. Lafarge Corporation.
c. Solomon Grind-Chem Services, Inc.

5. Joint Reinforcement, Ties, and Anchors:

a. AA Wire Products Co.
b. Dur-O-Wal, Inc.
c. Masonry Reinforcing Corp. of America.

2.2 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners, except where indicated as bullnose.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated below:

a. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated.

2. Aggregates: Do not use aggregates made from pumice, scoria, or tuff.
3. Provide Type I, moisture-controlled units.
4. Size: Manufactured to the actual dimensions listed below (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes indicated on drawings:

a. 6 inch nominal: 5-5/8 inch (143 mm) actual.
b. 8 inch nominal: 7-5/8 inch (194 mm) actual.

c. 12 inch nominal: 11-5/8 inch (295 mm) actual.

5. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Masonry Cement: ASTM C 91.

1. For pigmented mortars, use premixed, colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 5 percent of masonry cement by weight for mineral oxides nor 1 percent for carbon black.
2. For colored-aggregate mortars, use masonry cement of natural color or white as required to produce mortar color indicated.

2.4 INSULATION FOR CONCRETE MASONRY WALLS

A. Masonry block insulation inserts designed to fit into the open cells of exterior concrete masonry units. Insulation shall conform to ASTM C578-90, type 1, performed Celluar Polystyrene Thermal Insulation. Minimum density shall be 1.0 pcf. Thermal resistance value ® shall be 3.85 at 75 degrees F for one inch thickness. Insulation shall be 3 inches thick and shall be pre-installed against the inner face shell of masonry units at the factory.

PART 3 - EXECUTION

3.1 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

3.2 LINTELS

A. Install steel lintels where indicated.

B. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.3 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.

C. Install flashing as follows:

1. At lintels and shelf angles, extend flashing a minimum of 4 inches (100 mm) into masonry at each end. At heads and sills, extend flashing 4 inches (100 mm) at ends and turn up not less than 2 inches (50 mm) to form a pan.
2. Cut off flashing flush with face of wall after masonry wall construction is completed.

D. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

E. Install vents in vertical head joints at the top of each continuous cavity. Space vents and close off cavities vertically and horizontally with blocking in manner indicated.

1. Install through-wall flashing and weep holes above horizontal blocking.

F. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

3.4 INSTALLATION OF REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Do not exceed the following pour heights for fine grout:

   a. For minimum widths of grout spaces of 2 inches (51 mm) or for minimum grout space of hollow unit cells of 2 by 3 inches (51 by 76 mm), pour height of 60 inches (1524 mm).

2. Provide cleanout holes at least 3 inches (76 mm) in least dimension for grout pours over 60 inches in height.

   a. Provide cleanout holes at each vertical reinforcing bar.
   b. At solid grouted masonry, provide cleanout holes at not more than 32 inches o.c.

3.5 FIELD QUALITY CONTROL

A. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. (460 sq. m) of wall area or portion thereof.

B. Mortar properties will be tested per property specification of ASTM C 270.

C. Mortar composition and properties will be evaluated per ASTM C 780.

D. Grout will be sampled and tested for compressive strength per ASTM C 1019.

F. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM E 447, Method B, and as follows:

   1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

G. Evaluation of Quality-Control Tests: In the absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality-control tests comply with minimum requirements indicated.

3.6 PARGING

A. Parge predampened masonry walls, where indicated, with Type S or Type N mortar applied in 2 uniform coats to a total thickness of 3/4 inch). Scarify first parging coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp cure parging for at least 24 hours and protect until cured.

3.7 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units.

Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Contracting Officer and/or Project Manager's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean brick by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using the following masonry cleaner:

    a. Job-mixed detergent solution.

6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.8 MASONRY WASTE DISPOSAL

A. Recycling: Undamaged, excess masonry materials are Contractor's property and shall be removed from the project site for his use.

B. Disposal as Fill Material: Dispose of clean masonry waste, including broken masonry

units, waste mortar, and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches (100 mm) in greatest dimension.
2. Mix masonry waste with at least 2 parts specified fill material for each part masonry waste. Fill material is specified in Division 2 Section "Earthwork."
3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

C. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above, and other masonry waste and legally dispose of off Owner's property.

END OF SECTION 04200

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.

1. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.
2. Refer to Division 3 for anchor bolt installation in concrete, Division 4 for anchor bolt installation in masonry.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
2. High-strength bolts (each type), including nuts and washers.

a. Include Direct Tension Indicators if used.

3. Structural steel primer paint.
4. Shrinkage-resistant grout.

C. Shop drawings prepared under supervision of a licensed Structural Engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.

1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.

D. Test reports conducted on shop- and field-bolted and welded connections. Include data on type(s) of tests conducted and test results.

E. Certified copies of each survey conducted by a licensed Land Surveyor, showing elevations and locations of base plates and anchor bolts to receive structural steel and final elevations and locations for major members. Indicate discrepancies between actual installation and contract documents.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges."

a. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence:

1) "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any detail configuration of connections developed by the fabricator as a part of his preparation of these shop drawings."

2. AISC "Specifications for Structural Steel Buildings," including "Commentary."
3. "Specifications for Structural Joints using ASTM A 325 (ASTM A 325M) or ASTM A 490 (ASTM A 490M) Bolts" approved by the Research Council on Structural Connections.
4. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel."

5. ASTM A 6 (ASTM A 6M) "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

2. If recertification of welders is required, retesting will be Contractor's responsibility.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and relubricate before use.

1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.

B. Structural Steel Shapes, Plates, and Bars: ASTM A 36 (ASTM A 36M).

C. Cold-Formed Steel Tubing: ASTM A 500, Grade B.

D. Hot-Formed Steel Tubing: ASTM A 501.

E. Steel Pipe: ASTM A 53, Type E or S, Grade B; or ASTM A 501.

1. Finish: Black, except where indicated to be galvanized.

F. Steel Castings: ASTM A 27 (ASTM A 27M), Grade 65-35, medium-strength carbon steel.

G. Headed Stud-Type Shear Connectors: ASTM A 108, Grade 1015 or 1020, cold-finished carbon steel with dimensions complying with AISC Specifications.

H. Anchor Bolts: ASTM A 307 (ASTM F 568), nonheaded type unless otherwise indicated.

I. Unfinished Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), regular low-carbon steel bolts and nuts.

1. Provide hexagonal heads and nuts for all connections.
2. Provide either hexagonal or square heads and nuts, except use only hexagonal units for exposed connections.

J. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A 325 (ASTM A 325M).

a. Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B 695, Class 50, or hot-dip galvanized complying with ASTM A 153.

2. Quenched and tempered alloy steel bolts, nuts, and washers, complying with ASTM A 490 (ASTM A 490M).

K. Direct Tension Indicators: ASTM F 959, type as required.

1. Use on allASTM A 325 (ASTM A 325M) and ASTM A 490 (ASTM A 490M) bolts.
2. Use on allASTM A 325 (ASTM A 325M) and ASTM A 490 (ASTM A 490M) bolts on connections that are slip critical.
3. Use at Contractor's option.

L. Electrodes for Welding: Comply with AWS Code.

M. Structural Steel Primer Paint: SSPC - Paint 1; red lead and oil.

N. Structural Steel Primer Paint: SSPC - Paint 2; red lead-iron oxide, oil alkyd.

O. Structural Steel Primer Paint: SSPC - Paint 13.

P. Structural Steel Primer Paint: Fabricator's standard rust- inhibiting primer.

Q. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.

R. Metallic Shrinkage-Resistant Grout: Premixed factory-packaged ferrous aggregate grouting compound.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. 100 Non-Shrink Grout (Metallic); Conspec, Inc.
b. Firmix; Euclid Chemical Co.
c. Vibra-Foil; W. R. Grace.
d. Ferrogrout; L & M Construction Chemicals, Inc.
e. Embeco 885; Master Builders.
f. Protalico; Protex Industries, Inc.
g. Kemox G; Sika Corporation.
h. Ferrolith G; Sonneborn/Rexnord.

S. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. 100 Non-Shrink Grout (Non-Metallic); Conspec, Inc.
b. Supreme Grout; Cormix, Inc.
c. Sure Grip Grout; Dayton Superior.

d. Euco N.S.; Euclid Chemical Co.
e. Crystex; L & M Construction Chemicals, Inc.
f. Masterflow 713; Master Builders.
g. Sealtight 588 Grout; W. R. Meadows.
h. Propak; Protex Industries, Inc.
i. Set Non-Shrink; Set Products, Inc.
j. Five Star Grout; U.S. Grout Corp.

2.2 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

B. Connections: Weld or bolt shop connections, as indicated.

C. Bolt field connections, except where welded connections or other connections are indicated.

1. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
2. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.

D. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 (ASTM A 325M) or ASTM A 490 (ASTM A 490M) Bolts."

E. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

F. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.

G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld shear connectors in field, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

H. Steel Wall Framing: Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square, and true members in completed wall framing.

I. Build up welded door frames attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld steel bar stops to frames, except where shown removable. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches (250 mm) o.c., unless otherwise indicated.

J. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.

K. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.

L. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

M. Expansion Joints: Provide expansion joints in steel shelf angles when part of structural steel frame; locate at vertical brick expansion joints as indicated on drawings.

2.3 SHOP PAINTING

A. General: Shop-paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches (50 mm) of embedded areas only.

1. Do not paint surfaces to be welded or high-strength bolted with friction-type connections.
2. Do not paint surfaces scheduled to receive sprayed-on fireproofing.

3. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

B. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

1. SP-1 "Solvent Cleaning."
2. SP-2 "Hand-Tool Cleaning."
3. SP-3 "Power-Tool Cleaning."
4. SP-5 "White Metal Blast Cleaning."
5. SP-6 "Commercial Blast Cleaning."
6. SP-7 "Brush-Off Blast Cleaning."
7. SP-10 "Near-White Blast Cleaning."

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils (0.04 mm). Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.

D. Painting: Provide a one-coat, shop-applied paint system complying with Steel Structures Painting Council (SSPC) Paint System Guide No. 7.00.

2.4 SOURCE QUALITY CONTROL

A. General: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

1. Promptly remove and replace materials or fabricated components that do not comply.

B. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

1. Promptly notify Contracting Officer and/or Project Managers whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 - EXECUTION

3.1 ERECTION

A. Surveys: Employ a licensed land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Contracting Officer and/or Project Managers. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with Contracting Officer and/or Project Managers.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
4. For proprietary grout materials, comply with manufacturer's instructions.

E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

F. Level and plumb individual members of structure within specified AISC tolerances.

G. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

H. Splice members only where indicated and accepted on shop drawings.

I. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

J. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Contracting Officer and/or Project Managers. Finish gas-cut sections equal to a sheared appearance when permitted.

K. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

1. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

L. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint on structural steel is included in Division 9 under painting work.

3.2 QUALITY CONTROL

A. Engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

B. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

C. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

D. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

E. Testing agency may inspect structural steel at plant before shipment.

F. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.

G. Shop-Bolted Connections: Inspect or test in accordance with AISC specifications.

1. Verify that gaps of installed Direct Tension Indicators are less than gaps specified in ASTM F 959, Table 2.

H. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
2. Perform visual inspection of all welds.
3. Perform tests of welds as follows. Inspection procedures listed are to be used at Contractor's option.

    a. Liquid Penetrant Inspection: ASTM E 165.
    b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.
    c. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
    d. Ultrasonic Inspection: ASTM E 164.

I. Field-Bolted Connections: Inspect in accordance with AISC specifications.

1. For Direct Tension Indicators, comply with requirements of ASTM F 959. Verify that gaps are less than gaps specified in Table 2.

J. Field Welding: Inspect and test during erection of structural steel as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
2. Perform visual inspection of all welds.
3. Perform tests of welds as follows:

    a. Liquid Penetrant Inspection: ASTM E 165.
    b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.
    c. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
    d. Ultrasonic Inspection: ASTM E 164.

END OF SECTION 05120

SECTION 05310 - STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Steel roof deck.
2. Composite steel floor deck.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section "Cast-in-Place Concrete" for concrete fill and reinforcing steel.
2. Division 3 Section "Insulating Concrete Decks" for lightweight insulating concrete fill.
3. Division 5 Section "Structural Steel" for shop-welded shear connectors.
4. Division 5 Section "Metal Fabrications" for framing openings with miscellaneous steel shapes.
5. Division 9 Section "Painting" for touchup and repair painting of deck.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of deck, accessory, and product specified.

C. Shop drawings showing layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

1. For steel deck indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for its preparation.

D. Product certificates signed by manufacturers of steel deck certifying that their products comply with specified requirements.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

F. Product test reports from qualified independent testing agencies evidencing compliance with requirements of the following based on comprehensive testing:

1. Mechanical fasteners.

G. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence steel deck's compliance with the building code in effect for the project.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed steel deck similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Contracting Officer and/or Project Manager's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the work.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Fire-Test-Response Characteristics: Where indicated, provide steel deck panels identical to those tested as part of an assembly for fire resistance per ASTM E 119 by a testing and inspection agency performing testing and follow-up services, that is acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: As indicated by design designations listed in UL "Fire Resistance Directory," or by Warnock Hersey or another testing and inspecting agency.
2. Labeling: Identify steel deck with appropriate markings of applicable testing and inspecting agency.

E. FM Listing: Provide steel roof deck evaluated by Factory Mutual and listed in Factory Mutual "Approval Guide" for Class 1 fire rating and Class 1-60 windstorm ratings.

F. Engineer Qualifications: A professional engineer legally authorized to practice in the jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of steel deck similar to this project in material, design, and extent and that have a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.6 COORDINATION

A. Coordinate installation of sound-absorbing insulation strips in acoustic deck ribs with related units of work specified in other Sections to ensure that the insulation is protected against damage from effects of the weather and other causes.

B. Coordinate installation of trench headers, preset inserts, and duct fittings in cellular metal floor deck with related units of work specified in other Sections prior to casting concrete slab.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Bowman Metal Deck Armco, Inc.
2. United Steel Deck, Inc.
3. Vulcraft Div. of Nucor Corp.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels without top-flange stiffening grooves conforming to SDI Publication No. 28 "Specifications and Commentary for Steel Roof Deck" and the following:

1. Deck Profile: Type IR, intermediate rib.
2. Profile Depth: 1-1/2 inches (38 mm).
3. Design Uncoated-Steel Thickness: 0.0295 inch (0.75 mm).
4. Span Condition: As indicated.

2.3 FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels with integrally embossed or raised pattern ribs and interlocking side laps, conforming to SDI Publication No. 28 "Specifications and Commentary for Composite Steel Floor Deck," the minimum section properties indicated, and the following:

1. Galvanized-Steel Sheet: ASTM A 446, Grade A, G 90 (ASTM A 446M, Grade A, Z 275) zinc coated according to ASTM A 525 (ASTM A 525M).
2. Profile Depth: 2 inches (51 mm).
3. Design Uncoated-Steel Thickness: 0.0474 inch (1.20 mm).
4. Span Condition: As indicated.

2.4 ACCESSORIES

A. General: Provide accessory materials for steel deck that comply with requirements indicated and recommendations of the steel deck manufacturer.

B. Mechanical Fasteners: Manufacturer's standard, corrosion-resistant, low-velocity, powder-actuated or pneumatically driven carbon steel fasteners; or self-drilling, self-threading screws.

C. Side Lap Fasteners: Manufacturer's standard, corrosion-resistant, hexagonal washer head; self-drilling, carbon steel screws, No.10 minimum diameter.

D. Rib Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

E. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip glass fiber or mineral fiber.

F. Miscellaneous Roof Deck Accessories: Steel sheet, 0.0359-inch-thick minimum ridge and valley plates, finish strips, and reinforcing channels, of same material as roof deck.

G. Pour Stops and Girder Fillers: Steel sheet, of same material as deck panels, and of thickness and profile indicated.

H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material and thickness as deck panels, unless otherwise indicated.

I. Hanger Tabs: Manufacturer's standard piercing steel sheet hanger attachment devices for floor deck panels.

J. Weld Washers: Manufacturer's standard uncoated-steel sheet weld washers, shaped to fit deck rib, 0.0598 inch thick with 3/8-inch minimum diameter prepunched hole.

K. Flat Receiver Pan: Manufacturer's standard size, single-piece steel sheet, 0.071-inch- thick minimum units, of same material as deck panels. Cut holes for drains in the field.

L. Shear Connectors: ASTM A 108, Grade 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B.

M. Steel Sheet Accessories: ASTM A 446, G 60 (ASTM A 446M, Z 180) coating class, galvanized according to ASTM A 525 (ASTM A 525M).

N. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

O. Preset Inserts: Manufacturer's standard, UL-labeled single-piece preset inserts, fabricated from either steel sheet galvanized according to ASTM A 525, G 60 (ASTM A 525M, Z 180) coating class, or zinc sheet, with removable covers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of steel deck.

3.2 PREPARATION

A. Do not place deck panels on concrete supporting structure until concrete has cured and is dry.

B. Locate decking bundles to prevent overloading of supporting members.

3.3 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary of SDI Publication No. 28, manufacturer's recommendations, and requirements of this Section.

B. Install temporary shoring before placing deck panels when required to meet deflection limitations.

C. Place deck panels on supporting framing and adjust to final position with ends accurately aligned and bearing on supporting framing before being permanently fastened. Do not stretch or contract side lap interlocks.

1. Align cellular deck panels for entire length of run of cells and align cells at ends of abutting panels.

D. Place deck panels flat and square and fasten to supporting framing without warp or deflection.

E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to the decking.

F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

H. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's instructions.

3.4 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches (38 mm) long, and as follows:

1. Weld Diameter: 3/4 inch nominal.
2. Weld Spacing: Space and locate welds as indicated.
3. Weld Washers: Install weld washers at each weld location.

B. Side Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding 36 inches, using one of the following methods:

1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon steel screws.

C. End Bearing: Install deck ends over supporting framing with a minimum end bearing of 1-1/2 inches with end joints as follows:

1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking, and weld flanges to top of deck. Space welds not more than 12 inches apart with at least one weld at each corner.

E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's recommendations. Weld to substrate to provide a complete deck installation.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's instructions to ensure complete closure.

G. Sound-Absorbing Insulation: Install premolded, roll or strip sound-absorbing insulation according to deck manufacturer's instructions.

3.5 FLOOR DECK INSTALLATION

A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 3/4 inch nominal.
2. Weld Spacing: Space and locate welds as indicated.
3. Weld Washers: Install weld washers at each weld location.

B. Side Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, or at intervals not exceeding 36 inches using one of the following methods:

1. Mechanically clinch or button punch.

C. End Bearing: Install deck ends over supporting framing with a minimum end bearing of 1-1/2 inches with end joints as follows:

1. End Joints: Lapped or butted at Contractor's option.

D. Shear Connectors: Weld shear connectors through deck to support framing according to AWS D1.1 and manufacturer's instructions. Butt end joints of deck panels; do not overlap.

E. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

F. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck according to SDI recommendations to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.

G. Maintain smooth cellular raceway interiors free of welds or mechanical fasteners.

H. Install piercing hanger tabs not more than 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides, unless otherwise indicated.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: A qualified independent testing agency employed and paid by Owner will perform field quality-control testing.

B. Field welds will be subject to inspection.

C. Shear connector welds will be inspected and tested according to the requirements of AWS D1.1 for stud welding and as follows:

1. Shear connector welds will be visually inspected.
2. Bend tests will be performed when visual inspections reveal either less than a continuous 360 degree flash or welding repairs to any shear connector.
3. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to the requirements of AWS D1.1.

D. Testing agency will report test results promptly and in writing to Contractor and Contracting Officer and/or Project Managers.

E. Remove and replace work that does not comply with specified requirements.

F. Additional testing will be performed to determine compliance of corrected work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces with galvanized repair paint according to ASTM A 780 and the manufacturer's instructions.

B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on both surfaces of installed deck panels.

1. Touch up painted surfaces with same type of shop paint used on adjacent surfaces.

2. Where shop-painted surfaces are exposed in-service, apply touchup paint to blend into adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting of field welds, abraded areas, and rust spots, as required after erection and before proceeding with field painting, are included in Division 9 Section "Painting."

D. Provide final protection and maintain conditions to ensure steel decking is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Interior load-bearing steel-stud walls.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
2. Division 9 Section "Gypsum Board Assemblies" for gypsum board and non-load-bearing metal-stud framing and ceiling-suspension assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. AISI "Specifications": Calculate structural characteristics of cold-formed metal framing according to AISI's "Load and Resistance Factor Design Specification for Cold-Formed Steel Structural Members" and the following:

1. Center for Cold-Formed Steel Structures (CCFSS) Technical Bulletin, Vol. 2, No. 1, February 1993 "AISI Specification Provisions for Screw Connections."

B. Structural Performance: Engineer, fabricate, and erect cold-formed metal framing to withstand design loads within limits and under conditions required.

1. Design framing systems to withstand design loads without deflections greater than the following:

a. Interior Load-Bearing Walls: Lateral deflection of 1/360 of the wall height.

2. Design framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.

C. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering cold-formed metal framing by employing a qualified professional engineer to prepare design calculations, shop drawings, and other structural data.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of cold-formed metal framing, accessory, and product specified.

C. Mill certificates signed by manufacturers of cold-formed metal framing certifying that their products comply with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, and galvanized-coating thickness.

1. In lieu of mill certificates, submit test reports from a qualified independent testing agency evidencing compliance with requirements.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Contracting Officer and/or Project Managers and owners, and other information specified.

F. Product test reports from a qualified independent testing agency evidencing compliance with requirements of the following based on comprehensive testing:

1. Expansion anchors.
2. Powder-actuated anchors.
3. Mechanical fasteners.

G. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence cold-formed metal framing's compliance with building code in effect for project.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this

project and with a record of successful in-service performance.

B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Contracting Officer and/or Project Managers satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the work.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Fire-Test-Response Characteristics: Where fire-resistance-rated assemblies are indicated, provide cold-formed metal framing identical to that tested as part of an assembly for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: As indicated by design designations listed in UL "Fire Resistance Directory," or by Warnock Hersey or another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Professional Engineer Qualifications: A professional engineer legally authorized to practice in the jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of cold-formed metal framing similar to this Project in material, design, and extent and that have a record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated in the work include, but

are not limited to, the following:

1. Dale Industries, Inc.
2. Dietrich Industries, Inc.
3. United States Steel.

2.2 WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: 0.0747 inch (1.90 mm).
2. Flange Width: 2-1/2 inches (63 mm).
3. Web: Punched.
4. Studs:3-5/8 min.

B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: Matching steel studs.

2.3 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36 (ASTM A 36M), zinc coated by the hot-dip process according to ASTM A 123.

B. Cast-in-Place Anchor Bolts and Studs: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel hex-head bolts and studs; carbon-steel nuts; and flat, unhardened-steel washers. Zinc coated by the hot-dip process according to ASTM A 153.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.4 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and a 30-minute working time.

D. Thermal Insulation: ASTM C 665, Type I, unfaced mineral-fiber blankets produced by combining glass or slag fibers with thermosetting resins.

2.5 GYPSUM SHEATHING

A. Sheathing: Comply with requirements of Division 9 Section "Gypsum Sheathing."

A. Gypsum Sheathing Board with Water-Resistant Core: Gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material surfaced on face, back, and long edges with water-repellent paper bonded to the core. Comply with ASTM C 79 and requirements indicated below:

1. Type: Regular.
2. Edge and End Configuration: V-shaped, tongue-and-groove long edges; square ends.
3. Thickness: 1/2 inch (12.7 mm).

B. Available Products: Subject to compliance with requirements, gypsum sheathing boards that may be incorporated in the work include, but are not limited to, the following:

1. Gypsum Sheathing Board with Water-Resistant Core, Regular Type:

a. G-P Gypsum Sheathing; Georgia-Pacific Corp.

b. Gold Bond Building Products Div.
c. USG Gypsum Sheathing; United States Gypsum Co.

C. Sheathing Fasteners: ASTM C 954, steel drill screws, Type S-12 fluted tip, a minimum of 1-1/4 inches (32 mm) long, with organic-polymer coating or other corrosion-protective coating.

2.6 TAPES AND SEALANT

A. Sheathing Tape: Tape specifically designed and manufactured to seal joints in gypsum sheathing against water and air infiltration, formulated with an adhesive that permanently bonds to gypsum sheathing substrates, and as indicated below:

1. Self-adhering, glass-fiber tape, 2 inches (51 mm) wide, 10-by-10 or 10-by-20 threads per inch (25.4 mm), of type recommended by tape manufacturer to use with siliconized emulsion sealant in sealing joints and fasteners for gypsum sheathing, and with a history of successful in-service use.
2. Available Products: Subject to compliance with requirements, sheathing tapes that may be incorporated in the work include, but are not limited to, the following:

a. No. 8086 Contractor Sheathing Tape; 3M Construction Markets.
b. Perma-Tite Tape--PGM 207A; PermaGlass-Mesh, Inc.
c. Quik-Tape; Quik-Tape, Inc.

B. Silicone Emulsion Sealant: Product complying with ASTM C 834, compatible with sealant tape and gypsum sheathing, recommended by manufacturers of both sheathing and tape for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Product: Subject to compliance with requirements, provide Elmer's Siliconized Acrylic Latex Caulk; Borden, Inc.

2.7 AIR-INFILTRATION BARRIER

A. Provide one of the following products:

B. Provide the following product:

1. Polyethylene sheet, 0.0061 inch (0.15 mm) thick, formed by spinning continuous strands of fine, high-density polyethylene interconnected fibers and bonding them together by heat and pressure; incorporating an additive to provide ultralight resistance for up to 120 days; with a water-vapor transmission rate equaling 669 g in 24 hours through 1 sq. m of surface per ASTM E 96 procedure B and flame-spread and smoke-developed ratings of 0

and 25, respectively, per ASTM E 84.

C. Available Products: Subject to compliance with requirements, air-infiltration barriers that may be incorporated in the work include, but are not limited to, the following:

1. Tyvek Housewrap; DuPont Company, Fibers Department.
2. Typar HouseWrap; Reemay, Inc.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.

1. Fabricate framing assemblies in jig templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted.
4. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

5. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to manufacturer's recommendations.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or distortion.

C. Fabrication Tolerances: Fabricate assemblies to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a

maximum out-of-square tolerance of 1/8-inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements, including installation tolerances and other conditions affecting performance of cold-formed metal framing. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed-on fireproofing is applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed-on fireproofing.

B. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of cold-formed framing without reducing thickness of fireproofing below that required to obtain fire-resistance rating indicated. Protect remaining fireproofing from damage.

C. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation or it may be field assembled.

B. Install cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

C. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

D. Provide temporary bracing and leave in place until framing is permanently stabilized.

E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

F. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and double studs, inaccessible upon completion of framing work.

G. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

H. Erection Tolerances: Install cold-formed metal framing to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacing recommended by the manufacturer, but not greater than the following:

1. Spacing: 24 inches for nail or power-driven anchors.

B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom track. Space studs as follows:

1. Stud Spacing: 24 inches.

C. Set studs plumb, excepts as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align joists over studs. Where joists cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than the stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated or required by manufacturer.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. Where type of supplementary support is not indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced in rows not more than 48 inches apart. Fasten at each stud intersection.

1. Bridging: Combination of flat, steel-sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

J. Install steel-sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom track. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 GYPSUM SHEATHING INSTALLATION

A. General: Install gypsum-sheathing board according to manufacturer's instructions and GA-253 "Application of Gypsum Sheathing."

B. Install tongue-and-groove gypsum sheathing horizontally with long edges at right angles to studs with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent board without

forcing. Abut ends of boards over centers of studs and stagger end joints. Fasten gypsum-sheathing board to framing with self-drilling, bugle-head screws, as follows:

3.6 TAPE AND SEALANT APPLICATION

A. Sheathing Tape: Apply sheathing tape to joints in sheathing; overlap tape by not less than the tape width at joint intersections.

1. For polyethylene tape, apply primer, specified by tape manufacturer, to sheathing surfaces. In addition, apply polyethylene tape, 2 inches (50 mm) square, to completely cover each exposed fastener.
2. For glass-fiber tape, apply approximately a 3/8-inch (9.5-mm) bead of siliconized emulsion sealant to tapes along joints and embed sealant into tapes along their entire surface with a trowel. In addition, apply sealant with a trowel to each exposed fastener so that fasteners are completely covered.

3.7 AIR-INFILTRATION BARRIER INSTALLATION

A. Cover sheathing with air-infiltration barrier as follows:

1. Apply plastic sheet according to manufacturer's printed recommendations with a 4-inch (102-mm) overlap.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: A qualified independent testing agency employed and paid by Owner will perform field quality control testing.

B. Field and shop welds will be subject to inspection and testing.

C. Testing agency will report test results promptly and in writing to Contractor and Contracting Officer and/or Project Managers.

D. Remove and replace work that does not comply with specified requirements.

E. Additional testing will be performed to determine compliance of corrected work with specified requirements.

3.9 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanizing repair paint according to ASTM A 780 and the manufacturer's instructions.

B. Touchup Painting: Wire brushes, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing.

1. Touchup painted surfaces with same type of shop paint used on adjacent surfaces.

C. Protect gypsum sheathing that will be exposed to weather for more than one month as follows:

1. Protect cutouts, corners, and joints in the sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at the time sheathing is applied.

D. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer to ensure that cold-formed metal framing is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following metal fabrications:

1. Ladders (Ships Ladders). Elevator Pit.
2. Loose Steel Lintels.
3. Miscellaneous Framing and Supports for the following:

   a. Applications where framing and supports are not specified in other sections.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Structural Steel" for structural steel framing system components.
2. Division 5 Section "Metal Stairs" for metal framed stairs with metal pan, metal plate, or grating treads.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the work.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Steel Plates, Shapes, and Bars: ASTM A 36 (ASTM A 36M).

C. Rolled Steel Floor Plates: ASTM A 786 (ASTM A 786M).

D. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500.
2. Hot-Formed Steel Tubing: ASTM A 501.

E. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.

1. Black finish, unless otherwise indicated.
2. Galvanized finish for exterior installations and where indicated.

F. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either1ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27 (ASTM A 27M) cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

G. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 ALUMINUM

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T6.

B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632 (ASTM B 632M) Pattern 1, alloy 6061-T6.

2.3 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.4 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electro- deposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.

C. Machine Screws: ANSI B18.6.3 (ANSI B18.6.7M).

D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).

E. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).

F. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).

2.5 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

1. Nonshrink, Nonmetallic Grouts:

a. Diamond-Crete Grout; Concrete Service Materials Co.
b. Sure-grip High Performance Grout; Dayton Superior Corp.
c. Sealtight 588 Grout; W. R. Meadows, Inc.

2.6 CONCRETE FILL

A. Concrete Materials and Properties: Comply with requirements of Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless higher strengths are indicated.

2.7 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 100 deg F (55.5 deg C).

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.8 LOOSE STEEL LINTELS

A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels for equal bearing of 1 inch per foot (85 mm per m) of clear span but not less than 8 inches (200 mm) bearing at each side of openings, unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls.

2.9 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

a. Except as otherwise indicated, space anchors 24 inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.

C. Galvanize miscellaneous framing and supports in the following locations:

1. Exterior locations.
2. Interior locations where indicated.

2.10 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.

B. Finish metal fabrications after assembly.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 ALUMINUM FINISHES

A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surface level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.3 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use nonshrink, metallic grout in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a 2.0-mil (0.05-mm) minimum dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting."

C. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05510 - METAL STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Straight run, steel-framed stairs.
2. Steel pipe handrails and railing systems attached to metal stairs.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Division 5 Section "Pipe and Tube Railings" for pipe and tube handrails and railing systems.
2. Division 5 Section "Metal Fabrications for pipe and tube handrails and railing systems.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate, and install steel stairs to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of steel stairs.

1. Treads of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft. (4.8 kN/sq. m) or a concentrated load of 300 lbf (1.35 kN) on a area of 4 sq. inches (26 sq. cm) located in the center of the tread, whichever produces the greater stress.
2. Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft. (4.8 kN/sq. m).
3. Stair Framing: Capable of withstanding stresses resulting from loads specified above as well as stresses resulting from railing system loads.

B. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E 985 for structural performance based on the following:

1. Testing performed according to ASTM E 894 and E 935.
2. Structural computations.

C. Structural Performance: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each of the respective components of each metal fabrication.

1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:

   a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
   b. Uniform load of 50 lbf per linear foot (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf per linear foot (1460 N/m) applied vertically downward.
   c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:

   a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
   b. Uniform load of 50 lbf per linear foot (730 N/m) applied in any direction.
   c. Concentrated and uniform loads above need not be assumed to act concurrently.

3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbf (890 N) applied to one sq. ft. (0.09 sq. m) at any point in the system including panels, intermediate rails, balusters, or other elements composing the infill area.

   a. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for metal stairs, prefilled metal pan stair treads, nonslip aggregates and nonslip aggregate surface finishes, cast nosings, extruded nosings, steel floor plate, paint products, and grout.

C. Shop drawings detailing fabrication and installation of steel stairs. Include plans, elevations, sections, and details of steel stairs and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

1. For installed steel stairs indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.

D. Samples for verification of the following products, in the form of sections of units in manufacturer's standard sizes. Prepare samples from same material to be used for the work.

1. Precast stair treads.
2. Extruded abrasive nosings.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Contracting Officer and/or Project Managers and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing steel stairs similar to those indicated for this project with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the work.

B. Installer Qualifications: Arrange for steel stair installation specified in this Section by the same firm that fabricated them.

C. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of metal stairs (including handrails and railing systems) similar to this project in

material, design, and extent and that have a record of successful in-service performance.

D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pre-assembled stair units that may be incorporated in the work include, but are not limited to, the following:

1. American Metal Works, Inc.
2. American Stair Corp., Inc.
3. The Sharon Companies, Ltd.

2.2 FERROUS METALS

A. Metal Surfaces, General: For surfaces exposed to view in the completed work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, roughness, or, for steel sheet, variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36 (ASTM A 36M).

C. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500.
2. Hot-Formed Steel Tubing: ASTM A 501.

a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.

D. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.

1. Galvanized finish for exterior installations and where indicated.

E. Rolled Steel Floor Plate: ASTM A 786 (ASTM A 786M).

F. Steel Bars for Gratings: ASTM A 569 (ASTM A 569M) or ASTM A 36 (ASTM A 36M).

G. Wire Rod for Grating Cross Bars: ASTM A 510 (ASTM A 510M).

H. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:

1. Cold-Rolled Steel Sheet: ASTM A 366 (ASTM A 366M).
2. Hot-Rolled Steel Sheet: ASTM A 569 (ASTM A 569M).

I. Galvanized Steel Sheet: Quality as follows:

1. Structural Quality: ASTM A 446; Grade A, G 90 (ASTM A 446M); Grade A, Z 275) coating, unless otherwise indicated, or unless another grade is required for design loading.
2. Commercial Quality: ASTM A 526 (ASTM A 526M), G 90 (Z 275) coating designation, unless otherwise indicated.

J. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.3 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electro-deposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head type, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.

C. Machine Screws: ANSI B18.6.3 (ANSI B18.6.7M).

D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).

E. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).

F. Lock Washers: Helical, spring type, carbon steel, ANSI B 18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assemblies of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).

2.4 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.5 EXTRUDED ABRASIVE NOSINGS

A. Fabricate units of material, sizes, and configurations indicated. Provide extruded aluminum units with abrasive filler consisting of aluminum oxide or silicon carbide grits, or a combination of both, in an epoxy-resin binder. Furnish in lengths as required to accurately fit each opening or conditions.

1. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above the aluminum extrusion.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. American Safety Tread Co., Inc.
2. Armstrong Products, Inc.
3. Safe-T-Metal Co.

C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with the manufacturer.

D. Drill for mechanical anchors with countersunk holes located not more than 4 inches (100 mm) from ends and not more than 12 inches (300 mm) o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by the manufacturer.

2.6 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

1. Nonshrink, Nonmetallic Grouts:

a. Sealtight 588 Grout; W. R. Meadows, Inc.
b. Sonogrout 14; Sonneborn Building Products--ChemRex, Inc.
c. Kemset; The Spray-Cure Company.

2.7 PRECAST CONCRETE TREADS

A. Concrete Materials and Properties: Comply with requirements of Division 3 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5,000 psi (35 MPa) and a total air content of not less than 4 percent nor more than 6 percent.

B. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 inches by 2 inches--W0.3 by W0.3 (16 ASW gage or 0.0625-inch diameter) (50 mm by 50 mm--1.6 mm by 1.6 mm); comply with ASTM A 185 and ASTM A 82, except for minimum wire size.

2.8 FABRICATION, GENERAL

A. Form steel stairs from materials of size, thickness, and shapes indicated, but not less than that needed to comply with performance requirements indicated.

Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Shear and punch metals cleanly and accurately.

D. Remove sharp or rough areas on exposed surfaces.

E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Shop Assembly: Pre-assemble in shop to greatest extent possible to minimize field splicing and assembly. Use connections that maintain structural value of joined pieces. Clearly mark units for field assembly and coordinated installation.

I. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.9 STEEL-FRAMED STAIRS

A. General: Construct stairs to conform to sizes and arrangements indicated. Join pieces together by welding, unless otherwise indicated.

Provide complete stair assemblies, including metal framing, hangers, columns, handrails, railing systems, newels, balusters, struts, clips, brackets, bearing plates, or other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.

1. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual" for class of stair designated, except where more stringent requirements are indicated.

    a. Commercial class, unless otherwise indicated.
    b. Architectural class where indicated.

2. Fabricate treads and platforms of exterior stairs to accommodate slopes to drain in finished traffic surfaces.

B. Stair Framing: Fabricate stringers of structural steel channels, plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; and bolt or weld newels and framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finish surfaces.

1. Where masonry walls support steel stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal Pan Risers, Subtreads, and Subplatforms: Shape metal pans for risers and subtreads to conform to configuration shown. Provide thicknesses of structural steel sheet for metal pans indicated, but not less than that required, to support total design loading.

1. Form metal pans of uncoated hot-rolled steel sheet, unless otherwise indicated.
2. Form metal pans of galvanized-steel sheet, where indicated.
3. Directly weld risers and subtreads to stringers; locate welds on side of metal pans to be concealed by concrete fill.
4. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
5. Shape metal pans to include nosing integral with riser.
6. Attach cast abrasive nosings to pan risers. Make nosings full width of tread with noses flush with riser faces and tread surfaces.

7. Attach extruded abrasive nosings to pan risers. Make nosings full width of tread with noses flush with riser faces and tread surfaces.
8. At Contractor's option, provide prefabricated stair assemblies with prefilled treads consisting of prepoured reinforced concrete fill, with nonslip aggregate finish, in welded sheet metal pan, attached to installed stringers using manufacturer's standard connection detail.
9. Provide epoxy-resin-filled treads, reinforced with glass fibers, with slip-resistant, abrasive surface.
10. Provide subplatforms of configuration and construction indicated; if not indicated, of same metal as risers and subtreads, in thicknesses required to support design loading. Attach subplatform to platform framing members with welds.

    a. Smooth Soffit Construction: Construct subplatforms with smooth soffits.

D. Steel Floor Plate Treads and Platforms: Provide raised pattern steel floor plate in pattern indicated or, if not indicated, as selected from manufacturer's standard patterns.

E. Floor Grating Treads and Platforms: Provide patterns, spacing, and bar sizes indicated; fabricate to comply with ANSI/NAAMM MBG 531 "Metal Bar Grating Manual."

1. Fabricate treads from welded steel grating with 1-1/4-by-3/16-inch (32-by-4.8-mm) bearing bars at 15/16 inch (24 mm) o.c. and cross bars at 4 inches (100 mm) o.c., NAAMM designation: W-15-4 (1-1/4 x 3/16) STEEL.
2. Surface: Plain.
3. Finish: Shop prime paint.

F. Fabricate grating treads with steel plate nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.

G. Fabricate grating platforms with nosing matching that on grating treads at all landings. Provide toe plates at open-sided edges of grating platform. Secure grating to platform frame with welds.

2.10 STEEL PIPE HANDRAILS AND RAILING SYSTEMS

A. General: Fabricate pipe handrails and railing systems to comply with

requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.

B. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

1. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe to which end is joined, and weld all around.

C. Form changes in direction of handrails and rails as follows:

1. By welding in prefabricated flush elbow fittings.

D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

E. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

F. Close exposed ends of pipe by welding 3/16-inch- (4.8-mm-) thick steel plate in place or with prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch (6 mm) or less.

G. Fabricate newels of steel tubing and provide newel caps of gray-iron castings, as shown.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of handrails and railing systems to other work. Furnish inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work.

1. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

I. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

J. For galvanized handrails and railing systems, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

K. For nongalvanized steel handrails and railing systems, provide nongalvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

2.11 STAIR HANDRAILS AND RAILING SYSTEMS

A. General: Comply with applicable requirements of Division 5 Section "Pipe and Tube Railings" for steel pipe railings and handrails, and as follows:

1. Railings may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
2. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

2.12 FINISHES

A. General: Finish metal stairs after assembly.

1. Comply with NAAMM "Metal Finishes Manual" for recommendations on application and designations of finishes.

B. Galvanizing: Hot-dip galvanize items indicated to be galvanized to comply with applicable standard listed below:

1. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick and heavier.
2. Fill vent and drain holes that will be exposed in the finished work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed units:

1. Interiors (SSPC Zone 1A): SSPC SP 3 "Power Tool Cleaning."

D. Apply shop primer to uncoated surfaces, except those with galvanized finish or those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated.

Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, weld plates, and anchor bolts. Coordinate delivery of such items to project site.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing steel stairs to in-place construction; include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing steel stairs. Set units accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Install steel stairs by welding stair framing to steel structure or to weld plates cast into concrete, except where otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted field connections.

F. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with concrete or dissimilar metals with a heavy coat of bituminous paint.

H. Install precast treads with adhesive supplied by manufacturer.

3.3 INSTALLING STEEL STAIRS WITH GROUTED BASE PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base plates.

B. Set steel stair base plates on wedges or other adjustable devices. After the stairs have been positioned and aligned, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use nonmetallic, nonshrink grout, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLING STEEL PIPE RAILINGS AND HANDRAILS

A. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

1. Anchor posts to steel by welding directly to steel supporting members.
2. Anchor handrail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with drilled-in expansion anchors.

B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Use type of bracket with predrilled hole for exposed bolt anchorage.
3. For concrete and solid masonry anchorage, use drilled-in expansion anchor.
4. For hollow masonry anchorage, use toggle bolts having square heads.
5. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with stud installations for accurate location of backing members.
6. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on steel stairs are specified in Division 9 Section "Painting."

C. For galvanized surfaces, clean welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05510

SECTION 05521 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Aluminum pipe and tube handrails and railing systems.
2. Steel pipe and tube handrails and railing systems.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 5 Section "Metal Fabrications" for steel pipe handrails and railing systems.

1.3 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. For cold-formed structural steel: AISI "Specification for Design of Cold-Formed Steel Structural Members."
2. For aluminum: AA "Specifications for Aluminum Structures."

B. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections.

Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.

1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:

    a. Concentrated load of 200 lbf applied at any point and in any direction.
    b. Uniform load of 50 lbf per linear ft. applied horizontally and concurrently with uniform load of 100 lbf per linear ft. applied vertically downward.
    c. Concentrated load need not be assumed to act concurrently with uniform loads.

2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:

    a. Concentrated load of 200 lbf applied at any point and in any direction.
    b. Uniform load of 50 lbf per linear ft. applied in any direction.
    c. Concentrated and uniform loads need not be assumed to act concurrently.

3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbf applied to one sq. ft. at any point in the system including panels, intermediate rails, balusters, or other elements composing the infill area.

    a. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

C. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of handrails and railings to prevent buckling, opening up of joints, overstressing of components, connections and other detrimental effects. Base design calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified.

C. Shop drawings showing fabrication and installation of handrails and railings including plans, elevations, sections, details of components, and attachments to other units of work.

1. Where installed products are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by a qualified professional engineer responsible for their preparation.

D. Samples for verification purposes of each type of exposed finish required, prepared on components indicated below that are of the same thickness and metal indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

2. 6-inch-long sections of each distinctly different linear railing member including handrails, top rails, posts, and balusters.
3. Fittings and brackets.
4. Welded connections.

E. Test reports from independent testing laboratory evidencing compliance of handrails and railing systems with ASTM E 985.

F. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Contracting Officer/Project Managers and Owners, plus other information specified.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.

1.7 STORAGE

A. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

1.8 PROJECT CONDITIONS

A. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

5. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.9 SEQUENCING AND SCHEDULING

A. Sequence and coordinate installation of wall handrails as follows:

1. Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.
2. Mount handrails only on gypsum board assemblies reinforced to receive anchors and where the location of concealed anchor plates has been clearly marked for benefit of Installer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering handrails and railing systems that may be incorporated in the work include but are not limited to the following:

1. Aluminum Pipe and Tube Railing Systems:

a. Aluminum Tube Railing Inc.
b. Braun: J.G. Braun Co.
c. Wagner: R & B Wagner, Inc.

2. Steel Pipe and Tube Railing Systems:

a. Humane Equipment Co.
b. Wagner: R & B Wagner, Inc.

2.2 METALS

A. General: Provide metal forms and types that comply with requirements of referenced standards and that are free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.

B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required:

1. Extruded Bar and Tube: ASTM B 221, alloy 6063T5/T52.
2. Extruded Structural Pipe and Tube: ASTM B 429, 6063-T5/T52.
3. Drawn Seamless Tube: ASTM B 210, 6063-T832.
4. Plate and Sheet: ASTM B 209, 6061-T6.
5. Die and Hand Forgings: ASTM B 247, 6061-T6.
6. Castings: ASTM B 26, A356-T6.

C. Stain and Iron: Provide and iron in the form indicated, complying with the following requirements:

1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

a. Black finish, unless otherwise indicated
b. Galvanized finish for exterior installations and where indicated, or another weight, type, and grade required by structural loads.
c. Type F, standard weight (schedule 40), unless otherwise indicated, or another weight, type, and grade required by structural loads.

2. Steel Tubing: Product type (manufacturing method) and other requirements as follows:

a. Cold-Formed Round Steel Tubing: ASTM A 500, grade as indicated below:

1). Grade A, unless otherwise indicated or required by structural loads.

a. Hot-Formed Round Steel Tubing: ASTM A 501.
c. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.

3. Steel Plates, Shapes, and Bars: ASTM A 36 (ASTM A 36).
4. Gray Iron Castings: ASTM A 48, Class 30.

D. Brackets, Flanges, and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

2.3 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railing to other types of construction indicated and capable of withstanding design loadings.

1. For steel railings and fittings use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating or ASTM B 696, Class 12 for cadmium plating.

2. For aluminum railings provide fasteners fabricated from type 304 stainless steel.

C. Fasteners for Interconnecting Railing Components: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

1. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated.
2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

D. Cast-In-Place and Post-Installed Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.

1. Cast-in-place anchors.
2. Chemical anchors.
3. Expansion anchors.
4. Undercut anchors.

2.4 PAINT

E. Shop Primers: Provide primers to comply with applicable requirements of Division 9 Section "Painting".

B. Shop Primer for Ferrous Metal: Fast-curing, lead-and chromate-free, universal modified-alkyd primer, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure, comply with performance requirements of FS TT-P-664.

C. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and compatibility with finish paint systems indicated, complying with SSPC-Paint 5.

D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

E. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

2.5 GROUT AND ANCHORING CEMENT

F. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

G. Interior Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Use for interior applications only.

H. Erosion-Resistant Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

I. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include but are not limited to the following:

5. Nonshrink, Nonmetallic Grouts:

   a. "Sure-Grip High Performance Grout"; Dayton Superior Corp.
   b. "Sealtight 588 Grout"; W. R. Meadows, Inc.
   c. “Kemset”; Chem-Masters Corp.

6. Interior Anchoring Cement:

   a. "Ankertite Cement"; Dayton Superior Corp.
   b. "Por-Rok"; Minwax Construction Products Division.

7. Erosion-Resistant Anchoring Cement:

a. Bonsal Anchor Cement; W.R. Bonsal Co.
b. "Super Por-Rok"; Minwax Construction Products Division.
c. Thorogrip; thoro Systems Products.

2.6 FABRICATION

A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than those required to support structural loads.

B. Assemble handrails and railing systems in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

C. Form changes in direction of railing members as follows:

1. By insertion of prefabricated elbow fittings.
2. By radius bends of radius indicated.
3. By mitering at elbow bends.
4. By bending.
5. By any method indicated above, applicable to change of direction involved.

D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

E. Welded Connections: Fabricate railing systems and handrails for connection of members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

4. At tee and cross intersections, notch ends of intersecting members to

fit contour of pipe to which end is joined and weld all around.

5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

F. Nonwelded Connections: Fabricate railing systems and handrails for connection of members by means of railing manufacturer's standard concealed mechanical fasteners and fittings unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using epoxy structural adhesive where this represents manufacturer's standard splicing method.

G. Welded Connections for Aluminum Pipe: Fabricate pipe handrails and railing systems for connection of members by concealed internal welds, which eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

H. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors for interconnection of handrail and railing members to other construction.

I. Provide inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loadings imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.

J. For railing posts set in concrete, provide preset sleeves of steel, not less than 6 inches long and inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

K. For removable railing posts, fabricate slip-fit sockets from steel pipe whose inside diameter is sized for a close fit with posts and to limit deflection of post without lateral load, measured at top, to not more than 1/12 of post height. Provide socket covers designed and fabricated to resist accidental dislodgement.

1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

L. Shear and punch metals cleanly and accurately. Remove burrs from exposed

cut edges.

M. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

N. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

O. Fabricate joints that will be exposed to weather in a manner to exclude water.

P. Provide weepholes, or another means to evacuate entrapped water, in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.

Q. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

R. Toe Boards: Where indicated, provide toe boards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated for connection to, and centered between, each railing post.

S. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

2.7 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within 1/2 of the range of approved samples. Noticeable variations in the same piece are not acceptable.

Variations in appearance of other components are acceptable if they are within range of approved samples and they are assembled or installed to

minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of handrails and railing system.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

B. Mechanical Finish: AA-M12 (Mechanical Finish: as fabricated, nonspecular).

C. Class I Color Anodized Finish: AA-M12C22A42/A44 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, Medium Matte; Anodic Coating: Class I Architectural, film thicker than 0.7 mil with integral color or electrolytically deposited color) complying with AAMA 606.1 or AAMA 608.1.

1. Color: As selected by Contracting Officer/Project Manager from within standard industry colors and color density range.

2.9 STAINLESS STEEL FINISHES

A. Galvanized Finish: Hot-dip galvanize items indicated to be galvanized to comply with applicable standard listed below:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing iron and steel products made from rolled, pressed, and forged steel shapes, castings, plates, bars, and strips.

B. Fill vent and drain holes that will be exposed in the finished work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. For galvanized handrails and railings systems, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

D. For non-galvanized steel railings and railing systems, provide non-galvanized ferrous metal fittings, brackets, fasteners, and sleeves, except provide

galvanized anchors where embedded in exterior masonry and concrete construction.

E. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surfaces-preparation specifications and environmental exposure conditions of installed railings:

1. Exteriors (SSPC Zone 1B): SSPC-SP6" Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP7 "Brush-Off Blast Cleaning."

F. Apply shop primer to uncoated surfaces of handrails and railing components, except those with galvanized finish or to be embedded in concrete or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

1. Do not apply primer to galvanized surfaces.
2. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, that are to be embedded in concrete as masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections accurately together to form tight, hairline joints.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of handrails and railings.

Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/4 inch in 12 feet.
3. Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

D. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

E. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by design loading.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing handrails and railings to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use manufacturer's standard mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws with plastic filler cement colored to match finish of handrails and railing systems.

B. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100

percent contact or use manufacturer's standard fittings designed for this purpose.

C. Expansion Joints: Install expansion joints at locations indicated but not further apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Anchor posts in concrete by core drilling holes not less than 5 inches deep and 3/4 inch greater than outside diameter of post. Clean holes of all loose material, insert posts, and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.

1. Nonshrink, nonmetallic grout.
2. Nonshrink, nonmetallic grout or anchoring cement.

B. Cover anchorage joint with a round steel flange attached to post as follows:

1. By set screws.

C. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8-inch buildup, sloped away from post. For installations exposed on exterior or to flow of water, seal anchoring material to comply with grout manufacturer's directions.

D. Anchor posts to metal surfaces with oval flanges, angle type or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For stainless steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ANCHORING RAIL ENDS

A. Anchor rail ends into concrete and masonry with round flanges connected to rail ends and anchored into wall construction with post-installed anchors and bolts.

B. Anchor rail ends to metal surfaces with oval or round flanges.

2. Weld flanges to rail ends.
3. Connect flanges to rail ends using nonwelded connections.
4. Bolt flanges to metal surfaces.

C. Install removable railing sections where indicated in slip-fit metal sockets cast into concrete. Accurately locate sockets to match post spacing.

3.6 ATTACHMENT OF HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2-inch clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Use type of bracket with predrilled hole for exposed bolt anchorage.
3. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
4. For hollow masonry anchorage, use toggle bolts with square heads.
5. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with stud installations for accurate location of backing members.
6. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

3.7 ADJUSTING AND CLEANING

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

B. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 of these specifications.

C. For galvanized surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

D. Clean the following metals by washing thoroughly with clean water and soap, following by rinsing with clean water.

1. Aluminum.
2. Stainless steel.

3.8 PROTECTION

A. Protect finishes of railing systems and handrails from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 05521

SECTION 05530 - GRATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Heavy-duty metal bar gratings.
2. Metal frames and supports for gratings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Structural Steel" for structural steel framing system components.
2. Division 5 Section "Metal Stairs" for metal framed stairs with grating treads.
3. Division 5 Section "Pipe and Tube Railings" for metal pipe and tube handrails and railing systems.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate, and install gratings to withstand the following structural loads without exceeding the allowable design working stress of the grating materials, anchors, and connections.

1. Heavy-Duty Metal Bar Gratings: Capable of withstanding a uniform load of 250 lbf per sq. ft. (12 kN/sq. m) or a concentrated load of 8000 lbf (36 kN), whichever produces the greater stress.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for formed metal plank grating, manufacturer's clips and anchorage devices for gratings, and paint products.

C. Shop drawings detailing fabrication and erection of gratings. Include plans, sections, and details of connections. Show anchorage and accessory items.

Provide templates for anchors and bolts specified for installation under other sections.

1. For installed gratings indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" Article.

E. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project name, addresses and names of Contracting Officer and/or Project Managers and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing gratings similar to that indicated for this project with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the work.

B. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of gratings similar in material, design, and extent to that indicated for this project with a record of successful in-service performance.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.6 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which gratings must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1. Where field measurements cannot be made without delaying the work,

guarantee dimensions and proceed with fabricating gratings without field measurements.

Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36 (ASTM A 36M).

B. Steel Bars for Gratings: ASTM A 569 (ASTM A 569M) or ASTM A 36 (ASTM A 36M).

C. Wire Rod for Grating Cross Bars: ASTM A 510 (ASTM A 510M).

D. Uncoated Steel Sheet, Structural Quality: ASTM A 570 (ASTM A 570M), grade 33.

E. Galvanized Steel Sheet, Structural Quality: ASTM A 446, Grade A, and G 90 (ASTM A 446M, Grade A, and Z 275) coating designation.

F. Expanded Metal, Carbon Steel: ASTM F 1267, Class 1.

G. Expanded Metal, Galvanized: ASTM F 1267, Class 2, Grade A.

H. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.3 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electro-deposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Fasteners for Aluminum Gratings: Provide fasteners of aluminum, nonmagnetic stainless steel, zinc-plated steel, or other material warranted by the manufacturer to be noncorrosive and compatible with aluminum gratings and other components.

C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.

D. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).

E. Lock Washers: Helical, spring-type, carbon steel, ANSI B18.21.1.

F. Expansion Anchors: Anchor bolt and sleeve assemblies of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).

2.4 FABRICATION

A. General: Form from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.

1. Shear and punch metals cleanly and accurately.
2. Remove sharp or rough areas on exposed traffic surfaces.
3. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated.

B. Welding: Comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

C. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

D. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for re-assembly and coordinated installation.

2.5 METAL BAR GRATINGS

A. General: Produce metal bar gratings of description indicated per NAAMM marking system that comply with the following:

1. Heavy-Duty Metal Bar Grating Standard: "Guide Specifications for Heavy Duty Metal Bar Grating" published in ANSI/NAAMM MBG 532 "Heavy Duty Metal Bar Grating Manual."

B. Traffic Surface for Steel Bar Gratings: As follows:

1. Plain.
2. Serrated.
3. Knurled.
4. Applied abrasive finish consisting of aluminum-oxide aggregate in an epoxy-resin adhesive.
5. As indicated.

C. Traffic Surface for Aluminum Bar Gratings: As follows:

1. Plain.
2. Grooved.
3. Applied abrasive finish consisting of aluminum-oxide aggregate in an epoxy-resin adhesive.
4. As indicated.

M. Fabricate removable grating sections with banding bars attached by welding to entire perimeter of each section.

Include anchors and fasteners of type indicated, or if not indicated, as recommended by manufacturer, for attachment to supports.

1. Provide not less than 4 anchor blocks for each section of heavy-duty grating composed of bearing bars over 3/16 inch (4.8 mm) in thickness, with each block shop-welded to 2 bearing bars.
2. Provide not less than 4 saddle clips for each grating section composed of rectangular bearing bars 3/16 inch (4.8 mm) or less in thickness and spaced not less than 15/16 inch (23.8 mm) o.c., with each clip designed and fabricated to fit over 2 bearing bars.
3. Provide not less than 4 flange blocks for each section of aluminum I-bar grating, with block designed to fit over lower flange of I-shaped bearing bars.
4. Furnish threaded bolts with nuts and washers for each clip required.
5. Furnish self-drilling fasteners with washers for each clip required.
6. Furnish galvanized malleable-iron flange clamp with galvanized bolt for each clip required. Furnish as a system, designed to be installed from above grating by one person.

    a. Available Product: Subject to compliance with requirements, a product that may be incorporated in the work is Grate-Fast by Struct-Fast Inc.

N. Attach toe plates to grating by welding, unless otherwise indicated.

O. Furnish toe plates to attach in the field.

1. Toe Plate Height: 4 inches (100 mm), unless a greater height is indicated.

P. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

1. Edge band openings in grating that interrupt 4 or more bearing bars with bars of same size and material as bearing bars.
2. Do not notch bearing bars at supports to maintain elevation.

Q. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal bar gratings that may be incorporated in the work include, but are not limited to, the following:

1. Klemp Corp.
2. Ohio Gratings, Inc.
3. Tru-weld, Inc.

2.6 GRATING FRAMES AND SUPPORTS

A. General: Provide steel frames and supports, where indicated.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive gratings. Fabricate from structural steel shapes, plates, and steel bars of welded construction. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware, and similar items.

C. Equip units with integrally welded anchors for casting into concrete or building into masonry.

1. Unless otherwise indicated, space anchors 24 inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.

2.2 FINISHES

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish gratings, frames, and supports after assembly.

C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed items:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."

D. Apply shop primer to uncoated surfaces, except those with galvanized finish or to be embedded in concrete or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction.

Coordinate delivery of such items to project site.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing to in-place construction. Include expansion anchors for concrete and masonry, through-bolts, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation. Set accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.3 INSTALLING METAL BAR GRATINGS

A. General: Install gratings to comply with recommendations of NAAMM grating standard referenced under Part 2 that apply to grating types and bar sizes

indicated, including installation clearances and standard anchoring details.

B. Secure removable units to supporting members with type and size of clips and fasteners indicated, or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Secure nonremovable units to supporting members by welding where both materials are the same; otherwise, fasten by bolting as indicated above.

D. Attach toe plates to gratings by welding at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint is specified in Division 9 Section "Painting."

C. For galvanized surfaces, clean welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05530

SECTION 05720 - ORNAMENTAL HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Aluminum ornamental handrails and railing systems.
2. Copper alloy ornamental handrails and railing systems.
3. Stainless steel ornamental handrails and railing systems.
4. Steel and iron ornamental handrails and railing systems.
5. Glass-supported ornamental railing systems.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Metal Fabrications" for steel pipe handrails and railing systems.
2. Division 5 Section "Pipe and Tube Handrails and Railings" for handrails and railings fabricated from round pipe and tube components.
3. Division 5 Section "Ornamental Metalwork" for ornamental metal handrails fabricated from custom components.

C. Products furnished but not installed under this Section include inserts and anchors preset in masonry and concrete for anchorage of handrails and railing systems.

1.3 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. For Cold-Formed Structural Steel: AISI "Specification for Design of Cold-Formed Steel Structural Members."

2. For Stainless Steel: AISI "Stainless Steel Cold-Formed Structural Design Manual."
3. For Aluminum: AA "Specifications for Aluminum Structures."
4. For copper alloys use a safety factor of 1.65 applied to minimum yield strength of alloy.
5. For fully tempered glass in glass-supported railing systems use a safety factor of 4.0 applied to applicable modulus of rupture listed under "Mechanical Properties" in AAMA Aluminum Curtain Wall Series No. 12 "Structural Properties of Glass."

B. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E 985 for structural performance based on the following:

1. Testing performed in accordance with ASTM E 894 and ASTM E 935.
2. Structural computations.

C. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.

1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:

    a. Concentrated load of 200 lbf applied at any point and in any direction.
    b. Uniform load of 50 lbf per linear ft. applied horizontally and concurrently with uniform load of 100 lbf per linear ft. applied vertically downward.
    c. Concentrated load need not be assumed to act concurrently with uniform loads.

2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:

    a. Concentrated load of 200 lbf applied at any point and in any direction.
    b. Uniform load of 50 lbf per linear ft. applied in any direction.
    c. Concentrated and uniform loads need not be assumed to act concurrently.

3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbf applied to one sq. ft. at any point in the system including panels, intermediate rails, balusters, or other elements composing the infill area.

   a. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.

4. Glass-Supported Railing Systems: Capable of withstanding loads indicated for top rails and infill areas of guardrail systems, with each section of top rails supported by a minimum of 3 glass panels or by another means so that it remains in place should any one panel fail.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

E. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of handrails and railings to prevent buckling, opening up of joints, and overstressing of components, connections, and other detrimental effects. Base design calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Shop drawings showing fabrication and installation of handrails and railings including plans, elevations, sections, details of components, and attachments to other units of work.

   1. Where installed products are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by a qualified professional engineer responsible for their preparation.

D. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors available for those units with factory-applied color finishes.

E. Samples for verification purposes of each type of exposed finish required, prepared on components indicated below that are of the same thickness and metal indicated for final unit of work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

1. 6-inch-long sections of each distinctly different linear railing member including handrails, top rails, posts, balusters.
2. Fittings and brackets.
3. Welded connections.

F. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of railing components and systems with requirements based on comprehensive testing of current products.

G. Test reports from independent testing laboratory evidencing compliance of handrails and railing systems with ASTM E 985.

H. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, plus other information specified.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.

B. Engineering Responsibility: Engineer handrails and railing systems by qualified professional engineer legally authorized to practice in jurisdiction where project is located.

C. Engineer Qualifications: Professional engineer legally authorized to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated for handrails and railings similar in material, design, and extent to that indicated for this project and that have a record of successful in-service performance.

D. Testing Laboratory Qualifications: To qualify for acceptance, an independent

testing laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying the progress of the work.

E. Preconstruction Testing: Comply with the following requirements:

1. Preconstruction Testing Service: Owner will employ and pay qualified independent testing laboratories to perform preconstruction testing indicated.
2. Preconstruction Testing Service: Contractor shall employ and pay qualified independent testing laboratory to perform preconstruction testing indicated.
3. Test each type of railing system as indicated below per ASTM E 894 and ASTM E 935 for compliance with ASTM E 985:

    a. Fabricate mock-ups from materials representative of those proposed for use; fabricate and install mock-ups at qualified independent inspection laboratory, using personnel who will perform the same tasks for the project.
    b. Select sizes and configurations of mock-ups that result in adequately demonstrating the capability of railing systems to comply with performance requirements.
    c. Notify Architect one week in advance of the dates and times when mock-ups will be erected.
    d. Remove mock-ups from laboratory when testing program is completed and dispose of legally; do not use materials from mock-up on project.

F. Field-Constructed Mock-Ups: Prior to installation of railings, erect mock-ups for each form of guardrail and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of work.

1. Locate mock-ups on site in location and of size indicated or, if not indicated, directed by Architect.
2. Locate mock-ups on site in location indicated. Provide mock-ups consisting of 2 posts, top rail, infill area, and anchorage system components that are full height and not less than 2'-0" in length.
3. Notify Architect one week in advance of the dates and times when mock-ups will be erected.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Contracting Officer/Project Manager's acceptance of mock-ups

before start of final unit of work.

6. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of work.

    a. When directed, demolish and remove mock-ups from project site.
    b. Accepted mock-ups in undisturbed condition at time of Substantial Completion may become part of completed unit of work.

1.7 STORAGE

A. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

1.8 PROJECT CONDITIONS

A. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

    1. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.9 SEQUENCING AND SCHEDULING

A. Sequence and coordinate installation of wall handrails as follows:

    1. Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.
    2. Mount handrails only on gypsum board assemblies reinforced to receive anchors and where the location of concealed anchor plates has been clearly marked for benefit of Installer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering handrails and railing systems that may be incorporated in the work include but are not limited to the following:

1. Aluminum Ornamental Railing Systems:

   a. Aluminum Tube Railings, Inc.
   b. Blum: Julius Blum & Co., Inc.
   c. Blumcraft of Pittsburgh.
   d. Braun: J.G. Braun Co.
   e. CraneVeyor Corp.
   f. Livers Bronze Co., Inc.
   g. Newman Brothers, Inc.
   h. Rippel Architectural Metals, Inc.
   i. Sterling Factories, Inc.
   j. Superior Aluminum Products, Inc.
   k. Wausau Specialty Products
   l. Wylie: Glen J. Wylie & Associates, Ltd.

2. Copper Alloy Railing Systems:

   a. Blum: Julius Blum & Co., Inc.
   b. Braun: J.G. Braun Co.
   c. CraneVeyor Corp.
   d. Livers Bronze Co., Inc.
   e. Wausau Specialty Products
   f. Wylie: Glen J. Wylie & Associates, Ltd.

3. Stainless Steel Railing Systems:

   a. Blum: Julius Blum & Co., Inc.
   b. CraneVeyor Corp.
   c. Livers Bronze Co., Inc.
   d. Sterling Factories, Inc.
   e. Wausau Specialty Products
   f. Wylie: Glen J. Wylie & Associates, Ltd.

4. Steel Railing Systems:

   a. Blum: Julius Blum & Co., Inc.
   b. Braun: J.G. Braun Co.
   c. Livers Bronze Co., Inc.

5. Glass-Supported Railing Systems:

a. Blum: Julius Blum & Co., Inc.
b. Blumcraft of Pittsburgh.
c. CraneVeyor Corp.
d. Livers Bronze Company, Inc.
e. Newman Brothers, Inc.
f. Rippel Architectural Metals, Inc.
g. Wausau Specialty Products

2.2 METALS

A. General: Provide metal forms and types that comply with requirements of referenced standards and that are free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.

B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.

1. Extruded Bar and Shapes: ASTM B 221, 6063-T5/T52.
2. Extruded Pipe and Tube: ASTM B 429, 6063-T5/T52.
3. Drawn Seamless Tube: ASTM B 483, 6063-T832.
4. Plate and Sheet: ASTM B 209, 6061-T6.
5. Die and Hand Forgings: ASTM B 247, 6061-T6.
6. Castings: ASTM B 26, 356-T6.

C. Copper Alloys: Provide CDA copper alloy of type and form indicated to comply with the following requirements:

1. Extruded Shapes: ASTM B 455, alloy UNS No. C38500 (architectural bronze).
2. Seamless Pipe: ASTM B 43, alloy UNS No. C23000 (red brass, 84-86 percent copper).
3. Seamless Tube: ASTM B 135, alloy UNS No. C23000 (red brass, 85 percent copper).
4. Composition Bronze Castings: ASTM B 62, alloy UNS No. C83600 (leaded red brass).
5. Sand Castings: ASTM B 584, alloy UNS No. C86500 (high-strength yellow brass).

6. Plates and Bars: Alloy UNS No. C28000 (Muntz metal) composed of 58

to 61 percent copper, maximum 0.35 percent lead, maximum 0.25 percent tin, maximum 0.15 percent iron, maximum 0.10 percent other elements, and remainder zinc.

D. Stainless Steel: Provide austenitic stainless steel in form indicated complying with the following requirements:

1. Tubing: ASTM A 554, Grades MT 301, MT 302, or MT 304, as standard with manufacturer.
2. Pipe: ASTM A 312, Grade TP 304.
3. Castings: ASTM A 743, Grade CF 8 or CF 20.
4. Plate: ASTM A 167, Type 301, 302,or 304, as standard with manufacturer.

E. Steel and Iron: Provide steel and iron in the form indicated complying with the following requirements:

1. Cold-Formed Steel Tubing: ASTM A 500, grade as indicated below:

a. Grade A, unless otherwise indicated or required by structural loads.
b. Grade B, unless otherwise indicated or required by structural loads.

2. Hot-Formed Steel Tubing: ASTM A 501.
3. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.

F. Steel Plates, Shapes, and Bars: ASTM A 36.

G. Gray Iron Castings: ASTM A 48, Class 30.

H. Malleable Iron Castings: ASTM A 47, grade 32510.

2.3 GLASS PRODUCTS AND GLAZING MATERIALS

A. Safety Glass Standard: Provide safety glass complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

B. Tempered Glass: Provide fully tempered safety glass complying with

ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent glass, flat), Quality q3 (glazing select), class, thickness, and manufacturing process as indicated below:

1. Clear Glass: Class 1 (clear).
2. Tinted Glass: Class 2 (tinted heat absorbing and light reducing), manufacturer's standard tint color indicated below:

    a. Bronze.
    b. Gray.

3. Nominal Thickness: 1/4 inch (6.0 mm).
4. Nominal Thickness: 3/8 inch (10.0 mm).
5. Nominal Thickness: 1/2 inch (12.0 mm).
6. Nominal Thickness: 3/4 inch (19.0 mm).
7. Nominal Thickness: As indicated on drawings.
8. Nominal Thickness: As required to support structural loads.
9. Manufacturing Process: Manufacture fully tempered glass as follows:

    a. By horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed, unless otherwise indicated.
    b. By vertical (tong-held) or horizontal (roller hearth) process, at manufacturer's option.

C. Glazing Cement and Accessories: Provide glazing cement and related accessories recommended or supplied by railing manufacturer for bonding glass to aluminum subrails.

D. Glazing Cement: Provide nonshrinking organic cement designed for curing by passing an electric current through metal subrail holding glass panel, as standard with manufacturer.

2.4 GROUT AND ANCHORING CEMENT

A. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

B. Interior Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining,

hydraulic controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Use for interior applications only.

C. Erosion-Resistant Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

D. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include but are not limited to the following:

1. Nonshrink Metallic Grouts:

   a. "Metox RM"; Chem-Masters Corp.
   b. "Hi Mod Grout"; Euclid Chemical Co.
   c. "Embeco 885 and 636"; Master Builders.
   d. "Ferrolith G Redi-Mix and G-NC"; Sonneborn Building Products Div., Rexnord Chemical Products, Inc.
   e. "Stoncrete MG1"; Stonhard, Inc.

2. Nonshrink Nonmetallic Grouts:

   a. "Bonsal Construction Grout"; W. R. Bonsal Co.
   b. "Diamond-Crete Grout"; Concrete Service Materials Co.
   c. "Euco N-S Grout"; Euclid Chemical Co.
   d. "Kemset"; Chem-Masters Corp.
   e. "Crystex"; L & M Construction Chemicals, Inc.
   f. "Masterflow 713"; Master Builders.
   g. "Sealtight 588 Grout"; W. R. Meadows, Inc.
   h. "Sonogrout"; Sonneborn Building Products Div., Rexnord Chemical Products, Inc.
   i. "Stoncrete NM1"; Stonhard, Inc.
   j. "Five Star Grout"; U. S. Grout Corp.
   k. "Vibropruf #11"; Lambert Corp.

3. Interior Anchoring Cement:

   a. "Bonsal Anchor Cement"; W. R. Bonsal Co.
   b. "Por-Rok"; Minwax Construction Products Division.

4. Erosion-Resistant Anchoring Cement:

a. "Super Por-Rok"; Minwax Construction Products Division.

2.5 PAINT

A. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

B. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

C. Zinc Chromate Primer: FS TT-P-645.

2.6 MISCELLANEOUS MATERIALS

A. Wood Handrails: Hardwood handrail of species and profile indicated or, if not indicated, as selected by Architect from manufacturer's standards; bonded to aluminum subrail; with manufacturer's standard transparent finish.

B. Plastic Handrail Cap: Manufacturer's standard thermoplastic rail covering, color as indicated or, if not indicated, as selected by Contracting Officer/Project Manager from manufacturer's standard colors.

C. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

2.7 FASTENERS

A. Fasteners for Anchoring Railings to Other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railing to other types of construction indicated and capable of withstanding design loadings.

1. For steel railings and fittings use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating or ASTM B 696, Class 12 for cadmium plating.
2. For aluminum railings provide fasteners fabricated from type 304 stainless steel.
3. For copper alloy railings provide fasteners fabricated from same base metal as railing components or from type 304 stainless steel.

4. For stainless steel railings provide fasteners fabricated from type 304

stainless steel.

B. Fasteners for Interconnecting Railing Components: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

1. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work, except where otherwise indicated.
2. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated.
3. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

C. Cast-In-Place and Postinstalled Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.

1. Cast-in-place anchors.
2. Chemical anchors.
3. Expansion anchors.
4. Undercut anchors.

2.8 FABRICATION

A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than that required to support structural loads.

B. Preassemble railing systems in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

C. Form changes in direction of railing members as follows:

1. By insertion of prefabricated elbow fittings.
2. By radius bends of radius indicated.

3. By mitering at elbow bends.
4. By bending.
5. By any method indicated above, applicable to change of direction involved.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

E. Welded Connections: Fabricate railing systems and handrails for connection of members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface match those adjacent.

F. Nonwelded Connections: Fabricate railing systems and handrails for connection of members by means of railing manufacturer's standard concealed mechanical fasteners and fittings unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using epoxy structural adhesive where this represents manufacturer's standard splicing method.

G. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors for connection of handrail and railing members to other construction.

H. Provide inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loadings imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.

I. For railing posts set in concrete provide preset sleeves of steel, not less than 6 inches long and inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

J. For removable railing posts, fabricate slip-fit sockets from steel pipe whose inside diameter is sized for a close fit with posts and to limit deflection of post without lateral load, measured at top, to not more than 1/12 of post height.

Provide socket covers designed and fabricated to resist accidental dislodgement.

1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

K. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

L. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

M. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

N. For handrails and railing systems that are exposed to exterior or to moisture from condensation or other sources, provide weepholes or other means for evacuation of entrapped water in hollow sections of railing members.

O. Fabricate joints that will be exposed to weather in a manner to exclude water.

P. Close exposed ends of handrail and railing members by use of manufacturer's standard prefabricated end fittings.

Q. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of the railing and wall is 1/4 inch or less.

R. Toe Boards: Where indicated, provide toe boards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated for connection to, and centered between, each railing post.

S. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

2.9 GLASS PANEL FABRICATION

A. Glass Panels: Cut tempered glass to final size and shape prior to heat treatment; provide for proper edge clearance and bite on glass. Provide thickness indicated

but not less than that required to support structural loads.

1. Factory-bond glass to aluminum base and top rail channels in railing manufacturer's plant using glazing cement to comply with manufacturer's specifications.
2. Apply ceramic linework on glass to comply with Glass Tempering Association's "Engineering Standards Manual, Section 4, Specification for Ceramic Enameled Spandrel Glass Fully Tempered or Heat Strengthened," Specification No. 66-9-20 Rev. #3.

2.10 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are not acceptable if they are within 1/2 of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved samples and they are assembled or installed to minimize contrast.

2.11 ALUMINUM FINISHES

A. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

B. Mechanical Finish: AA-M3x (Mechanical Finish: as specified) sand handrail, top rails, and intermediate rails in one direction only, parallel to length of handrail or railing, with #120 and #320 grit. After installation, polish top rail and handrails with No. 0 steel wool immersed in paste wax then rubbed to a luster with soft dry cloth.

C. Class II Clear Anodized Finish: AA-M12C22A31 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).

D. Class I Clear Anodized Finish: AA-M12C22A41 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class I Architectural, clear film thicker than 0.7 mil) complying with AAMA 607.1.

E. Class II Color Anodized Finish: AA-M12C22A32/A34 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, film thicker than 0.4 mil with integral color or electrolytically deposited color).

F. Class I Color Anodized Finish: AA-M12C22A42/A44 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class I Architectural, film thicker than 0.7 mil with integral color or electrolytically deposited color) complying with AAMA 606.1 or AAMA 608.1.

1. Color: Light bronze.
2. Color: Medium bronze.
3. Color: Dark bronze.
4. Color: Black.
5. Color: Match Architect's sample.
6. Color: As selected by Architect from within standard industry colors and color density range.

G. Baked Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with minimum dry film thickness of 1.5 mils, medium gloss.
2. Color: As indicated by reference to manufacturer's standard color designations.
3. Color: Match Contracting Officer/Project Manager's sample.
4. Color: As selected by Architect from manufacturer's standard colors.

H. High-Performance Organic Coating: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.

1. Fluorocarbon 2-Coat Coating System: Manufacturer's standard 2-coat thermo-cured system, composed of specially formulated inhibitive primer and fluorocarbon color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, complying with AAMA 605.2.
2. Fluorocarbon 3-Coat Coating System: Manufacturer's standard 3-coat

thermo-cured system composed of specially formulated inhibitive primer, fluorocarbon color coat, and clear fluorocarbon topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, complying with AAMA 605.2.

a. Color and Gloss: As indicated by reference to manufacturer's standard color and gloss designations.
b. Color and Gloss: Match Architect's sample.
c. Color and Gloss: As selected by Architect from manufacturer's standard choices for color and gloss.

2.12 COPPER ALLOY FINISHES

A. Finish designations prefixed by "CDA" conform with the system established by the Copper Development Association for designating copper alloy finish systems.

B. Buffed Finish: CDA M21 (Mechanical Finish: buffed, smooth specular).

C. Hand-Rubbed Finish: CDA M31-M34 (Mechanical Finish: directional textured, fine satin; Mechanical Finish: directional textured, hand-rubbed).

D. Hand-Rubbed Finish, Lacquered: CDA M31-M34-06x (Mechanical Finish: directional textured, fine satin; Mechanical Finish: directional textured, hand-rubbed; Coating: clear organic, air dry, as specified below).

1. Clear Organic Coating: Clear air-drying acrylic lacquer specially developed for coating copper alloy products, applied by air-spray in 2 coats per manufacturer's directions, with interim drying, to a total thickness of 1.0 mil.

a. Product: Subject to compliance with requirements, provide "Incralac" as developed by International Copper Research Corporation.

E. Medium Satin Finish: CDA M32 (Mechanical Finish: directional textured, fine satin).

F. Fine Matte Finish: CDA M42 (Mechanical Finish: nondirectional finish, fine matte).

G. Statuary Conversion Coating Over Satin Finish: CDA-M32-C55 (Mechanical Finish: directional textured, fine satin; Chemical Finish: conversion coating, sulfide).

1. Color: Match Architect's sample.

H. Patina Conversion Coating: CDA-M36-C12-C52 (Mechanical Finish: directional textured, uniform; Chemical Finish: nonetched cleaned, degreased; Chemical Finish, conversion coating, ammonium sulfate).

1. Color: Match Architect's sample.

2.13 STAINLESS STEEL FINISHES

A. Remove or blend tool and die marks and stretch lines into finish.

B. Grind and polish surfaces to produce uniform directional textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Cold-Rolled Unpolished Finish: AISI No. 2B finish.

D. Bright, Directional Polish: AISI No. 4 finish.

E. Satin, Directional Polish: AISI No. 6 finish.

F. Satin, Reflective, Directional Polish: AISI No. 7 finish.

G. Mirrorlike Reflective, Nondirectional Polish: AISI No. 8 finish.

H. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.14 GALVANIZED FINISH

A. General: Hot-dip galvanize items indicated to be galvanized to comply with applicable standard listed below:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing iron and steel products made from rolled, pressed, and forged steel shapes, castings, plates, bars, and strips.

B. For exterior steel railings and handrails formed from steel tubing with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.

C. For interior steel railings and handrails formed from steel tubing with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.

D. For interior steel railings formed from nongalvanized steel members, provide nongalvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

E. Factory-Primed Finish: Apply air-dried primer immediately following cleaning and pretreatment, to provide a minimum dry film thickness of 2.0 mils per applied coat, to surfaces that will be exposed after assembly and installation and to concealed, nongalvanized surfaces.

2.15 STEEL FINISHES

A. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP7 "Brush-Off Blast Cleaning."

B. Apply shop primer to uncoated surfaces of handrails and railing components, except those with galvanized finish or to be embedded in concrete or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

1. Shop Primer: Manufacturer's or Fabricator's standard, fast-curing, lead-free, "universal" primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
2. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, that are to be embedded in concrete

as masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections accurately together to form tight, hairline joints.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of handrails and railings. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/4 inch in 12 feet.
3. Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

D. Corrosion Protection: Coat concealed surfaces of the following, which will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint or zinc chromate primer.

1. Aluminum alloys.
2. Copper alloys.

E. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by structural loads.

F. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use manufacturer's standard mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic filler cement colored to match finish of handrails and railing systems.

B. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact or use manufacturer's standard fittings designed for this purpose.

C. Expansion Joints: Install expansion joints at locations indicated but not further apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.

B. Anchor posts in concrete by core drilling holes not less than 5 inches deep and 3/4 inch greater than outside diameter of post. Clean holes of all loose material, insert posts, and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.

1. Nonshrink, nonmetallic grout.
2. Nonshrink, nonmetallic grout or anchoring cement.

C. Cover anchorage joint with a round flange of same metal as post; attach to post as follows:

1. Welded to post after placement of anchoring material.
2. By set screws.

D. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8-inch buildup, sloped away from post. For installations exposed on exterior or to flow of water, seal anchoring material to comply with grout manufacturer's directions.

E. Anchor steel posts to steel with oval flanges, angle type or floor type as required by conditions, welded to posts and bolted to metal supporting members.

F. Anchor posts to metal surfaces with oval flanges, angle type or floor type as

required by conditions, connected to posts and to metal supporting members as follows:

1. For aluminum railings, attach posts as indicated using manufacturer's standard fittings designed and engineered for this purpose.
2. For copper alloy railings, attach posts as indicated using manufacturer's standard fittings designed and engineered for this purpose.
3. For stainless steel railings, weld flanges to post and bolt to metal supporting surfaces.
4. For steel railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ANCHORING RAIL ENDS

A. Anchor rail ends into concrete and masonry with round flanges connected to rail ends and anchored into wall construction with post-installed anchors and bolts.

B. Anchor rail ends to metal surfaces with oval or round flanges.

1. Weld flanges to rail ends.
2. Connect flanges to rail ends using nonwelded connections.
3. Bolt flanges to metal surfaces.

C. Install removable railing sections where indicated in slip-fit metal sockets cast into concrete. Accurately locate sockets to match post spacing.

3.6 ATTACHMENT OF HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2-inch clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to

threaded hanger bolt.

2. Use type of bracket with predrilled hole for exposed bolt anchorage.
3. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
4. For hollow masonry anchorage, use toggle bolts with square heads.
5. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with stud installations for accurate location of backing members.
6. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

3.7 INSTALLATION OF GLASS PANELS

A. Glass-Supported Railing Systems: Install assembly to comply with railing manufacturer's instructions to listed tolerances, beginning with attachment of base channel to building structure, followed by insertion and connection of factory-fabricated and -assembled glass panels.

1. Erect glass railing systems under direct supervision of manufacturer's authorized technical personnel.

B. Post-Supported Glass Railing Systems: Install assembly to comply with railing manufacturer's instructions, beginning with erection of posts and other metal railing components, followed by setting of factory-cut glass panels. Do not cut, drill, or alter glass panels in any way in field; protect edges from damage.

3.8 INSTALLATION OF PLASTIC HANDRAIL CAPS

A. Apply plastic handrail caps to top rails and handrails where indicated, complying with manufacturer's instructions for cutting, mounting, forming, welding, cleaning, applying end caps, and finishing.

B. Minimize number of joints in plastic caps by installing in as long lengths as possible. Allow for shortening of plastic cap caused by welding and splicing process; butt ends together to produce hairline joint.

1. Continuously weld, splice, miter, and end-cap joints using plastic cap manufacturer's electric welding iron designed for this purpose. Remove welding flash while material is still warm.

2. Weld only prongs on underside of plastic cap at splice; miter and end-cap joints. After cutting plastic cap, dress ends with file to produce a hairline fit between abutting sections. After mounting cap, polish top surface of plastic rail cap with cap manufacturer's solvent designed for this purpose until joint becomes almost invisible.

3.9 FIELD QUALITY CONTROL

A. Testing Laboratory: Owner will employ and pay an independent testing laboratory to perform field quality-control testing.

B. Extent and Testing Methodology: Arrange for testing of completed railing assemblies that are randomly selected by testing laboratory. Test railings per ASTM E 894 and ASTM E 935 for compliance with ASTM E 985.

C. Testing laboratory shall report test results promptly and in writing to Contractor and Architect.

D. Repair or replace railings within areas where test results indicate noncompliance with requirements.

3.10 ADJUSTING

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material.

B. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 of these specifications.

C. For galvanized surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

D. Clean the following metals by washing thoroughly with clean water and soap, following by rinsing with clean water.

1. Aluminum.
2. Stainless steel.

E. Clean copper alloys in accordance with recommendations of metal finisher in a manner that leaves an undamaged and uniform finish matching approved sample.

3.11 PROTECTION

A. Protect finishes of railing systems and handrails from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 05720

SECTION 05810 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Floor expansion joint cover assemblies.
2. Wall expansion joint cover assemblies.
3. Ceiling expansion joint cover assemblies.
4. Fire-rated expansion joint cover assemblies.
5. Seismic expansion joint cover assemblies.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 7 Section "Flashing and Sheet Metal" for sheet metal roof and wall expansion joint systems.
2. Division 7 Section "Roof Specialties and Accessories" for curb- type expansion joints.
3. Division 7 Section "Joint Sealers" for elastomeric sealants and compression seals without metal frames.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data in form of manufacturer's product specifications, installation instructions, and general recommendations for each type of expansion joint cover assembly indicated.
2. Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements indicated.

3. Shop drawings showing full extent of expansion joint cover assemblies; include large-scale details indicating profiles of each type of expansion joint cover assembly, splice joints between sections, joinery with other types, special end conditions, anchorages, fasteners, and relationship to adjoining work and finishes. Include description of materials and finishes.
4. Samples for each type of metal finish indicated on metal of same thickness and alloy to be used in work. Where normal color and texture variations are to be expected, include 2 or more units in each set of samples showing limits of such variations.

1.4 QUALITY ASSURANCE

A. Manufacturer's Instructions: In addition to requirements of these specifications, comply with manufacturer's instructions recommendations for all phases of work, including preparation of substrate, applying materials, and protection of installed units.

B. Single-Source Responsibility: Obtain expansion joint cover assemblies from one source from a single manufacturer.

C. Fire Performance Characteristics: Where indicated, provide expansion joint cover assemblies identical to those of assemblies whose fire resistance has been determined per ANSI/UL 263, NFPA 251, U.B.C. 43-1, or ASTM E 119 and E 814 including hose stream test at full-rated period by a nationally recognized testing and inspecting organization or by another means, as acceptable to authorities having jurisdiction.

1. Fire Rating: Not less than the rating of adjacent construction.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:

1. Architectural Art Mfg. Inc.
2. Balco, Inc.
3. D.S. Brown Co.
4. CLD Industries

5. Construction Specialties, Inc.
6. E-Poxy Industries, Inc.
7. Erie Metal Specialties
8. Metalines, Inc.
9. MM Systems Corp.
10. Michael Rizza Co., Inc.
11. Watson Bowman Acme Corp.

2.2 MATERIALS

A. Metals:

1. Aluminum: ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209, alloy 6061-T6, sheet and plate.

    a. Protect aluminum surfaces in contact with cementitious materials with zinc chromate primer or chromate conversion coating.

2. Bronze: ASTM B 455, alloy C38500 for extrusions; alloy C28000, Muntz Metal for plates.
3. Brass: UNS Alloy C26000 for half hard sheet and coil.
4. Stainless Steel: ASTM A 167, Type 304 with 2B finish, unless indicated otherwise, for plates, sheet, and strips.

B. Nonmetal Products:

1. Extruded Preformed Seals: Single or multilayered rubber extrusions as classified under ASTM D 2000, designed with or without continuous, longitudinal, internal baffles and formed to fit compatible frames, in color indicated, or, if not indicated, as selected by Architect from manufacturer's standard colors.
2. Elastomeric Sealant: Manufacturer's standard elastomeric sealant complying with ASTM C 920, Use T, factory-formed and bonded to metal frames or anchor members; in color indicated, or, if not indicated, as selected by Architect from manufacturer's standard colors.

    a. Joints Up to 2 inches Wide: Withstand plus or minus 35 percent movement of the joint width without failure.
    b. Joints 2 inches to 4 inches Wide: Withstand plus or minus 50 percent movement of the joint width without failure.

3. Seismic Seals: Typically two single layered rubber extrusions, one interior and one exterior, as classified under ASTM D 2000, retained in a set of compatible frames, in color indicated, or, if not indicated, as selected by Architect from manufacturer's standard colors.
4. Fire Barriers: Designed for indicated or required dynamic structural movement without material degradation or fatigue. Tested in maximum joint width condition with a field splice as a component of an expansion joint cover in accordance with ANSI/ UL 263, NFPA 251, U.B.C. 43-1, or ASTM E 119 and E 814 including hose stream test at full-rated period by a nationally recognized testing and inspecting organization or by another means, as acceptable to authorities having jurisdiction.

C. Accessories: Manufacturer's standard anchors, fasteners, set screws, spacers, flexible vapor seals and filler materials, drain tubes, adhesive, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 FABRICATION

A. General: Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated. Select units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and structural movement. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint cover assemblies.

B. Metal Joint Cover Assemblies: Provide continuous extruded metal frames of profile indicated with seating surface and raised floor rim to accommodate flooring and concealed bolt and steel anchors for embedment in concrete. Provide assemblies formed to receive cover plates of design indicated and to receive filler materials (if any) between raised rim of frame and edge of plate. Furnish depth and configuration to suit type of construction and to produce a continuous flush wearing surface with adjoining finish floor surface.

1. Floor-to-Floor Joints:

a. Partially Concealed Cover: Provide one frame on each side of joint, designed to cover floor plate and filler.
b. Exposed Cover: Provide one frame on each side of joint, designed to support floor plate and filler.

2. Flat Cover Plates: Provide cover plates of profile and wearing surface indicated. Extend flat plates to lap each side of joint. If required, furnish abrasive-resistant flexible filler for space between edge of cover plate and raised rim of frame.

    a. Fixed Cover Plates: Attach one side of the cover plate to a frame or finished wearing surface with other side resting on other frame or finished wearing surface in such a manner to allow free movement.
    b. Floating Cover Plates: Secure the cover plate in or on top of frames in such a manner as to have free movement on both sides.

3. Floor Cover Plate Wearing Surfaces: Provide cover plates with the following type of wearing surface.

    a. Plain
    b. Fluted
    c. Recessed to receive full thickness of flooring material
    d. Abrasive plate
    e. Adhesive filled plate
    f. Adhesive strip plate

4. Provide manufacturer's continuous standard flexible vinyl moisture seals under covers at locations indicated.
5. Floor-to-Wall Joints: Provide one frame on floor side of joint only. Provide wall side frame where required by manufacturer's design.
6. Angle Cover Plates: Attach angle cover plates for floor-to-wall joints to wall with countersunk, flat-head exposed fasteners secured to drilled-in-place anchor shields, unless otherwise indicated, at spacing recommended by joint cover manufacturer.
7. Wall, Ceiling, Roof, and Soffit Joint Cover Assemblies:

    a. Fixed Metal Cover Plates: Provide on one side of the joint a concealed, continuously anchored frame fastened to wall, ceiling, or soffit only on one side of joint. Extend cover to lap each side of joint and to permit free movement on one side. Attach cover to frame with cover in close contact with adjacent finish surfaces.
    b. Floating Metal Cover Plates: Secure the cover plate in or on top of frames in such a manner as to have free movement on both sides.
    c. Flexible Filler: Secure the approved flexible filler between frames in such a manner that it will compress and expand.

1) Provide manufacturer's continuous standard flexible vinyl moisture seals for joint covers in exterior and on interior of exterior walls and at other locations indicated.

C. Joint Cover Assembly with Preformed Seal: Provide joint cover assemblies consisting of continuously anchored aluminum extrusions and continuous extruded preformed seals of profile indicated or required to suit types of installation conditions shown. Furnish extrusions designed for embedment in concrete and mechanical retention of lugs of field-installed extruded preformed seals. Vulcanize or heat-seal splices (if any) to ensure hermetic joint condition.

1. Include extruded aluminum cover plate with fluted surface; fasten plate to one side of joint and extend plate to lap each side of joint, with free movement and with cover in close contact with adjacent contact surfaces.

D. Joint Cover Assembly with Elastomeric Sealant: Provide continuous cover joint assemblies consisting of elastomeric sealant factory-bonded to extruded aluminum frames of profile indicated or required to suit types of installation conditions shown. Provide frames for floor joints with means for embedment or anchorage to concrete without use of exposed fasteners and that will result in exposed surfaces of sealant and aluminum frames finishing flush with adjacent finished floor surface without exposing anchors.

2.4 METAL FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are fabricated. Protect finishes on exposed surfaces with protective covering before shipment.

B. Aluminum Finishes:

1. Mill Finish: AA-M10 (unspecified mill finish).
2. Clear Anodized Finish: AA-C22A41; medium matte etched finish with 0.7-mil minimum thick anodic coating.
3. Color Anodized Finish: AA-C22A42; medium matte etched finish with 0.7-mil minimum thick integrally colored anodic coating. Provide color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

4. High-Performance Coating: AA-C12C42R1x, cleaned with inhibitive

chemicals, conversion coated with an acid-chromate-fluoride phosphate treatment with organic coating specified below. Apply where high-performance coating is indicated, in strict compliance with coating and resin manufacturer's instructions using a licensed applicator.

a. Fluorocarbon Coating: Inhibited thermocured primer, 0.2-mil minimum dry film thickness, and thermocured fluorocarbon coating containing full 70 percent "Kynar 500" resin, l.0-mil minimum dry film thickness. Provide color indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.

5. Factory-Primed Concealed Surfaces: Protect concealed metal surfaces that will be in contact with concrete and masonry surfaces when installed by applying a shop coat of manufacturer' standard primer to contact surfaces. Provide minimum dry film thickness of 2.0 mils.

C. Bronze Finish:

1. Natural Satin Finish: NAAMM-M32, mechanical finish, directional textured, medium satin.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, templates, and instructions for installation of expansion joint cover assemblies to be embedded in concrete or have recesses formed into edges of concrete slab for later placement and grouting-in of frames.

3.2 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing expansion joint cover assemblies to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.

B. Cutting, Fitting and Placement: Perform all cutting, drilling, and fitting required

for installation of expansion joint covers. Install joint cover assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from established lines and levels. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling. Set floor covers at elevations to be flush with adjacent finished floor materials. Locate wall, ceiling, roof, and soffit covers in continuous contact with adjacent surfaces. Securely attach in place with all required accessories. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches on centers.

C. Joinery and Continuity: Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials (if any) to frames with adhesive or pressure- sensitive tape as recommended by manufacturer.

D. Installation of Extruded Preformed Seals: Install seals to comply with manufacturer's instructions and with minimum number of end joints. For straight sections provide preformed seals in continuous lengths. Vulcanize or heat-seal all field splice joints in preformed seal material to provide watertight joints using manufacturer's recommended procedures. Apply manufacturer's approved adhesive, epoxy, or lubricant-adhesive to both frame interfaces prior to installing preformed seal. Seal transitions in accordance with manufacturer's instructions.

E. Installation of Elastomeric Sealant Joint Assemblies: Seal all end joints within continuous runs and joints at transitions in accordance with manufacturer's directions to provide a watertight installation.

F. Installation of Seismic Seals: Install interior seals in continuous lengths; vulcanize or heat-seal all field splice joints in interior seal material to provide watertight joints using manufacturer's recommended procedures. Install exterior flexible seal in standard lengths. Seal transitions and butt joints in accordance with manufacturer's instructions.

G. Installation of Fire Barriers: Install fire barriers in accordance with federal, state, and local building codes using manufacturer's recommended procedures. Install transition and end joints to provide continuous fire resistance and in accordance with manufacturer's instructions.

3.3 CLEANING AND PROTECTION

A. Do not remove strippable protective material until finish work in adjacent areas is complete. When protective material is removed, clean exposed metal surfaces to comply with manufacturer's instructions.

END OF SECTION 05810

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Wood grounds, nailers, and blocking.
2. Wood furring.
3. Sheathing.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 6 Section "Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

A. Rough carpentry includes carpentry work not specified as part of other Sections and generally not exposed, unless otherwise specified.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for the following products:

1. Insulating sheathing.
2. Metal framing anchors.
3. Construction adhesives.

C. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.

D. Wood treatment data as follows including chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material:

1. For each type of preservative treated wood product include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. For water-borne treated products include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.
3. Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.
4. Warranty of chemical treatment manufacturer for each type of treatment.

E. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction evidencing compliance of the following wood products with specified requirements and building code in effect for project.

1. Plastic board sheathing.
2. Metal framing anchors.
3. Power driven fasteners.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood products from one source from a single manufacturer.

B. Testing Laboratory Qualifications: To qualify for acceptance, an independent testing laboratory must demonstrate to Contracting Officer and/or Project Manager's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying the progress of the work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Lumber Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:

1. RIS - Redwood Inspection Service.
2. NLGA - National Lumber Grades Authority (Canadian).
3. SPIB - Southern Pine Inspection Bureau.
4. WCLIB - West Coast Lumber Inspection Bureau.
5. WWPA - Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber furnish pieces with grade stamps applied to ends or back of each piece; or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide seasoned lumber with 19 percent maximum moisture content at

time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

3. Provide lumber with 15 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

2.2 BOARDS

A. Exposed Boards: Where boards will be exposed in the finished work, provide the following:

1. Moisture Content: 19 percent maximum, "S-DRY" or KD-19.
2. Where painted finish is indicated, provide "No. 1 Boards" per SPIB rules, "Select Merchantable Boards" per WCLIB rules, or "No. 2 Common Boards & Better" per WWPA rules.

B. Concealed Boards: Where boards will be concealed by other work, provide lumber of 19 percent maximum moisture content (S-DRY or KD-19) and of following species and grade:

1. Redwood "Construction Common" per RIS rules, Southern Pine "No. 2 Boards" per SPIB rules, or any species graded "Construction Boards" or "No. 3 Common" per WCLIB or WWPA rules.

C. Board Sizes: Provide sizes indicated or, if not indicated (for sheathing, subflooring and similar uses), provide 1-inch by 8-inch boards.

2.3 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: "Standard" grade light-framing-size lumber of any species or board-size lumber as required. "No. 3 Common" or "Standard" grade boards per WCLIB or WWPA rules or "No. 2 Boards" per SPIB rules.

2.4 CONSTRUCTION PANELS FOR BACKING

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade designation, APA C-D PLUGGED EXPOSURE 1, in thickness indicated, or, if not otherwise indicated, not less than 15/32 inch.

2.5 GYPSUM SHEATHING

A. Gypsum Sheathing Board with Water-Resistant Core: Gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material, surfaced on face, back, and long edges with water-repellent paper; complying with ASTM C 79 and requirements indicated below:

1. Type: Regular (not Type X).
2. Edge and End Configuration: V-shaped tongue and groove long edges, square ends.
3. Thickness: 1/2 inch.
4. Size: 4 feet by 8 feet.

B. Available Products: Subject to compliance with requirements, gypsum sheathing boards that may be incorporated in the work include, but are not limited to, the following:

1. Gypsum Sheathing Board with Water-Resistant Core, Regular Type:

a. "Gyproc Gypsum Sheathing," Domtar Gypsum Co.
b. "Gold Bond Gypsum Sheathing," Gold Bond Building Products Div., National Gypsum Co.
c. "USG Gypsum Sheathing," United States Gypsum Co.

2.6 AIR INFILTRATION BARRIER

A. Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 15 asphalt felt), unperforated.

B. Available Products: Subject to compliance with requirements, air infiltration barriers that may be incorporated in the work include, but are not limited to, the following:

1. "Barricade Building Wrap," Simplex Products Division, Anthony Industries, Inc.
2. "Tyvek Housewrap," Fibers Department, Du Pont Company.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacturer.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power Driven Fasteners: National Evaluation Report NER-272.

D. Wood Screws: ANSI B18.6.1.

E. Lag Bolts: ANSI B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.8 METAL FRAMING ANCHORS

A. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:

1. Current Evaluation/Research Reports: Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this project.
2. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

B. Galvanized Steel Sheet: Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G60 and with ASTM A 446, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.

1. Use galvanized steel framing anchors for rough carpentry exposed to weather, in ground contact, or in area of high relative humidity, and

where indicated.

2.9 MISCELLANEOUS MATERIALS

A. Sill Sealer Gaskets: Glass fiber resilient insulation fabricated in strip form for use as a sill sealer; 1 inch nominal thickness compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated; in rolls of 50 feet or 100 feet in length.

B. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturer.

C. Water Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.

2.10 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

A. General: Where lumber or plywood is indicated as preservative-treated wood or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.

B. Pressure-treat above-ground items with water-borne preservatives to a minimum retention of 0.25 pcf. For interior uses, after treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches above grade.
4. Wood floor plates installed over concrete slabs directly in contact with earth.

C. Pressure-treat wood members in contact with the ground or fresh water with water-borne preservatives to a minimum retention of 0.40 pcf.

D. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece

of lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

E. Countersink nail heads on exposed carpentry work and fill holes.

F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Install permanent grounds of dressed, preservative treated, key-bevelled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when

no longer required.

3.3 GYPSUM SHEATHING

A. General: Install gypsum board sheathing where shown. Fasten to exterior face of stud framing for exterior walls. Use 1-1/2-inch long, 11 gage galvanized roofing nails with 3/8-inch head or 15 gage, divergent point galvanized staples 1/2 inch wide by 1-1/2 inches long. Keep perimeter fasteners 3/8 inch from edges and ends of board units. Fit boards tightly against each other and around openings.

3.4 FIBERBOARD SHEATHING

A. General: Install fiberboard wall sheathing where shown. Fasten each unit to intermediate supports and then at edges and ends.

B. Drive fasteners flush with surface of sheathing and locate perimeter fasteners at least 3/8 inch from edges and ends.

1. For 1/2-inch sheathing, use 11 gage galvanized roofing nails with 7/16-inch or 3/8-inch heads and a minimum length of 1-1/2 inches, 6d common nails, or 16 gage galvanized staples with 7/16-inch crown and a minimum length of 1-1/8 inches.

C. Install 4-foot by 8-foot or longer sheathing vertically with long edges parallel to, and centered over, studs. Install solid wood blocking where end joints do not bear against framing sills or plates. Allow 1/8-inch open space between edges and ends of adjacent units. Stagger horizontal joints, if any. Nail or staple to each support to comply with manufacturer's recommended spacing, but space fasteners not more than 3 inches o.c. around perimeter at edge and end supports and 6 inches o.c. at intermediate supports.

3.5 AIR INFILTRATION BARRIER

A. Cover sheathing with air infiltration barrier as follows:

1. Apply asphalt-saturated organic felt horizontally with 2-inch overlap and 6-inch endlap; fasten to sheathing with corrosion-resistant staples.

END OF SECTION 06100

SECTION 06105 - MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Rough carpentry work not specified elsewhere and generally intended for support of other work.
2. Wood furring.
3. Utility shelving.
4. Miscellaneous blocking, grounds, nailers, and panels.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section "Cast-In-Place Concrete" for wood formwork.
2. Division 6 Section "Interior Architectural Woodwork" for interior trim and ornamental elements specially fabricated for this project.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Wood treatment data from chemical treatment manufacturer. Include chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated material.

1. Preservative Treatment: Include certification by treatment plant stating type of solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. Waterborne Preservative Treatment: Include certification that moisture content of treated wood was reduced to levels specified prior to shipment to project site.
3. Fire-Retardant Treatment: Include certification by treating plant that treated wood complies with specified requirements.

4. Warranty: Include warranty of chemical treatment manufacturer for each type of treatment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack material above ground level on uniformly spaced supports to prevent deformation.

1. For material pressure treated with waterborne chemicals, place spacers between each bundle for air circulation.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Grade Stamps: Furnish lumber with each piece factory-marked with grade stamp of inspection agency that indicates grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, furnish pieces marked on ends or back of each piece.

C. Sizes: Provide nominal (actual) sizes indicated, complying with PS 20 except where actual sizes are specifically noted as being required.

D. Surfacing: Dressed lumber, S4S, unless otherwise indicated.

2.2 DIMENSION LUMBER FOR CONCEALED CONDITIONS

A. Species: Any wood species listed by PS 20.

B. Moisture Content: S-DRY, KD 19 or MC 19 (19 percent maximum moisture content).

C. Grade: No. 2 or standard grade.

D. Grade: No. 3 or utility grade.

2.3 DIMENSION LUMBER FOR EXPOSED CONDITIONS

A. Species: Any wood species listed by PS 20.

B. Moisture Content: S-DRY, KD 19 or MC 19 (19 percent maximum moisture content).

C. Grade: No. 1 or construction grade.

2.4 BOARDS FOR CONCEALED CONDITIONS

A. Species: Any wood species listed by PS 20.

B. Moisture Content: S-DRY, KD 19 or MC 19 (19 percent maximum moisture content).

C. Grade: No. 2, 2 Common, or Construction Boards.

2.5 BOARDS FOR EXPOSED CONDITIONS

A. Species: Any wood species listed by PS 20.

B. Moisture Content: S-DRY, KD 19 or MC 19 (19 percent maximum moisture content).

C. Grade: No. 1, 1 Common, Construction Heart, or Select Merchantable Boards.

2.6 CONSTRUCTION PANELS

A. Standards: Comply with requirements of PS 1 Voluntary Product Standard "Construction and Industrial Plywood" for veneer plywood and APA PRP-108 "Performance Standards and Policies for Structural-Use Panels" for performance-rated panels.

1. Trademark: Furnish construction panels that are each factory-marked with APA trademark for grade specified.

B. Miscellaneous Concealed Plywood: C-C Plugged Exterior, thickness as indicated but not less than 1/2 inch (12.7 mm) nominal.

C. Miscellaneous Concealed Panels: APA-RATED SHEATHING, Exposure 1, span rating to suit framing in each location.

D. Miscellaneous Exposed Plywood: A-D Interior, thickness as indicated but not less than 1/2 inch (12.7 mm) nominal.

E. Electrical/Telephone Backing Panels: APA-RATED SHEATHING, Exposure 1, fire-retardant treated, thickness as indicated but not less than 15/32 inch (12 mm).

F. Electrical/Telephone Backing Panels: C-D Plugged, Exposure 1 plywood panels, fire-retardant treated, thickness as indicated but not less than 1/2 inch (12.7 mm) nominal.

2.7 PARTICLEBOARD

A. Standard: Provide particleboard panels manufactured and each factory-marked to comply with requirements of ANSI A 208.1 "Wood Particleboard" for grade indicated.

B. Wall Sheathing: Grade 2-M-1.

2.8 FASTENERS

A. General: Where miscellaneous carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel.

B. Nails, Wire, Brads and Staples: FS FF-N-105.

C. Bolts: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and flat washers.

2.9 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

A. General: Obtain preservative-treated lumber complying with AWPA Standard C2. Mark each treated item with AWPB or SPIB Quality Mark Requirements. Coat surfaces cut after treatment to comply with AWPA M4.

B. Above-Ground Wood Treatment: Pressure treat with waterborne preservatives to a minimum retention of 0.25 lb/cu ft (4.0 kg/cu m).

1. Kiln-dry interior dimension lumber after treatment to 19 percent maximum moisture content.
2. Kiln-dry interior construction panels after treatment to 15 percent maximum moisture content.
3. Treat wood items indicated and in the following circumstances:

a. In contact with roofing, flashing, or waterproofing.
b. In contact with masonry or concrete.
c. Within 18 inches (450 mm) of grade.

C. Ground-Contact Wood Treatment: Pressure treat with waterborne preservatives to a minimum retention of 0.40 lb/cu ft (6.4 kg/cu m).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of miscellaneous carpentry and in sizes that would require an excessive number or poor arrangement of joints.

B. Cut and fit miscellaneous carpentry accurately. Install members plumb and true to line and level.

C. Coat cut edges of preservative-treated wood to comply with AWPA M4.

D. Securely fasten miscellaneous carpentry as indicated and according to applicable codes and recognized standards.

E. Countersink nail heads on exposed carpentry work and fill holes.

F. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install where shown and where required for screeding or attachment of other work. Cut and shape to required size. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 WOOD FURRING

A. General: Install at spacing indicated, with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.

B. Furring to Receive Plywood Paneling: Install 1 by 3 inch nominal size (19 by 64 mm actual size) furring at 24 inches (600 mm) o.c., horizontally and vertically. Select furring strips for freedom from knots that could cause bent-over nails and damage to paneling.

C. Furring to Receive Gypsum Board: Install 1 by 2 inch nominal size (19 by 38 mm actual size) furring at 16 inches (400 mm) o.c., vertically.

D. Furring to Receive Plaster Lath: Install 1 by 2 inch nominal size (19 by 38 mm actual size) furring at 16 inches (400 mm) o.c., vertically.

3.4 CONSTRUCTION PANELS

A. Comply with applicable installation recommendations in APA Form E30 "Design/Construction Guide--Residential & Commercial."

END OF SECTION 06105

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Laminate clad cabinets (plastic-covered casework).
2. Cabinet tops (countertops).

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work that is not exposed to view.
2. Division 9 Section "Painting" for final finishing of installed Architectural woodwork.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Fire-retardant treatment data for material impregnated by pressure process to reduce combustibility. Include certification by treating plant that treated materials comply with requirements.

D. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Apply WIC Certified Compliance Label to first page of shop drawings.

E. Samples for initial selection purposes of the following in form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of material indicated.

1. Plastic laminate.
2. Factory-applied opaque finishes.

F. Samples for verification purposes of the following:

1. Lumber with or for transparent finish, 50 square inches, for each species and cut, finished on one side and one edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent finished woodwork.
3. Lumber and panel products with factory-applied opaque finish, 8- 1/2 inches by 11 inches for panels and 50 square inches for lumber, for each finish system and color, with one half of exposed surface finished.
4. Laminate clad panel products, 8-1/2 inches, by 11 inches for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
5. Corner pieces as follows:

   a. Cabinet front frame joints between stiles and rail as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
   b. Miter joints for standing trim.

6. Exposed cabinet hardware, one unit of each type and finish.

G. Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.

H. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Contracting Officer and/or Project Managers and Owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.

B. Single-Source Responsibility: Arrange for production by a single firm of

architectural woodwork with sequence matched wood veneers.

1. Include the veneering of wood doors in the single-firm production, where veneer matching extends across wood doors.

C. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation.

D. Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

E. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

F. WIC Quality Standard: Comply with applicable requirements of "Manual of Millwork" published by Woodwork Institute of California (WIC) unless otherwise indicated.

1. WIC Quality Marking: Mark each unit of the following types of architectural woodwork with WIC Certified Compliance Label indicating quality grade required.

a. Casework.
b. Plastic laminate countertops.

2. WIC Certificate of Compliance: For types of architectural woodwork not eligible for marking with WIC Certified Compliance Label, issue WIC Certificates of Compliance certifying that items comply with WIC requirements for AWI grade indicated.

G. Hardware Coordination: Distribute copies of approved scheduled for cabinet hardware specified in Division 8 Section "Finish Hardware" to manufacturer of architectural woodwork; coordinate cabinet shop drawings and fabrication with hardware requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting, wet work, grinding, and similar

operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

1. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with manufacture of woodwork without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 HIGH PRESSURE DECORATIVE LAMINATE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high pressure decorative laminates which may be incorporated in the work include but are not limited to the following:

1. Formica Corp.
2. Laminart.
3. Nevamar Corp.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of the AWI woodworking standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

1. Hardboard: ANSI/AHA A135.4
2. High Pressure Laminate: NEMA LD 3.
3. Medium Density Fiberboard: ANSI A208.2.
4. Particleboard: ANSI A208.1
5. Softwood Plywood: PS 1.
6. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary standard referenced below:

    a. Particleboard: NPA 8.
    b. Medium Density Fiberboard: NPA 9.
    c. Hardwood Plywood: HPMA FE.

A. Fire-Retardant Particleboard: Where indicated, provide panels complying with the following requirements that have fire-retardant chemicals bonded to softwood particles at time of panel manufacture to achieve products identical to those tested for flame spread of 20 or less and for smoke developed of 25 or less per ASTM E 84 by UL or other testing and inspecting organization acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1. For 45-lb-density panels and thicknesses of 3/4 inch and less, comply with ANSI A208.1 for Grade 1-M-1 except that minimums for modulus of elasticity and screw-holding capacity on face and edge shall be 300,000 psi, 250 lb, and 225 lb, respectively.
2. For 44-lb-density panels and thicknesses of 13/16 inch to 1-1/4 inch, comply with ANSI A208.1 for Grade 1-M-1 except that minimums for modulus of rupture, modulus of elasticity, internal bond, linear expansion, and screw-holding capacity on face and edge shall be 1300 psi, 250,000 psi, 60 psi, 0.50 percent, 250 lb, and 175 lb, respectively.
3. Product: Subject to compliance with requirements, provide "Duraflake FR" by Duraflake Div.; Willamette Industries, Inc.

2.3 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of cabinets and edges of solid wood (lumber) members less than 1 inch in nominal thickness: 1/16 inch.

2. Edges of rails and similar members more than 1 inch in nominal

thickness: 1/8 inch.

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges of cutouts with a water-resistant coating.

2.4 LAMINATE CLAD CABINETS (PLASTIC-COVERED CASEWORK)

A. Quality Standard: Comply with AWI Section 400 and its Division 400B "Laminate Clad Cabinets."

B. Grade: Premium.

C. AWI Type of Cabinet Construction: Flush overlay.

D. WIC Construction Type: Type I multiple self-supporting units rigidly joined together.

E. WIC Door and Drawer Front Style: Flush overlay.

F. WIC Door and Drawer Front Style: Lipped.

G. Laminate Cladding: High pressure decorative laminate complying with the following requirements:

1. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

a. Provide selections made by Contracting Officer and/or Project Managers from laminate manufacturer's full range of standard colors and finishes in the following categories:

1) Solid colors.
2) Wood grains.

2. Laminate Grade for Exposed Surfaces: Provide laminate cladding

complying with the following requirements for type of surface and grade.

a. Horizontal Surfaces Other Than Tops: GP-50 (0.050-inch nominal thickness).
b. Postformed Surfaces: PF-42 (0.042-inch nominal thickness).
c. Vertical Surfaces: GP-50 (0.050-inch nominal thickness).
d. Edges: GP-50 (0.050-inch nominal thickness).

3. Semiexposed Surfaces: Provide surface materials indicated below:

a. High pressure laminate, GP-28.

2.5 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Finish Hardware."

B. Cabinet Hardware Schedule: Refer to schedule at end of this section for cabinet hardware required for architectural cabinets.

C. Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA code number indicated.

1. Satin Chromium Plated, Steel Base: BHMA 652.

E. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of ANSI/BHMA A156.9.

1. Install glass to comply with applicable requirements of Division 8 Section "Glass and Glazing" and of FGMA "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.6 ARCHITECTURAL CABINET TOPS (COUNTERTOPS)

A. Quality Standard: Comply with AWI Section 400 and its Division 400C.

B. Type of Top: High pressure decorative laminate complying with the following:

1. Grade: Premium.
2. Laminate Cladding for Horizontal Surface: High pressure decorative laminate as follows:

    a. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

        1) Provide selections made by Contracting Officer and/or Project Managers from manufacturer's full range of standard colors and finishes in the following categories:

            a) Solid colors.
            b) Wood grains.

    b. Grade: GP-50 (0.050-inch nominal thickness).
    c. Grain Direction: Parallel to longest dimension.

3. Edge Treatment: Same as laminate cladding on horizontal surfaces.

2.7 FASTENERS AND ANCHORS

A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

1. For metal framing supports, provide screws as recommended by metal framing manufacturer.

B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

C. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.8 FACTORY FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Quality Standard: Comply with AWI Section 1500 unless otherwise indicated.

B. Quality Standard: Comply with WIC Section 25, "Factory Finishing of

Architectural Woodwork," unless otherwise indicated.

C. General: The entire finish of interior architectural woodwork is specified in this section, regardless of whether factory applied or applied after installation.

1. Factory Finishing: To the greatest extent possible, finish architectural woodwork at factory. Defer only final touch-up, cleaning, and polishing until after installation.
2. Factory Finishing: The extent to which the final finish is applied to architectural woodwork at factory is Contractor's option, except factory apply at least prime/base coat to the greatest extent possible before delivery.

D. General: The primary and prefinishing (if any) of interior architectural woodwork required to be performed at factory is specified in this section. Refer to Division 9 Section "Painting" for final finishing of installed architectural woodwork and for material and application requirements of prime coats for woodwork not specified to receive final finish in this section.

E. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.

C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.

B. Quality Standard: Install woodwork to comply with WIC Section 26 for same grade specified in Part 2 of this section for type of woodwork involved.

C. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.

D. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

G. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of cabinets with transparent finish.

H. Tops: Anchor securely to base units and other support systems as indicated.

I. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips and by blind nailing on backup strips, splined-connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.

J. Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.

K. Refer to the Division 9 Sections for final finishing of installed architectural woodwork.

3.3 ADJUSTMENT AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up

factory-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensures that woodwork is being without damage or deterioration at time of Substantial Completion.

END OF SECTION 06402

SECTION 07110 - SHEET MEMBRANE WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes sheet membrane waterproofing systems.

B. Types of sheet waterproofing specified in this section include the following:

1. Butyl sheet waterproof membranes.
2. EPDM sheet waterproof membranes.

1.3 SYSTEM PERFORMANCE

A. General: Provide sheet waterproofing products that have been produced and installed to establish and maintain watertight continuous seals.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

B. Product data and general recommendations from waterproofing materials manufacturer for types of waterproofing required.

C. Samples of sheet membrane waterproofing and auxiliary materials as requested by Contracting Officer and/or Project Managers.

1.5 QUALITY ASSURANCE

A. Manufacturer: Obtain primary waterproofing materials of each type required from a single manufacturer, to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials.

B. Installer: Firm with not less than five waterproofing projects similar to requirements for this project with satisfactory in-service performance.

C. Preinstallation Conference: Prior to installation of waterproofing and associated work, meet at project site with Installer of each component of associated work, inspection and testing agency representatives (if any), and installers of work requiring coordination with waterproofing work. Review material selections and procedures to be followed in performing work. Notify Contracting Officer and/or Project Managers at least 48 hours before conducting meeting.

1.6 PROJECT CONDITIONS

A. Substrate: Proceed with work after substrate construction, openings, and penetrating work have been completed.

B. Weather: Proceed with waterproofing and associated work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.7 WARRANTY

A. Special Project Warranty: Submit a written warranty, executed by manufacturer, agreeing to repair or replace sheet membrane waterproofing that fails in materials or workmanship within the specified warranty period. This Warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

1. Warranty period is 5 years after date of substantial completion.

PART 2 - PRODUCTS

2.1 BUTYL SHEET WATERPROOFING

A. Butyl synthetic rubber formed into uniform flexible sheets not less than 60 mils thick, complying with the following:

1. Hardness: 50 to 70 Shore A; ASTM D 2240.
2. Tensile Strength: 1200 psi; ASTM D 412.
3. Ultimate Elongation: 300 percent; ASTM D 412.
4. Brittleness Temperature: Minus 40 deg F (minus 40 deg C); ASTM D 746.
5. Tear Resistance: 125 lbs. per lin. inch; ASTM D 624 (Die C).

6. Resistance to Heat Aging: Maximum hardness increase of 15 points, maximum reduction in elongation of 30 percent, and maximum loss of tensile strength of 30 percent (168 hours at 240 deg F, (116 deg C); ASTM D 573.
7. Resistance to Ozone Aging: No cracks for 100 hours' exposure of 10 percent elongated samples at 104 deg F (40 deg C) and 50 pphm ozone; ASTM D 1149.
8. Resistance to Water Absorption: Less than 3.0 percent volume gain after 72 hours of water immersion at 212 deg F (100 deg C); ASTM D 471.

2.2 EPDM SHEET WATERPROOFING

A. Ethylene propylene diene monomers formed into uniform flexible sheets of thickness shown or, if no thickness is shown, not less than 1/16 inch thick, complying with the following:

1. Hardness: 50 to 70 Shore A; ASTM D 2240.
2. Tensile Strength: 1400 psi; ASTM D 412.
3. Ultimate Elongation: 300 percent; ASTM D 412.
4. Brittleness Temperature: Minus 75 deg F (minus 59 deg C); ASTM D 746.
5. Tear Resistance: 125 lbs. per lin. inch; ASTM D 624 (Die C).
6. Resistance to Heat Aging: Maximum hardness increase of 15 points, maximum reduction in elongation of 30 percent, and maximum loss of tensile strength of 15 percent (168 hrs. at 240 deg F, 116 deg C); ASTM D 573.
7. Resistance to Ozone Aging: No cracks after 168 hours' exposure of 50 percent elongated sample at 104 deg F (40 deg C) and 100 pphm ozone; ASTM D 1149.
8. Resistance to Water Absorption: Less than 0.5 percent volume gain for 72 hours' immersion at 212 deg F (100 deg C); ASTM D 471.

2.3 AUXILIARY MATERIALS

A. Adhesives and Joint Tape: Provide types of adhesive compound and tapes recommended by waterproofing sheet manufacturer for bonding to substrate (if required), for waterproof sealing of seams in membrane, and for waterproof sealing of joints between membrane and flashings, adjoining surfaces, and projections through membrane.

B. Primers: Provide type of concrete primer recommended by manufacturer of sheet waterproofing material for applications required.

C. Flashing Materials: Except as otherwise indicated, provide types of flexible sheet material for flashing as recommended by waterproofing sheet manufacturer.

D. Protection Board: Provide type of protection board recommended by waterproofing sheet manufacturer. Include adhesives recommended by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Comply with manufacturer's instructions for surface preparation.

B. On concrete decks, immediately before placement of waterproofing sheet, grind or abrasive-blast surface lightly to ensure removal of projections that might penetrate sheet or curing compounds that would interfere with fully bonded systems. Clean deck of loose material by brooming and vacuuming.

C. On vertical foundation walls chip off projections where necessary for proper placement and adhesion of waterproofing sheet.

D. Apply primer to concrete and masonry surfaces at rate recommended by manufacturer of primary waterproofing materials. Prime only area that will be covered by WP membrane in same working day; reprime areas not covered by WP membrane within 24 hours.

3.2 INSTALLATION

A. Comply with manufacturer's instructions for handling and installation of sheet waterproofing materials.

B. Coordinate installation of waterproofing materials and associated work to provide complete system complying with combined recommendations of manufacturers and installers involved in work. Schedule installation to minimize period of exposure of sheet waterproofing materials.

C. Seal to projections through membrane and seal seams. Bond to vertical surfaces and also, where shown or recommended by manufacturer, bond to horizontal surfaces.

D. Top Edge Seal: For vertical and sloped wall membrane, finish in reglet (where

provided); otherwise finish under flashing or under masonry in joint. Caulk exposed edges with mastic or sealant.

E. Expansion Joints: Install joint filler as recommended by manufacturer, with protruding rounded surface. Apply continuous 8-inch-wide strip of membrane on joint, followed by membrane application.

F. Coat exposed areas of sheet and flashing materials. Comply with sheet manufacturer's recommendations for application and cure of coating.

G. Install protection board over completed membrane, complying with manufacturer's recommendations for both waterproofing sheet and protection course materials.

3.3 FIELD QUALITY CONTROL

A. In-place Testing: Before completed membranes on horizontal surfaces are covered by protection course or other work, test for leaks with 2-inch depth of water maintained for 24 hours. Repair any leaks revealed by examination of substructure and repeat test until no leakage is observed.

3.4 CLEANING

A. After completion, remove any masking materials and stains from exposed surfaces caused by waterproofing installation.

3.5 PROTECTION

A. Provide for protection of completed membrane during installation of other materials or processes over membrane and throughout remainder of construction period. Do not allow traffic of any type on unprotected membrane.

END OF SECTION 07110

SECTION 07160 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Hot-applied coal tar dampproofing.
2. Hot-applied asphalt dampproofing.
3. Cold-applied asphalt cut-back dampproofing.
4. Cold-applied asphalt emulsion dampproofing.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Bituminous sheet waterproofing is specified in Division 7 Section "Sheet Membrane Waterproofing."
2. Bituminous asphalt roofing is specified in Division 7 Section "Built-up Asphalt Roofing."
3. Bituminous coal tar roofing is specified in Division 7 Section "Built-up Coal Tar Roofing."

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Section "Submittals."

1. Product Data: Include data substantiating that materials comply with specified requirements for each dampproofing material specified.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed bituminous dampproofing work similar in material, design, and extent to that

indicated for project and that has resulted in construction with a record of successful in-service performance.

B. Single-Source Responsibility: Obtain primary dampproofing materials and primers from a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

1.5 PROJECT CONDITIONS

A. Substrate: Proceed with dampproofing work only after substrate construction and penetrating work have been completed.

B. Weather: Proceed with dampproofing work only when existing and forecast weather conditions will permit work to be performed in accordance with manufacturer's recommendations.

C. Ventilation: Provide adequate ventilation during application of solvent-based components in enclosed spaces. Maintain ventilation until dampproofing membrane has thoroughly cured.

PART 2 - PRODUCTS

2.1 BITUMINOUS DAMPPROOFING, GENERAL

A. Odor Elimination: For interior and concealed-in-wall uses, provide type of bituminous dampproofing material that is warranted by manufacturer to be substantially odor-free after drying for 24 hours under normal conditions.

2.2 HOT-APPLIED COAL TAR DAMPPROOFING

A. Coal-Tar-Based Primer: ASTM D 43.

B. Coal Tar Bitumen: ASTM D 450, Type II or Type III.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering hot-applied coal tar products that may be incorporated in the work include, but are not limited to, the following:

1. Celotex Corporation.
2. GAF Building Materials Corporation.

3. GS Roofing Products Company, Inc.
4. Koppers Company, Inc.
5. Manville Building Materials Corporation.
6. Owens-Corning Fiberglas Corporation.

1.3 HOT-APPLIED ASPHALT DAMPPROOFING

A. Asphalt Primer: ASTM D 41.

B. Dampproofing Asphalt: ASTM D 449, Type I.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering hot-applied asphalt products that may be incorporated in the work include, but are not limited to, the following:

1. Celotex Corporation.
2. GAF Building Materials Corporation.
3. GS Roofing Products Company, Inc.
4. Manville Building Materials Corporation.
5. Owens-Corning Fiberglas Corporation.
6. Tamko Corporation.
7. Tremco, Inc.

1.4 COLD-APPLIED COAL TAR DAMPPROOFING

A. Coal Tar Bitumen Compound: ASTM D 450, Type II, coal tar pitch and solvent compound, containing nonasbestos, inorganic fibrous reinforcement and filler materials recommended for dry below-grade exterior applications, compounded to penetrate substrate and build to moisture-resistant, firm, elastic coating.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-applied coal tar products that may be incorporated in the work include, but are not limited to, the following:

1. Celotex Corporation.
2. GAF Building Materials Corporation.
3. Koppers Company, Inc.

1.5 COLD-APPLIED ASPHALT CUT-BACK DAMPPROOFING

A. Asphalt Compound: Asphalt and solvent compound, compounded to penetrate substrate and build to firm, moisture-resistant, vapor-resistant, elastic coating.

1. Provide heavy fibrated-type mastic compound complying with ASTM D 2822, Type I and containing nonasbestos inorganic fibrous reinforcement materials.
2. Provide semifibrated-type semimastic compound complying with ASTM D 2823 and containing nonasbestos inorganic fibrous reinforcement and filler materials.
3. Provide nonfibrated-type liquid compound complying with ASTM D 2823 and containing nonasbestos inorganic filler materials.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering asphalt cut-back products that may be incorporated in the work include, but are not limited to, the following:

1. Celotex Corporation.
2. ChemRex Inc./Sonneborne Building Products Div.
3. GS Roofing Products Company, Inc.
4. J & P Petroleum Products, Inc.
5. Karnak Chemical Corporation.
6. Koch Materials Company.
7. Koppers Company, Inc.
8. Lunday Thagard Company.
9. Manville Building Materials Corporation.
10. Tamko Corporation.
11. Tremco, Inc.

C. Bond-Coat Type: Where asphalt dampproofing is indicated on bond coat for bonding of plaster or other materials to substrate, provide tack-surfaced material recommended by manufacturer for application shown.

1.6 COLD-APPLIED ASPHALT EMULSION DAMPPROOFING

A. Asphalt Emulsion: Asphalt-and-water-emulsion coating, compounded to penetrate substrate and build to moisture-resistant coating.

1. Provide heavy fibrated-type mastic asbestos-free emulsion; ASTM D 1227, Type IV, except containing nonasbestos, inorganic fibrous reinforcement materials.
2. Provide semifibrated-type semimastic asbestos-free emulsion; ASTM D 1227, Type II, except containing nonasbestos fibrous reinforcement and filler materials.
3. Provide nonfibrated-type liquid asbestos-free emulsion; ASTM D 1227, Type III.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering asphalt emulsion products that may be incorporated in the work include, but are not limited to, the following:

1. Celotex Corporation.
2. ChemRex, Inc./Sonneborne Building Products Div.
3. GS Roofing Products Company, Inc.
4. J & P Petroleum Products, Inc.
5. Karnak Chemical Corporation.
6. Koch Materials Company.
7. Koppers Company, Inc.
8. Lunday Thagard Company.
9. Manville Building Materials Corporation.
10. Tamko Corporation.
11. Tremco, Inc.

1.7 REINFORCED-ASPHALT SPRAYED DAMPPROOFING

A. General: 2-component product, consisting of spray-grade asphaltic compound, complying with ASTM D 1227, Type I, combined with chopped glass fiber produced and specifically recommended by manufacturer for dampproofing applications, and intended for mixing at spray nozzle during installation.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering asphalt emulsion products that may be incorporated in the work include, but are not limited to, the following:

1. Celotex Corporation.
2. ChemRex, Inc./Sonneborne Building Products Div.
3. GAF Building Materials Corporation.
4. GS Roofing Products Company, Inc.
5. Karnak Chemical Corporation.
6. Koch Materials Company.
7. W.R. Meadows, Inc.

1.8 MISCELLANEOUS MATERIALS

A. Glass-Fiber Mat: Nonwoven fiberglass fabric of continuous filament or jack-straw filament/yarn pattern of glass fiber, impregnated and bound together with type of organic/synthetic binder that is compatible with type of bituminous compound indicated to be reinforced, weighing 1.0 to 1.5 lbs. per 100 sq. ft., 36-inch-wide rolls.

B. Bituminous Grout: Comply with ASTM D 147.

C. Plastic Cement: Asphalt based, complying with ASTM D 491, except provide coal tar base where specifically recommended by manufacturer of bituminous dampproofing materials.

D. Protection Course, Board Type: Asphalt-impregnated and coated organic fiberboard, 1/2 inch thick.

E. Protection Course, Roll Roofing Type: ASTM D 249, smooth-surfaced roll roofing, weighing not less than 55 lbs. per 100 sq. ft.

F. Protection Course, Film Type: 4-mil carbonated polyethylene film.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBSTRATE

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.

B. Install cant strips and similar accessories as shown and as recommended by prime materials manufacturer even though not shown.

C. Fill voids, seal joints, and apply bond breakers (if any) as recommended by prime materials manufacturer, with particular attention at construction joints.

D. Install separate flashings and corner protection stripping as recommended by prime materials manufacturer, where indicated to precede application of dampproofing. Comply with details shown and manufacturer's recommendations. Give particular attention to requirements at building expansion joints, if any.

E. Prime substrate as recommended by prime materials manufacturer.

F. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work, by masking or otherwise protecting adjoining work.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's recommendations, except where more stringent requirements are indicated or specified and where project conditions require extra precautions or provisions to ensure satisfactory performance of work.

3.3 BITUMINOUS DAMPPROOFING INSTALLATION

A. General: Apply dampproofing to all exterior below-grade surfaces of exterior underground walls in contact with earth or other backfill and where space is enclosed on opposite side.

B. Reinforcement: At changes in plane or where otherwise shown as "Reinforced," install lapped course of glass-fiber mat in first coat of dampproofing compound before it thickens.

C. Bituminous Cant Strips: Install 2-inch by 2-inch cant strip of bituminous grout at base of vertical dampproofing where it meets horizontal surface.

D. Extend vertical dampproofing down walls from finished grade line to top of footing, extend over top of footing, and turn down minimum of 6 inches over outside face of footing. Extend 12 inches onto intersecting walls and footings but do not extend onto surfaces that will be exposed to view when project is completed.

3.4 HOT BITUMEN ON EXTERIOR SURFACES

A. Do not apply hot bitumen when substrate condition causes foaming.

B. Apply coat of hot bitumen by mopping or spraying at rate of 20 lbs. or 2.5

gallons per 100 sq. ft., to produce a uniform film thickness of not less than 30 mils.

C. Apply a second coat same as specified above, after allowing 24 hours for curing of first coat. Double thickness of second coat at locations where first application has failed to produce a smooth, lustrous, impervious coat.

3.5 COLD BITUMEN ON EXTERIOR AND INTERIOR SURFACES

A. Apply coat of cold, liquid bituminous dampproofing material, by brushing or spraying at rate of 1.25 to 2.0 gallons per 100 sq. ft., depending upon substrate

texture, as required to produce a uniform dry film thickness of not less than 12 mils.

1. For exterior surfaces, provide either pitch or asphalt dampproofing materials, at Contractor's option. For interior surfaces provide only asphalt materials.

B. Apply a second coat same as specified above, after allowing 24 hours for drying of first coat. Apply second coat at rate of 0.8 to 1.25 gallons per 100 sq. ft. Double thickness of second coat where first application has failed to produce smooth, lustrous, impervious coat.

C. Apply coat of cold, semifibrated, semimastic asphalt dampproofing material, by brushing or spraying at rate of 5.0 gallons per 100 sq. ft., to produce uniform dry film thickness of not less than 30 mils.

D. Apply coat of cold, fibrated, mastic asphalt dampproofing material, by troweling onto substrate at minimum rate of 7.0 gal. per 100 sq. ft., to produce average dry film of 70 mils but not less than 30 mils at any point.

3.6 ASPHALT EMULSION ON EXTERIOR AND INTERIOR SURFACES

A. Apply coat of liquid asphalt emulsion dampproofing material by brushing or spraying at rate of 1.5 to 2.5 gallons per. 100 sq. ft., depending upon substrate texture, as required to produce uniform dry film thickness of not less than 15 mils. Apply in 2 coats if necessary to obtain required thickness, allowing time for complete drying between coats.

B. Apply coat of semifibrated, semimastic, asphalt emulsion dampproofing materials, by brushing or spraying at rate of 5.0 gallons per 100 sq. ft., to produce uniform, dry film thickness of not less than 30 mils.

C. Apply coat of fibrated, mastic, asphalt emulsion dampproofing material, by troweling onto substrate at a minimum rate of 7.0 gal. per 100 sq. ft., to produce average dry film of 60 mils but not less than 30 mils at any point.

3.7 REINFORCED ASPHALT ON EXTERIOR OR INTERIOR SURFACES

A. General: Comply with manufacturer's instructions for spray application of bituminous dampproofing compound and reinforcing fiber in single, continuous, uniform course, at rate of 18 gallons per 100 sq. ft.

3.8 INSTALLATION OF DAMPPROOF PROTECTION COURSE

A. General: Where indicated, install protection course of type indicated over completed-and-cured dampproofing treatment. Comply with dampproofing materials manufacturer's recommendations for method of support or attachment of protection materials. Support with spot application of plastic cement where not otherwise indicated.

END OF SECTION 07160

SECTION 07210 – BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

B. All work shall be performed by mechanics skilled in their respective trades in accordance with the best practices of the trade, and in accordance with the requirements of the materials manufactured.

1.2 SCOPE OF WORK

A. Batt insulation or blown-in insulation for thermal insulation between trusses (R-30).

B. Batt insulation for thermal insulation at exterior walls, R-19, 5-1/2" unfaced fiberglass batt insulation.

C. Rigid insulation.

1.3 WORK NOT INCLUDED

A. Piping and duct insulation by Division 15.

B. Perimeter Insulation (by Section 03100).

C. Rigid Insulating Sheathing (by Section 06100).

1.3 MATERIALS

A. Between roof trusses use batts or blown-in insulation with total value of R=30 (minimum). Blow-in insulation shall be fiberglass, non-combustible blow-in insulation as manufactured by Certainteed "Insul-Safe II", conforming to FS HS-1-1030A type 1. It shall be listed by UL as having the following fire hazard classification when tested in accordance with ASTM E-84:

Flame Spread ----------5
Fuel Contributed----------0
Smoke Developed----------5

B. Other Acceptable Manufacturers: Owens-Corning, Johns Manville, Celotex.

C. Batt Insulation (Fiberglass-or Rockwool): Meet ASTM C 665-84 Type I for batt or roll type insulation without vapor barrier.

1.4 INSTALLATION

A. Batt Insulation:

1. Install where indicated on drawings continuously and without gaps.
2. Carry insulation around all pipes and ductwork where it penetrates.

B. Blow-In Insulation: Shall be applied as per manufacturer's specifications and recommendations.

C. Coordinate start and installation of insulation with other trades.

D. Do not block the flow of air thru the vent at the eaves.

E. Install insulation in cavities between studs at exterior wall corners and all junctions between exterior walls and interior partitioning.

F. Install insulation in all voids between window and doorframes and the adjacent woof framing members.

1.5 CERTIFICATION

A. Label Batt Insulation to show type, Manufacturer, R-Value for the labeled thickness.

B. Provide a certification card showing the data required for Batt Insulation and the name of the installer. Affix to a conspicuous location within the structure.

C. Blow-in Insulation fiber shall have a UL label attached to each package of material delivered to the jobsite.

1.6 CLEAN UP

A. Remove all excess materials from jobsite.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 07210

SECTION 07527 - SBS-MODIFIED BITUMINOUS SHEET ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Modified bituminous sheet with mineral granule surfacing.
2. Vapor retarder.
3. Roof insulation.
4. Roof membrane surfacing material.
5. Protected roof membrane insulation.
6. Pakers

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 6 Section "Rough Carpentry" for treated wood nailers, curbs, and wood cants.
2. Division 7 Section "Flashing and Sheet Metal" for metal counter flashings.
3. Division 7 Section "Roof Accessories" for prefabricated curb units.
4. Division 7 Section "Joint Sealants " for exterior and interior joints.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definitions of terms related to roofing work not otherwise defined in this Section.

B. Thermal Resistivity (r-value) is the reciprocal of thermal conductivity (k-value) which is the rate of heat flow through a homogenous material exactly 1 inch (25.4 mm) thick. Thermal resistivity (r-value) is expressed by the temperature difference in degrees F (Kelvins) between two parallel surfaces required to cause 1 Btu to flow through 1 sq. ft. (1 watt to flow through 1 sq. m) of a homogenous material exactly 1 inch (25.4 mm) thick per hour at the mean temperature indicated.

C. Thermal Resistance (R-value) is the reciprocal of thermal conductance (C-value) which is the rate of heat flow through a material of the thickness indicated. Thermal resistance (R-value) is expressed by the temperature difference in degrees F (Kelvins) between the two exposed faces required to cause 1 Btu to flow through 1 sq. ft. (1 watt to flow through 1 sq. m) per hour at the mean temperature indicated.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Install modified bituminous sheet roofing to withstand wind loads, structural movement, thermally induced movement, and exposure to weather, without failure.

B. UL Listing: Provide modified bituminous sheet roofing system and component materials that have been tested for application and slopes indicated and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.

1. Provide roof-covering materials bearing UL Classification Marking on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-up Service.

C. FM Listing: Provide modified bitumen sheet roofing system and component materials that have been evaluated by Factory Mutual System for fire spread, wind uplift, and hail damage and that are listed in "Factory Mutual Approval Guide" for Class I construction.

1. Roofing system shall comply with FM Class I-60 for wind-uplift resistance.

D. Insulation Fire-Performance Characteristics: Provide insulation materials that are identical to materials whose fire-performance characteristics have been determined for the assemblies of which the insulation materials are a part, per test method listed below, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Surface Burning Characteristics: ASTM E 84.
2. Fire Resistance Ratings: ASTM E 119.

1.5 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified. Include data substantiating that materials comply with requirements.

1. For asphalt bitumen, provide label on each container or certification with each load of bulk bitumen, indicating flash point (FP), finished blowing temperature (FBT), softening point (SP), and equiviscous temperature (EVT).

C. Manufacturer's certification indicating that bulk bituminous materials (if any) delivered to project comply with required standards. Include quantity and statistical and descriptive data for each product. Submit certificate with each load before it is used.

1. Include continuous log showing time and temperature for each load of bulk bitumen, indicating date obtained from manufacturer, where held, and how transported prior to final heating and application on roof.

D. Field Test Reports: Submit daily softening point test reports on samples of asphalt used on project, taken at beginning of each day's work and at 2-hour intervals during course of the work. Test by Ring and Ball Test, ASTM D 36, or similar recognized test method. Submit samples to independent laboratory for testing or perform tests in field, at Contractor's option.

E. Samples of the following:

1. 3 lb (1.5 kg) samples of aggregate surfacing material.
2. 12 x 12 inch (300 x 300 mm) square samples of each color modified, bituminous, mineral-surface cap sheets to be exposed as finished roof surface.

F. Installer Certification: Submit written certification from manufacturer of modified bituminous sheet roofing system certifying that Installer is approved by manufacturer to install specified roofing system. Provide copy of certification to Contracting Officer and/or Project Managers before award of roofing work.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain primary products, including each type of roofing sheet, bitumen, membrane flashings, and vapor retarder (if any), from a single manufacturer. Provide secondary products as recommended by manufacturer of primary products for use with roofing system specified.

B. Installer Qualifications: Engage an experienced Installer (Roofer) who is certified by modified bituminous sheet roofing system manufacturer as qualified to install manufacturer's roofing materials.

1. Installer's Field Supervision: Require Installer to maintain a full-time supervisor/foreman on job site during times that modified bituminous sheet roofing work is in progress and who is experienced in installation of roofing systems similar to type and scope required for this project.

C. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store and handle roofing sheets in a dry, well-ventilated, weathertight place to ensure no possibility of significant moisture pickup. Store rolls of felt and other sheet materials on end on pallets or other raised surface.

B. Do not leave unused felts and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from weather or other moisture sources.

C. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit unit of work to be installed in accordance with manufacturers' recommendations and warranty requirements.

B. Temporary Roofing: When adverse job or weather conditions prevent permanent roofing system from being installed according to requirements and Contractor determines that roofing cannot be delayed because of need for job progress or protection of other work, install temporary roofing. Engage roofing Installer to provide temporary roofing and to remove it prior to proceeding with permanent roofing work.

1. Record by way of Change Order the Owner's agreement to proceed with temporary roofing, along with any additional costs and other changes to Contract Documents.

1.9 SEQUENCING AND SCHEDULING

A. Sequence installation of modified bituminous sheet roofing with related units of work specified in other Sections to ensure that roof assemblies, including roof accessories, flashing, trim, and joint sealers, are protected against damage from effects of weather, corrosion, and adjacent construction activity.

1.10 WARRANTY

A. Special Project Warranty: Submit two executed copies of standard 2-year Roofing Warranty on form included at end of this Section, covering work of this section including roofing membrane, membrane flashing, roof insulation, any vapor retarders, and roofing accessories, signed and countersigned by Installer (Roofer) and Contractor.

B. Manufacturer's Warranty: Submit executed copy of roofing manufacturer's standard Service Warranty agreement including flashing endorsement, signed by an authorized representative of modified bitumen sheet roofing system manufacturer, on form that was published with product literature as of date of Contract Documents, for the following period of time:

1. 20 years, NDL (No dollar limit) after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TEMPORARY ROOFING

A. Temporary Roofing Membrane: Two plies of asphalt-impregnated glass-fiber felt complying with ASTM D 2178, Type IV, set in and glaze-coated with hot moppings of ASTM D 312, Type III asphalt.

1. Provide base of rigid perlite board roof insulation over metal deck surfaces of minimum thickness as required to span between top flutes of deck without deflection, but not less than 3/4 inch (19 mm). Attach to deck with FM-approved adhesive.

2.2 VAPOR RETARDER

A. Bituminous Vapor Retarder: Two plies of asphalt-impregnated glass-fiber felt, complying with ASTM D 2178, Type IV, set in and glaze-coated with ASTM D 312, Type III asphalt.

2.3 ROOF INSULATION

A. Perlite Board Insulation: Rigid, noncombustible, perlite-fiber boards of thicknesses indicated, with k value of 0.36 (kSI value of 0.62) at 75 deg F (24 deg C), integrally skinned surfaces, complying with ASTM C 728. Provide manufacturer's standard sizes.

B. Insulation Overlay Board: Perlite board, 3/4 inch (19 mm) thick; ASTM C 728.

2.4 MODIFIED BITUMINOUS SHEET ROOFING SYSTEM

A. Modified Bituminous Sheet, General: Furnish modified bituminous sheet materials complying with the following:

1. Breaking Strength: ASTM D 412, minimum 66 lb (30 kg).
2. Ultimate Elongation (elongation at break): ASTM D 412, 4.0 percent.
3. Water Resistance: ASTM D 570, will not absorb more than 1.0 gram of water and dimensional change will not exceed 1.0 percent (ASTM D 1204).
4. Water Vapor Transmission: ASTM E 96, maximum 1.0 gram in 24 hours.
5. Dynamic Impact (puncturing): Pass water-tightness test after impact of 1.8 ft. lb (2.4 J).
6. Lap Joint Strength: ASTM D 412, 66 lbf (295 N), after immersion at 50 deg F (10 deg C) for 5 days plus five freeze-thaw cycles.
7. Breaking Strength: ASTM D 412, Minimum 175 lb (80 kg).
8. Ultimate Elongation (elongation at break): ASTM D 412, 8.0 percent.
9. Water Resistance: ASTM D 570, will not absorb more than 1.0 gram of water and dimensional change will not exceed 1.0 percent (ASTM D 1204).
10. Water Vapor Transmission: ASTM E 96, maximum 1.0 gram in 24 hours.
11. Dynamic Impact (puncturing): Pass water-tightness test after impact of 3.6 ft. lb (5 J).
12. Lap Joint Strength: ASTM D 412, 176 lbf (780 N), after immersion at 50 deg F (10 deg C) for 5 days plus five freeze-thaw cycles.

B. Insulated-Deck, Modified Bitumen Membrane/Fully Adhered (IMBF):

1. Base Sheet: No. 40 asphalt-saturated and -coated organic felt, complying with ASTM D 2626.
2. Base Sheet: Asphalt-impregnated and -coated, glass-fiber base sheet dusted with mineral granules both sides, complying with ASTM D 4601, Type II.
3. Base Sheet: Asphalt-impregnated, glass-fiber felt, complying with ASTM D 2178, Type IV.
4. Base Sheet: Styrene Butadiene Styrene (SBS)-modified bitumen base sheet, with glass-fiber reinforcing mat, dusted with fine mineral granules both sides.
5. Venting Base Sheet: Asphalt-coated, heavyweight, glass-fiber base sheet with granular surfacing and embossed venting channels on bottom surface, complying with ASTM D 4897, Type II.
6. Interply Bitumen: Roofing asphalt, complying with ASTM D 312, Type III.

7. Modified Bitumen Sheet Membrane/Mineral Surfaced: Styrene Butadiene Styrene (SBS)-modified asphalt sheets with continuous layer of mineral granules factory-applied to top exposed surface; manufacturer's standard sheet thickness. Granule color: White.
8. Modified Bitumen Sheet Membrane/Metallic Surfaced: Styrene Butadiene Styrene (SBS)-modified asphalt sheets with embossed copper foil surface; manufacturer's standard sheet thickness.
9. Modified Bitumen Sheet Membrane/Plain Surfaced: Styrene Butadiene Styrene (SBS)-modified asphalt sheet with smooth surface, dusted on both sides with fine mineral granules; manufacturer's standard sheet thickness.

    a. Sheet Reinforcing: Woven or nonwoven polyester.
    b. Sheet Reinforcing: Glass-fiber mesh or nonwoven glass-fiber mat.
    c. Sheet Reinforcing: Composite polyester and glass-fiber mat.

10. Comply with "NRCA Roofing and Waterproofing Manual," Specification Plate No. 47-3--IMBF.
11. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

    a. GAF Building Materials Corporation.
    b. Manville Sales Corporation.
    c. Soprema Roofing and Waterproofing, Inc.
    d. Tremco, Inc.

B. Concrete-Deck, Modified Bitumen Membrane/Fully Adhered (CMBF):

1. Primer: Asphalt cut-back primer, complying with ASTM D 41.
2. Base Sheet: No. 40 asphalt-saturated and -coated organic felt, complying with ASTM D 2626.
3. Base Sheet: Asphalt-impregnated and -coated, glass-fiber base sheet dusted with mineral granules both sides, complying with ASTM D 4601, Type II.
4. Base Sheet: Asphalt-impregnated, glass-fiber felt, complying with ASTM D 2178, Type IV.
5. Venting Base Sheet: Asphalt-coated, heavyweight, glass-fiber base sheet with granular surfacing and embossed venting channels on bottom surface, complying with ASTM D 4897, Type II.
6. Interply Bitumen: Roofing asphalt, complying with ASTM D 312, Type III.

7. Modified Bitumen Sheet Membrane/Mineral Surfaced: Styrene Butadiene Styrene (SBS)-modified asphalt sheets with continuous layer of mineral granules factory-applied to top exposed surface; manufacturer's standard sheet thickness. Granule color: White.
8. Modified Bitumen Sheet Membrane/Metallic Surfaced: Styrene Butadiene Styrene (SBS)-modified asphalt sheets with embossed copper foil surfacing layer; manufacturer's standard sheet thickness.
9. Modified Bitumen Sheet Membrane/Plain Surfaced: Styrene Butadiene Styrene (SBS)-modified asphalt sheets with smooth surface, dusted with fine mineral granules on both sides; manufacturer's standard thickness.

    a. Sheet Reinforcing: Woven or nonwoven polyester.
    b. Sheet Reinforcing: Glass-fiber mesh or nonwoven glass-fiber mat.
    c. Sheet Reinforcing: Composite polyester and glass-fiber mat.

10. Comply with "NRCA Roofing and Waterproofing Manual," Specification Plate No. 57-3--CMBF.
11. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

    a. The Celotex Corporation.
    b. GS Roofing Products Co., Inc.
    c. Manville Sales Corporation.
    d. Siplast, Inc.
    e. Soprema Roofing and Waterproofing, Inc.
    f. Tamko Asphalt Products, Inc.
    g. Tremco, Inc.
    h. Tri-ply.
    g. U.S. Intec, Inc.

2.5 MISCELLANEOUS MATERIALS

A. Surfacing Aggregate: Crushed stone, free of sharp edges, complying with ASTM D 1863.

1. Where ASTM D 1863 aggregate is not available, provide aggregate complying with gradation sizes 6, 7, and 67 of ASTM D 448, provided that moisture content by weight is 3 percent or less and aggregate meets other requirements of ASTM D 1863.

B. Roof Coating: Acrylic coating, solvent-based, white; formulated for use on bituminous roof surfaces.

C. Wood Members: Comply with requirements of Division 6 Section "Rough Carpentry" for wood members indicated as roofing system work.

D. Cants: Perlite board, ASTM C 728.

E. Tapered Edge Strips: Rigid perlite board, ASTM C 728.

F. Walkway Protection Boards: Mineral-surfaced bituminous composition boards, approximately 1/2 inch (12.7 mm) thick, manufactured specifically for hot bituminous application on modified bitumen sheet roofing as a protection course for foot traffic.

G. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

2. Carey-Tread, Celotex Corp.
3. J-Walk, Manville Sales Corporation.
4. White Walk, W. R. Meadows, Inc.

H. Substrate Joint Tape: 6 or 8 inch (150 or 200 mm) wide, coated, glass-fiber joint tape.

I. Mastic Sealant: Polyisobutylene (plain or bituminous modified), nonhardening, nonmigrating, nonskinning, and nondrying.

J. Fasteners: Provide mechanical fasteners for modified bitumen sheet roofing system work, tested by manufacturer for required pull-out strength where applicable and compatible with deck type and roofing products used. Provide either 1 inch (25 mm) diameter nail heads or 1-3/8 inch (35 mm) diameter by 0.012 inch (0.3 mm) sheet metal caps for nails used to secure base sheets, felts, or insulation boards.

2.6 PAVERS AND ROOF PAVER LEVELING SYSTEM

A. Hanover Architectural Products, Inc. (Basic of Design).
B. Hastings Pavement Co. Inc.
C. Roofblok Lt.d

2.7 DRAINAGE MAT/BOARD

A. If insulation board not pr Basis of Design, provide the following required extra component:

1. Monsey-Bakor (MR Drain).

2. Mira FDI-T-C MiraDRI (MiraDrain 9000).
3. Approved equals.

2.8 PAVERS

A. Provide premanufactured concrete pavers as roof ballast. Pavers shall match existing pavers to greatest extent possible in size, color, and finish.

1. Manufacturer: Hanover Architectural Products, Inc.
2. Size: 23-1/2" x 23-1/2" x 21/2" thick.
3. Color: Limestone Grey.
4. Finish: Tudo.

B. Provide premanufactured leveling system and spacers for use with pavers.

1. System allows for leveling pavers to roof slopes up to ½" per 1'-0".
2. High density plastic composition capable of withstanding dead loads and live loads of plaza.
3. Integrates with paver spacer systems.
4. Provide Hanover Compensator System (Basic of Design) or approved equal.
5. Provide Hanover Paver Support Pedestal (Basic of Design) or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate surfaces to receive modified bitumen sheet roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

1. Verify that flatness and fastening of metal roof decks comply with installation tolerances specified in Division 5 Section "Steel Deck."
2. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.5 mm) out of plane.

3. Test concrete substrate for excessive moisture by pouring 1 pint (0.5 L) of hot bitumen at 400 deg F (204 deg C) or EVT on deck at start of each day's work and at start of each roof area or plane. Do not proceed with roofing work if test sample foams or can be easily and cleanly stripped after cooling--then substrate is too wet.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Cooperate with inspection and test agencies engaged or required to perform services in connection with installing modified bitumen sheet roofing system.

B. Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace or restore other work damaged by installation of modified bituminous sheet roofing system work.

C. Insurance/Code Compliance: Where required, install and test modified bitumen sheet roofing system to comply with governing regulations and specified insurance requirements.

D. Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut offs at end of each day's work to cover exposed ply sheets and insulation with a course of coated felt with joints and edges sealed with roofing cement. Remove cut offs immediately before resuming work.

E. Asphalt Bitumen Heating: Heat and apply bitumen according to EVT Method as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 25 deg F (14 deg C), at point of application) more than 1 hour prior to time of application. Determine flash point, finished blowing temperature, EVT, and fire-safe handling temperature of bitumen either by information from manufacturer or by suitable tests. Do not exceed recommended temperature limits during bitumen heating. Do not heat bitumen to a temperature higher than 25 deg F (14 deg C) below flash point. Discard bitumen that has been held at temperature exceeding finished blowing temperature (FBT) for more than 3 hours. Keep kettle lid closed except when adding bitumen.

F. Aggregate Surfacing: Limit temperature of adhesive coat to minimum required for proper embedment of aggregate and maximum that will permit retention of required coating weight based on slope of surface.

G. Bitumen Mopping Weights: For interply mopping, apply bitumen at the rate of 25 lb of asphalt per roof square (1.22 kg of asphalt per sq. m) (plus or minus 25 percent on a total-job average basis).

H. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction. Where mopping is applied directly to substrate, tape substrate joints or, where steep asphalt is used, hold asphalt back 2 inches (50 mm) from both sides of the joint.

I. Cutoffs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and any insulation. Provide temporary covering of two plies of No. 15 roofing felt set in full moppings of hot bitumen; remove at beginning of next day's work.

3.3 TEMPORARY ROOF INSTALLATION

A. Temporary Roofing Over Nailable Decks: Apply two plies of roofing felts, lapping each felt 19 inches (475 mm) (plus or minus 1/2 inch (13 mm)) over preceding one, and mopping with 20 lb per square (1 kg/sq. m) of Type III asphalt between felts (plus or minus 25 percent on a total-job average basis). Nail each felt 9 inches (225 mm) o.c. at a line approximately 2 inches (50 mm) down from concealed edge. Glaze-coat completed surface with Type III asphalt at rate of 20 lb per square (1 kg/sq. m) (plus or minus 25 percent on a total-job average basis).

1. Install one lapped course of loose rosin-sized building paper before installing temporary roofing on wood or plywood decks.
2. Comply with NRCA "Low-Slope Roofing Manual" Specification 10-TR and Diagram TR-N.

B. Temporary Roofing on Steel Decks: Apply continuous ribbons of Type III hot asphalt to deck at 6 inches (150 mm) o.c.; thickness sufficient to spread to 2 inches (50 mm) in width when insulation is placed. Install one course of perlite board roof insulation in hot asphalt; thickness as required to span deck flutes but not less than 1/2 inch (13 mm) thick. Apply two plies of roofing felts, lapping each felt 19 inches (475 mm) over preceding one, using solid moppings of 20 lb per square (1 kg/sq. m) (plus or minus 25 percent) of Type III asphalt. Glaze-coat completed surface with Type III asphalt at rate of 20 lb per square (1 kg/sq. m) (plus or minus 25 percent).

1. Comply with NRCA "Low-Slope Roofing Manual" Specification 10-TR and Diagram TR-SI.

C. Remove temporary roof completely prior to installing permanent roofing system.

3.4 VAPOR RETARDER INSTALLATION

A. Vapor Retarder on Nailable Decks: Apply two plies of vapor retarder felts, lapping each felt 19 inches (475 mm) (plus or minus 1/2 inch (13 mm)) over preceding one, and mopping with Type III asphalt at a rate of 20 lb per square (1 kg/sq. m) (plus or minus 25 percent). Glaze-coat completed surface with Type III asphalt at a rate of 20 lb per square (1 kg/sq. m) (plus or minus 25 percent).

1. Comply with "NRCA Low-Slope Roofing Manual" Specification 11-VR and Diagram VR-C.

B. Vapor Retarder on Steel Decks: Mechanically fasten one course of perlite board roof insulation in thickness as required to span deck flutes, but not less than 1 inch thick. Use FM-approved fasteners specifically designed for securing insulation boards to steel roof deck and driven through metal discs. Space fasteners in accordance with FM requirements for specified Windstorm Resistance Classification. Locate end joints of insulation over deck flutes.

C. Over insulation board, apply two plies of vapor retarder felts, lapping each felt 19 inches (475 mm) over the preceding one. Fully adhere each ply to deck using Type III asphalt at the rate of 20 lb per square (1 kg/sq. m) (plus or minus 25 percent).
Glaze-coat completed surface with Type III asphalt at rate of 20 lb per square (1 kg/sq. m) (plus or minus 25 percent).

1. Comply with "NRCA Low-Slope Roofing Manual" Specification 11-VR and Diagram VR-SI.
2. Apply two-course stripping of glass-fiber fabric and roofing cement at obstructions and penetrations through vapor retarder.

3.5 INSTALLING INSULATION

A. General: Comply with insulation manufacturer's instructions and recommendations for the handling, installation, and bonding or anchorage of insulation to substrate.

B. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal of primer per 100 sq. ft. (0.3 L of primer per sq. m) and allow primer to dry.

C. Set insulation in hot solid mopping of Type III asphalt, applied within temperature range of EVT plus or minus 25 F deg (14 C deg) and at a rate of 25 lb per 100 sq. ft. (1.2 kg/sq. m) (plus or minus 15 percent on a total-job basis). Run long joints of insulation in continuous straight line, perpendicular to roof slope, with end joints staggered between rows.

D. Secure insulation to deck using mechanical fasteners specifically designed and sized for attaching specified board-type insulation to deck type shown. Fasten insulation over entire area of roofing at spacing as required by FM for specified Windstorm Resistance Classification. Run long joints for insulation in continuous straight lines, perpendicular to roof slope with end joints staggered between rows.

E. Two-Layer Installation: Where overall insulation thickness is 2 inches (50 mm) or greater, install required thickness in two layers with joints of second layer staggered from joints of first layer a minimum of 12 inches (300 mm) each direction. Install second layer in full mopping of hot Type III asphalt.

F. Trim surface of insulation where necessary at roof drains so completed surface is flush with ring of drain.

G. Nailers: Where roof slopes are greater than 1/2 inch per foot (1:25), mechanically fasten wood nailers of same thickness as insulation, spaced not more than 20 to 21 feet (6.0 to 6.3 m) apart and between insulation boards, depending on board size. Run nailers perpendicular to slope of roof unless otherwise indicated.

3.6 ROOF MEMBRANE INSTALLATION

A. Shingling Plies: Install membrane with ply sheets shingled uniformly to achieve required number of membrane plies throughout. Shingle in proper direction to shed water on each large area of roofing, where slope is significant (over 1/2 inch per foot (1:25)).

B. Where slope exceeds 2 inches per foot (1:6), run sheets of modified bituminous roofing membrane parallel with slope, except run cap sheet surfacing near-parallel with 1:12 (0.8:10) incline for proper shed of water from exposed edges of cap sheets. Nail top ends of sheets.

C. Nailing, General: Comply with governing regulations, insurance requirements, roofing materials manufacturer's recommendations, and recognized industry standards, but not less than one nail per 1.5 sq. ft. (0.14 sq. m) of roofing area.

D. Cant Strips/Tapered Edge Strips: Install performed 45-degree cant strips at junctures of modified bituminous sheet roofing system membrane with vertical surface. Provide performed, tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

E. Base Sheet: Install one lapped course of base sheet. Nail to substrate as indicated.

F. Interply Sheets: Install the number and type(s) of ply sheets, lapped amount indicated to form a continuous, uniform membrane with continuous bitumen moppings between sheets so that ply sheets do not touch.

G. Top Sheet: Install top sheet using hot bitumen at the same rate as interply sheets to form a continuous bonded membrane.

1. Extend modified bituminous sheet to 2 inches (50 mm) above top edge of cant strip and terminate.
2. Nail edges of membrane to wood blocking at perimeter edges of roof prior to installing metal gravel stops/fascias. Space nails at minimum 8 inches (200 mm) on center.

H. Set-On Accessories: Where small roof accessories are set on modified bituminous sheet roofing, set metal flanges in a bed of roofing cement and seal penetration of membrane with bead of roofing cement to prevent flow of bitumen from membrane.

3.7 MEMBRANE FLASHING AND STRIPPING

A. Install modified bituminous flashing at cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof. Install one ply of flashing sheet material by mopping substrate and back of flashing sheet with Type III asphalt and embedding flashing solidly against substrate. Extend flashing a minimum of 6 inches (150 mm) onto modified bituminous sheet roofing.

B. Roof Drains: Set 30 x 30 inch (750 x 750 mm) lead flashing sheet in bed of roofing cement on completed modified bituminous roofing sheet. Cover lead sheet with modified bituminous stripping, with stripping extending a minimum of 4 inches (100 mm) beyond edge of lead flashing onto roof membrane. Clamp roof membrane, lead flashing, and stripping into roof drain clamping ring.

C. Allow for expansion of running metal flashing and edge trim that adjoins roofing. Do not seal or bond membrane or modified bituminous flashing or stripping to metal flanges over 36 inches (900 mm) in length.

D. Counter-Flashings: Counter-flashings, cap flashings, expansion joints, and similar work to be coordinated with modified bitumen roofing work are specified in other Sections.

E. Roof Accessories: Miscellaneous sheet metal accessory items, including piping vents, insulation vents and other devices to be coordinated with modified bituminous roofing system work, are specified in other Sections.

F. Aggregate Surfacing: Promptly after completing modified bituminous roof membrane, flashings, and roof accessories installation, flood-coat roof surface and, while each small area is hot and fluid, cast the following approximate weight of aggregate in a uniform course.

1. Flood Coat: 60 lb per square (3 kg/sq. m) of Type I or Type II asphalt, except provide steep asphalt where slope exceeds 3/4 inch per foot (1:16).

2. Aggregate: Gravel, averaging 400 lb per square (20 kg/sq. m).
3. Aggregate: Slag, averaging 300 per square (15 kg/sq. m).
4. Do not install flood coating of bitumen and aggregate surfacing at edges of roofing until flashing and stripping work has been completed. Delay aggregate surfacing only as long as necessary to substantially complete edge work and any tests.

H. Acrylic Coating: Apply two coats according to manufacturer's instructions, but not less than 1.5 gal per 100 sq. ft. (0.5 L/sq. m) per coat.

I. Cap Sheet Surfacing: Promptly after completing base sheet (same day where possible), apply one lapped course of cap sheet of type indicated. Set cap sheet in uniform mopping of same hot bitumen used in ply-sheet course, at average rate of 15 lb per square (0.83 kg/sq. m), with 1/4-inch (6-mm) bitumen flow exposed along cap sheet edge. Lap edges 4 inches (100 mm) and sheet ends 6 inches (150 mm) minimum.

3.8 ROOF WALKWAYS

A. Membrane Reinforcement: Prior to applying aggregate surfacing on roof membrane, and in pattern shown for walkways, and extended 6 inches beyond either side of walkways, install one additional ply of modified bituminous sheet roofing set in mopping of hot bitumen.

B. Cap Sheet Walkways: In pathways and widths as indicated, install a cap sheet course, set in a minimum mopping of same bitumen use in ply-sheet courses. Confine mopping to surface under cap sheets. Cut sheets in 10 feet (3 m) maximum lengths, and install by mop-and-flop method where possible, with butt joints.

1. Color Change: Provide cap sheet of color contrasting with roofing surface as selected by Contracting Officer and/or Project Managers from available sources.

3.9 DRAINAGE MAT/BOARD INSTALLATION

A. Install drainage mat in accordance with manufacturers instructions.

B. Overlap per manufacturer’s instructions.

C. Contractor shall bore insulation thickness from benchmark threshold elevation.

3.10 PAVER INSTALLATION

A. Apply another layer of asphalt protection board over insulation. Overlap 100 mm.

B. Layout new pavers in full units to form boarder at perimeters of expansion joints and building edge perimeters.

C. Layout salvaged units as in-fill with cut pavers at perimeter(s) to greatest extent possible.

D. Contractor shall establish benchmark elevation at exterior door thresholds and lay pavers flush to benchmark elevation.

E. Pavers shall be laid level over the roof paver leveling spacer system. Adjust spacer heights as required to achieve level deck plane.

F. Lay spacers at corner of paver pedestals, compensate for vertical dimensions differentials with leveling spacers.

G. Dry lay pavers on spacers. Adjust fit to provide consistent even joint appearances.

3.11 PROTECTING ROOFING

A. Protect roofing during remainder of construction period. At end of construction period, or at a time when remaining construction will in no way affect or endanger roofing, inspect roofing and prepare a written report, with copies to Contracting Officer and/or Project Managers and Owner, describing nature and extent of deterioration or damage found.

B. Repair or replace (as required) deteriorated or defective work found at time of above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION 07527

SECTION 07610 METAL ROOFING

PART 1 – GENERAL

1.1 DESCRIPTION

A. SUMMARY: Furnish all labor, material, tools, equipment, and services for all performed roofing as indicated, in accordance with provisions of Contract Documents.

1. Completely coordinate with work of all other trades. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

B. Related work specified elsewhere:

1. Structural Steel: Section 05120
2. Cold-Formed Metal Framing: Section 05400
3. Flashing and Sheet Metal: Section 07620

1.2 QUALITY ASSURANCE

A. Applicable Standards:

1. SMACNA: “Architectural Sheet Metal Manual” Sheet Metal and Air Conditioning Contractors National Association, Inc.
2. AISC: “Steel Construction Manual” American Institute of Steel Construction.
3. AISI: “Cold Form Steel Design Manual” American Iron and Steel Institute.
4. ASTM A792-89: Standard Specification for Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot Dip Process, General Requirements.
5. ASTM A527-90: Standard Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.
6. ASTM A526-90: Standard Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
7. ASTM A446-91: Standard Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

B. Manufacturer's Qualifications:

1. Manufacturer's has a minimum of three years experience in manufacturing panels of this nature in a permanent, stationary, indoor production facility.

C. Installer's Qualifications:

1. Installation of panels and accessories by installers with a minimum of three years experience in panel projects of this nature.

1.3 SUBMITTALS

A. Shop Drawings:

1. Submit complete shop drawings and erection details to Contracting Officer and/or Project Manager for review. Do not proceed with manufacture prior to review of shop drawings. Do not use drawings prepared by Architect for shop or erection drawings.

2. Shop drawings show methods of erection, elevations, and plans of roof panels, sections and details, anticipated loads, flashings, roof curbs, vents, sealants, interfaces with all materials not supplied and proposed identification of component parts and their finishes.

B. Samples:

1. Submit samples and color strips for all proposed finishes.

a. Submit one 12-in. long sample of panel, including clips.
b. Submit two 3 in x5 in. color chip samples in color selected by Contracting Officer and/or Project Managers.

C. Warranty (s):

1. Metal panel manufacturer, upon final acceptance for project, finish a warranty covering bare metal against rupture, structural failure, and perforation due to normal atmospheric corrosion exposure for a period of 20 years.
2. Covering panel finish against cracking, blistering, peeling, flaking, chipping, chalking, and fading for a period of twenty (20) years.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver panels to job site properly packaged to provide protection against transportation damage.

B. Handling: Exercise extreme care in unloading, storing, and erecting panels to prevent bending, warping, twisting, end and surface damage.

C. Storage: Store all material and accessories above ground on well-skidded platforms. Store under waterproof covering. Provide proper ventilation to panels to prevent condensation buildup between each panel.

PART 2 – PRODUCTS (#VERTICAL SEAM, ARCHITECTURAL STRUCTURAL STANDARDING SEAM ROOF SYSTEM, MINIMUM SLOPE OF 3:12)

2.1 MATERIAL

A. Panel Profile:
1. 1-3.4 in. high rib x 18in. wide panel.

B. Panel Style:
1. Narrow rib, vertical leg, concealed fastener, positive snap lock standing seam, utilizing male and female rib configurations, with factory applied hot melt mastic in female rib.

C. Gauge:
1. 22 gauge (#UL-90 rated-Underwriters Laboratories).

D. Substrate:
1. Galvalume steel sheet, 0.55 ounces/square foot, minimum yield of 50,000 PSI.

E. Clip:
1. 18 gauge standard clip one fastener to structural.

F. Texture:
1. Smooth.

G. Finish:
1. Premium fluorocarbon coating produced with Kynar-500 or Hylar 5000 resin. (#20 year warranty).

H. Color:
1. Selected from manufacturer's standard offering.

I. Acceptable manufacturer:
1. Metal Sales Manufacturing Cororation (800) 944-3786
2. Steelox Systems, Mason OH.

2.2 FABRICATION

A. Roll form panels in continuous length, full length of detailed runs.

B. Fabricate trim, flashing and accessories to detailed profiles.

C. Fabricate trim and flashing from same material as panel.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:
1. Inspect installed work of other trades and verify that such work is complete to a point where this work may continue.
2. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions.

B. Discrepancies:
1. In event of discrepancy, notify Contracting Officer and/or Project Manager
2. Do not proceed with installation until discrepancies have been resolved.

3.2 INSTALLATION

A. Install panels so that they are weathertight, without waves, warps, buckles, fastening, stresses or distortion, allowing for expansion and contraction.

B. Install panels in accordance with manufacturer's installation instructions and shop drawings.

C. Provide concealed anchors at all panel attachment locations.

D. Install panels plumb, level, and straight with seams and ribs/battens parallel, conforming to design as indicated.

3.3 CLEANING, PROTECTION

A. Dispose of excess materials and remove debris from site.

B. Clean work in accordance with manufacturer's recommendations.

C. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the Contracting Officer and/or Project Manager, any work that becomes damaged prior to final acceptance.

D. Touch up minor scratches and abrasions.

3.4 ACCESSORY ITEMS

A. Anchor Clips: Shall be concealed fastener type. Spacing of clips shall be as necessary to achieve uplift criteria.

B. Fasteners: The anchor clip shall be fastened to underlaying substrates with a #14 type "A" screw. Flashing fasteners shall be #14 type "A" screw of sufficient length and shall have a nylon color cap to match roof color.

C. Snowguards: If snow guards are indicated, nonpenetrating rib clamps shall be utilized to secure the clamp assembly. Snow guards shall be gage material and of same color and finish as the roof panel.

END OF SECTION 07610

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:

1. Roof-drainage systems.
2. Exposed trim, gravel stops, and fasciae.
3. Copings.
4. Metal flashing.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 4 Sections for through-wall flashing and other integral masonry flashings specified as part of masonry work.
2. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
3. Division 7 Section "Joint Sealants" for elastomeric sealants.
4. Division 7 Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

B. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:

1. Wind Zone 1: Wind pressures of 21 to 30 psf (1.00 to 1.44 kPa).

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.

1. 8-inch- (200-mm-) square Samples of specified sheet materials to be exposed as finished surfaces.
2. 12-inch- (300-mm-) long Samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Contracting Officer and/or Project Managers and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

B. Mockups: Prior to installing sheet metal flashing and trim, construct mockups indicated to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution.

Build mockups to comply with the following requirements, using materials indicated for final unit of work.

1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Contracting Officer and/or Project Managers.
2. Notify Contracting Officer and/or Project Managers one week in advance of the dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Construct mockups for the following type of sheet metal flashing and trim:

    a. Gutters and downspouts.
    b. Scuppers.
    c. Exposed trim, gravel stops, and fasciae.
    d. Copings.

5. Obtain Contracting Officer and/or Project Manager's approval of mockups before start of final unit of work.
6. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.

    a. When directed, demolish and remove mockups from project site.
    b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed work.

1.6 PROJECT CONDITIONS

A. Coordinate work of this Section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance, durability of work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:

1. Extruded Aluminum: ASTM B 221 (ASTM B 221M), alloy 6063-T52, with a minimum thickness of 0.080 inch (2.0 mm) for primary legs of extrusions that are anodized, unless otherwise indicated.

A. Coil-Coated Galvanized Steel Sheet: Zinc-coated, commercial-quality steel sheet conforming to ASTM A 755, G 90 (ASTM A 755M, Z 275) coating designation, coil coated with high-performance fluoropolymer coating as specified in "Coil-Coated Galvanized Steel Sheet Finish" Article; not less than 0.0336 inch (0.85 mm) thick, unless otherwise indicated.

2.2 CONCEALED THROUGH-WALL SHEET METAL FLASHING

A. Material: Fabricate from the following metal:

1. Stainless Steel: 0.0156 inch (0.4 mm) thick.
2. Fabricate through-wall metal flashings embedded in masonry as follows:

a. With ribs formed in dovetail pattern at 3-inch (75-mm) intervals along length of flashing to provide a 3-way integral mortar bond and weep-hole drainage.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

1. Cheney Flashing (Dovetail); Cheney Flashing Company, Inc.
2. Keystone Three-Way Interlocking Thruwall Flashing; Keystone Flashing Co.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Solder for Stainless Steel: ASTM B 32, Grade Sn60, used with an acid flux of type recommended by stainless-steel sheet manufacturer; use a noncorrosive rosin flux over tinned surfaces.

B. Stainless-Steel Welding Rods: Type recommended by stainless-steel sheet manufacturer for type of metal sheets furnished.

C. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

D. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coat.

E. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

F. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

G. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.

H. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

I. Paper Slip Sheet: 5-lb/square (0.244 kg/sq. m) red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

J. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- (0.15-mm-) thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

K. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

L. Gutter Screen: 1/4-inch (6-mm) hardware cloth installed in sheet metal frames. Fabricate screen and frame of same basic material as gutters and downspouts.

M. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.4 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Contracting Officer and/or Project Managersural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

E. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

F. Expansion Provisions: Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

G. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

H. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

I. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

J. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.5 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Gutters with Girth up to 15 Inches (380 mm): Fabricate from the following material:

1. Aluminum: 0.0320 inch (0.8 mm) thick.
2. Stainless Steel: 0.0156 inch (0.4 mm) thick.
3.

C. Downspouts: Fabricate from the following material:

1. Copper: 16 oz./sq. ft. (0.55 mm thick).
2. Lead-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).
3. Aluminum: 0.024 inch (0.6 mm) thick.
4. Stainless Steel: 0.0156 inch (0.4 mm) thick.
5. Terne-Coated Stainless Steel: 0.015 inch (0.4 mm) thick.
6. Galvanized Steel: 0.0217 inch (0.55 mm) thick.
7. Aluminum-Zinc Alloy-Coated Steel: 0.0217 inch (0.55 mm) thick.
8. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.

D. Roof-Drain Flashing: Fabricate from the following material:

1. Stainless Steel: 0.0156 inch (0.4 mm) thick.

E. Exposed Trim, Gravel Stops, and Fasciae: Fabricate from the following material:

1. Aluminum: 0.050 inch (1.2 mm) thick.
2. Stainless Steel: 0.0187 inch (0.5 mm) thick.
3. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

F. Copings: Fabricate from the following material:

1. Aluminum: 0.050 inch (1.2 mm) thick.
2. Stainless Steel: 0.0250 inch (0.65 mm) thick.
3. Galvanized Steel: 0.0396 inch (1.0 mm) thick.

C. Base Flashing: Fabricate from the following material:

1. Aluminum: 0.040 inch (1.0 mm) thick.
2. Stainless Steel: 0.0187 inch (0.5 mm) thick.
3. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

D. Counterflashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch (0.8 mm) thick.
2. Stainless Steel: 0.0187 inch (0.5 mm) thick.
3. Galvanized Steel: 0.0217 inch (0.55 mm) thick.

E. Flashing Receivers: Fabricate from the following material:

1. Aluminum: 0.0320 inch (0.8 mm) thick.
2. Stainless Steel: 0.0156 inch (0.4 mm) thick.
3. Galvanized Steel: 0.0217 inch (0.55 mm) thick.

F. Valley Flashing: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch (0.5 mm) thick.

G. Drip Edges: Fabricate from the following material:

1. Aluminum: 0.0320 inch (0.8 mm) thick.
2. Stainless Steel: 0.0156 inch (0.4 mm) thick.
3. Galvanized Steel: 0.0217 inch (0.55 mm) thick.

H. Eave Flashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch (0.8 mm) thick.
2. Stainless Steel: 0.0156 inch (0.4 mm) thick.
3. Galvanized Steel: 0.0217 inch (0.55 mm) thick.

P. Roof-Penetration Flashing: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch (0.5 mm) thick.
2. Galvanized Steel: 0.0276 inch (0.7 mm) thick.
3. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch (0.7 mm) thick.

2.6 ALUMINUM EXTRUSION FABRICATIONS

A. Aluminum Extrusion Units: Fabricate extruded-aluminum running units with formed or extruded-aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.

2.7 ALUMINUM FINISHES

A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.

B. Class I, Clear Anodic Finish: AA-C22A41 (Chemical Finish: etched, medium matte; Anodic Coating: Contracting Officer and/or Project Managersural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

1. Color: As selected by Contracting Officer and/or Project Managers from the full range of industry colors and color densities.

C. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

a. Color and Gloss: As selected by Contracting Officer and/or Project Managers from manufacturer's full range of choices for color and gloss.

2.8 COIL-COATED GALVANIZED STEEL SHEET FINISH

A. High-Performance Organic Coating Finish: Apply the following system by coil-coating process on galvanized steel sheet as recommended by coating manufacturers and applicator.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

a. Color and Gloss: As selected by Contracting Officer and/or Project Managers from manufacturer's full range of choices for color and gloss.

2. Coil-Coated Steel Sheet Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

a. Atas Aluminum Corporation.
b. Petersen Aluminum Corporation.

B. Shop Finish, Rain Drainage: Provide manufacturer's standard baked-on, white-acrylic shop finish on sheet metal rain-drainage units (gutters, downspouts, and similar exposed units); 1.0-mil (0.025-mm) dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Contracting Officer and/or Project Managersural Sheet Metal Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.

D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal work. Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except where pretinned surface would show in finished Work.

1. Do not solder the following metals:

    a. Aluminum.
    b. Coil-coated galvanized steel sheet.

2. Pretinning is not required for the following metals:

    a. Lead.
    b. Lead-coated copper.
    c. Terne-coated stainless steel.

3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.

1. Use joint adhesive for nonmoving joints specified not to be soldered.

G. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

H. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

2. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
3. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

I. Install reglets to receive counterflashing according to the following requirements:

1. Where reglets are shown in concrete, furnish reglets for installation under Division 3 Section "Cast-in-Place Concrete."
2. Where reglets are shown in masonry, furnish reglets for installation under Division 4 Section "Unit Masonry."

J. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches (50 mm) and bed with sealant.

K. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system

installation.

Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.

L. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.

M. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

N. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.

O. Splash Pans: Install where downspouts discharge on low-sloped roofs, unless otherwise shown. Set in roof cement or sealant compatible with roofing membrane.

P. Install continuous gutter screens on gutters with noncorrosive fasteners, arranged as hinged units to swing open for cleaning gutters.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07620

SECTION 07720 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Roof hatches.
2. Ridge Vents

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Sections for ladders and support framing.
2. Division 6 Section "Rough Carpentry" for roof deck and nailers.
3. Division 7 Section for roofing types and roofing accessories included as part of roofing work.
4. Divisions 7 Section “Manufactured Roof Specialties” for fascia, coping, gravel stops, and roof expansion joint covers.
5. Division 7 Section "Flashing and Sheet Metal" for metal flashing, valleys, gutters, and downspouts.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified. Submit manufacturer's detailed technical product data, installation instructions and recommendations, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop drawings showing fabrication and installation of each roof accessory specified including fully dimensioned plans, elevations, sections, details of components, and attachments to other units of Work. Also show layout, anchorage details, rough-in requirements, and conditions on the roof or for other accessories.

D. Samples for initial selection purposes in the form of manufacturer's color charts showing full range of colors, textures, shapes, and sizes available for each type of roof accessory indicated.

1.4 QUALITY ASSURANCE

A. Standards: Comply with the following:

1. SMACNA "Contracting Officer and/or Project Managers Sheet Metal Manual" details for fabrication of units, including flanges and cap-flashing to coordinate with type of roofing indicated.
2. NRCA "Roofing and Waterproofing Manual" details for installation of units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to, the following:

1. Roof Hatches:
   a. Babcock-Davis Hatchways, Inc.
   b. Bilco Co.
   c. ThyCurb Div./ThyBar Corp.

2. Ridge Vents:
   a. Air Vent, Inc.
   b. Ampcor, Div. of The Solar Group.
   c. ThyCurb Div./ThyBar Corp.

2.2 MATERIALS, GENERAL

A. Aluminum Sheets: ASTM B 209 (ASTM B 209M) for Alclad alloy 3005H25 or alloy and temper required to suit forming operations with mill finish, unless indicated otherwise.

B. Commercial-Quality Galvanized Steel Sheet: ASTM A 526 (ASTM A 526M) with G90 (Z275) coating complying with ASTM A 525 (ASTM A 525M).

C. Insulation: Manufacturer's standard rigid or semirigid glass-fiber board of thickness indicated.

D. Wood Nailers: Softwood lumber, pressure treated with water-borne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inch (38 mm) thick.

E. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

1. Where removal of exterior exposed fasteners affords access to building, provide nonremovable fastener heads.

F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.

G. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4 mm) dry film thickness per coating.

H. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

I. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25, and Uses NT, G, and, A.

J. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.3 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations on applying and designating finishes.

B. Finish designations prefixed by AA conform to the system for designating aluminum finishes established by the Aluminum Association.

C. Class I, Clear-Anodized Finish: AA-C22A41 (Chemical Finish: etched, medium matte; Anodic Coating: Class I Contracting Officer and/or Project Managers, clear film thicker than 0.7 mil (0.02 mm)) complying with AAMA 607.1.

D. Organic Coating: Thermosetting-modified acrylic enamel primer and topcoat system complying with AAMA 603.8, except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.

1. Color: As selected by Contracting Officer and/or Project Managers from manufacturer's standard colors.

E. Fluoropolymer Two-Coat Coating System: Manufacturer's standard two-coat thermocured system, complying with AAMA 605.2, composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene resin by weight; complying with AAMA 605.2.

1. Color and Gloss: As selected by Contracting Officer and/or Project Managers from manufacturer's standard choices for color and gloss.

2.4 ROOF HATCHES

A. General: Fabricate units to withstand 40-lbf/sq. ft. (1.9 kPa) external loading and 20-lbf/sq. ft. (0.95 kPa) internal loading pressure. Frame with 9-inch (225 mm) high, integral-curb, double-wall construction with 1-1/2 inch (38 mm) insulation, cant strips and cap flashing (roofing counterflashing), with welded or sealed mechanical corner joints. Provide double-wall cover (lid) construction with 1-inch insulation core. Provide gasketing and equip corrosion-resistant or hot-dip galvanized hardware including pintle hinges, hold-open devices, interior padlock hasps, and both interior and exterior latch handles.

B. Type: Single-leaf personnel access.

1. For Ship's Ladder Access: 30 x 54 inches (750 x 1350 mm).

C. Material: Aluminum, sheets and extrusions.

2.5 RIDGE VENTS

A. Aluminum: Fabricate of sheet aluminum with baffles to prevent snow and rain entering and weep holes to allow water to drain to roof. Provide splice plates and end caps required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, vapor barriers, roof insulation, roofing and flashing, as required, to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses, as well as inward and outward loading pressures.

1. Except as otherwise indicated, install roof accessory items according to construction details of NRCA "Roofing and Waterproofing Manual."

B. Isolation: Where metal surfaces of units are to be installed in contact with incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.

C. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

D. Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counterflashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

E. Operational Units: Test operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.2 CLEANING AND PROTECTION

A. Clean exposed metal and plastic surfaces according to manufacturer's instructions. Touch up damaged metal coatings.

END OF SECTION 07720

SECTION 07901 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes joint sealants for the following locations:

1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:

   a. Control and expansion joints in cast-in-place concrete.
   b. Control and expansion joints in unit masonry.
   c. Joints between different materials listed above.
   d. Perimeter joints between materials listed above and frames of doors and windows.
   e. Control and expansion joints in ceiling and overhead surfaces.

2. Exterior joints in horizontal traffic surfaces as indicated below:

   a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
   b. Joints between different materials listed above.

3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:

   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Perimeter joints between interior wall surfaces and frames of interior doors, and windows.
   d. Perimeter joints of toilet fixtures.

4. Interior joints in horizontal traffic surfaces as indicated below:

   a. Control and expansion joints in cast-in-place concrete slabs.
   b. Control and expansion joints in tile flooring.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Flashing and Sheet Metal" for sealing joints related to flashing and sheet metal for roofing.
2. Division 7 Section "Paving Joint Sealants" for sealing joints in portland cement concrete for pavements, walkways, and curbing.
3. Division 8 "Glass and Glazing" for sealants used in glazing.
4. Division 9 Section "Gypsum Drywall" for sealing concealed perimeter joints of gypsum board partitions to reduce sound transmission.
5. Division 9 Section "Tile" for sealing tile joints.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data from manufacturers for each joint sealant product required.

1. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.

C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.

D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

F. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants.

Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

G. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for project that have resulted in construction with a record of successful in-service performance.

B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

a. Perform tests under normal environmental conditions that will exist during actual installation.

2. Submit not less than 9 pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the work.
4. Investigate materials failing compatibility or adhesion tests and obtain joint sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.

C. Product Testing: Provide comprehensive test data for each type of joint sealant based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24-month period preceding date of Contractor's submittal of test results to Contracting Officer and/or Project Managers.

1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920.

Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low-temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.

2. Include test results performed on joint sealants after they have cured for 1 year.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4 deg C).
3. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 SEQUENCING AND SCHEDULING

A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:

1. Provide selections made by Contracting Officer and/or Project Managers from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

2.3 SOLVENT-RELEASE-CURING JOINT SEALANTS

A. Acrylic Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing acrylic terpolymer sealant complying with AAMA 808.3 or FS TT-S-00230 or both, with capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage change in joint width existing at time of application and remain adhered to joint substrates indicated for project without failing cohesively:

1. 7-1/2 percent movement in both extension and compression for a total of 15 percent.

B. Butyl Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids to be nonstaining, paintable, and have a tack-free time of 24 hours or less.

2.4 LATEX JOINT SEALANTS

A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.

C. Silicone Emulsion Sealant: Provide product complying with ASTM C 834 and, except for weight loss measured per ASTM C 792, with ASTM C 920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.

D. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the work include, but are not limited to, the following:

2.5 TAPE SEALANTS

A. Tape Sealant: Manufacturer's standard, solvent-free, butyl-based tape sealant with a solids content of 100 percent formulated to be non-staining, paintable, and non-migrating in contact with nonporous surfaces with or without reinforcement thread to prevent stretch and packaged on rolls with a release paper on one side.

2.6 PREFORMED FOAM SEALANTS

A. Preformed Foam Sealants: Manufacturer's standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:

1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.
2. Impregnating Agent: Manufacturer's standard.
3. Density: Manufacturer's standard.
4. Backing: Pressure-sensitive adhesive factory applied to one side with protective wrapping.

2.7 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Open-cell polyurethane foam.
2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, non-outgassing in unruptured state.
3. Proprietary, reticulated, closed-cell polymeric foam, non-outgassing, with a density of 2.5 pcf (40 kg/cu. m) and tensile strength of 35 psi (240 kPa) per ASTM D 1623, and with water absorption less than 0.02 g/cc per ASTM C 1083.
4. Any material indicated above.

C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    a. Do not leave gaps between ends of joint fillers.
    b. Do not stretch, twist, puncture, or tear joint fillers.
    c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

Install sealants at the same time sealant backings are installed.

F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
2. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.

    a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION 07901

SECTION 07905 - PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes joint sealants for the following:

1. Expansion and contraction joints within portland cement concrete paving.
2. Joints between portland cement concrete paving and asphalt paving.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Portland Cement Concrete Paving" for construction of joints in concrete paving.
2. Division 2 Section "Hot-Mixed Asphalt Paving" for construction of joints between asphalt paving and concrete paving.
3. Division 7 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data from manufacturers for each joint sealant product required.

1. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.

C. Samples for verification purposes of each type and color of joint sealant required. Install joint sealant samples in 1/2-inch (13-mm) wide joints formed between two 6-inch (150-mm) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

E. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names, addresses, names of Contracting Officer and/or Project Managers and Owners, plus other information specified.

F. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

G. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for project that have resulted in construction with a record of successful in-service performance.

B. Testing Laboratory Qualifications: To qualify for acceptance, an independent testing laboratory must demonstrate to Contracting Officer and/or Project Manager's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying progress of the work.

C. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

D. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers samples of materials that will contact or affect joint sealants for compatibility and adhesion testing as indicated below:

1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

a. Perform tests under normal environmental conditions that will exist during actual installation.

2. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the work.
3. Investigate materials failing compatibility or adhesion tests and obtain joint sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.
4. Testing will not be required when joint sealant manufacturer is able to submit joint preparation data required above that are acceptable to Contracting Officer and/or Project Managers and are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

E. Product Testing: Provide comprehensive test data for each type of joint sealant based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24-month period preceding date of Contractor's submittal of test results to Contracting Officer and/or Project Managers.

1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low-temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.
2. Include test results performed on joint sealants after they have cured for 1 year.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.

2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4 deg C).
3. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:

1. Match colors indicated by reference to manufacturer's standard designations.
2. Provide selections made by Contracting Officer and/or Project Managers from manufacturer's full range of standard colors for products of type indicated.

2.2 COLD-APPLIED JOINT SEALANTS

A. Two-Part, Jet-Fuel-Resistant Sealant for Concrete: Pourable, chemically curing elastomeric formulation complying with the following requirements relative to formulation and with ASTM C 920 for Type, Grade, Class, and Uses indicated.

1. Urethane Formulation: Type M, Grade P, Class 12-1/2, Uses T, M, and O as applicable to joint substrates indicated.
2. Bitumen-Modified Urethane Formulation: Type M, Grade P, Class 25, Uses T, M, and O as applicable to joint substrates indicated.

B. Jet-Fuel-Resistant, Coal-Tar-Modified Polysulfide Sealant for Concrete: Two-part formulation complying with FS SS-S-200, Type as indicated below:

1. Type M (machine application/fast curing).
2. Type H (hand application/retarded cure), nonsag formulation for vertical and sloping joints.

C. Silicone Sealant for Concrete: One-part, low-modulus, neutral-cure silicone sealant complying with ASTM C 920 for Type S, Grade as indicated below, Class 25, and as follows:

1. Uses Related to Joint Substrates: Uses M and, as applicable to joint substrates of concrete highways and concrete runways of airports subject to jet fuel exposure, O.
2. Uses Related to Joint Substrates: Uses M and, as applicable to joint substrates of concrete highways, O.
3. Grade P for joints in horizontal paved surfaces.
4. Grade NS for vertical and other joints where installation of a Grade P (self-leveling) sealant would result in sealant flowing out of joint.
5. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated:

    a. 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.

D. Silicone Sealant for Concrete and Asphalt: One-part, low-modulus, neutral-cure silicone sealant complying with ASTM C 920, Type S, Grade P, Class 25, and Uses T, M, and as applicable to joints with concrete and asphalt substrates, O and with the following requirements:

1. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated:

    a. 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.

E. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated in the work include, but are not limited to, the following:

1. Two-Part, Jet-Fuel-Resistant Sealant for Concrete:

a. "Vulkem 202," Mameco International, Inc.
b. "SEALTIGHT GARDOX," W.R. Meadows, Inc.
c. "Urexpan NR-300," Pecora Corp.
d. "Sonomeric 2," Sonneborn Building Products Div., ChemRex, Inc.

2. Jet-Fuel-Resistant, Coal-Tar-Modified Polysulfide Sealant for Concrete, Type M:

a. "Jet-Seal Product 9015-M," Koch Materials Co.

3. Grade NS Silicone Sealant for Concrete:

a. "Roadsaver Silicone," Crafco Inc.
b. "Dow Corning 888," Dow Corning Corp.

4. Silicone Sealant for Concrete and Asphalt:

a. "Dow Corning 890-SL," Dow Corning Corp.

2.3 JOINT FILLERS FOR CONCRETE PAVING

A. General: Provide joint fillers of thicknesses and widths indicated.

B. Self-Expanding Cork Joint Filler: Preformed strips complying with ASTM D 1752 for Type III.

C. Cork Joint Filler: Preformed strips complying with ASTM D 1752 for Type II.

D. Sponge Rubber Joint Filler: Preformed strips complying with ASTM D 1752 for Type I.

E. Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751:

1. Asphalt saturated fiberboard.
2. Granulated cork with asphalt binder encased between 2 layers of saturated felt or glass-fiber felt of width and thickness indicated.

2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers;

and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Backer Rods for Cold-Applied Sealants: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible, plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, and nonoutgassing in unruptured state.
2. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf (40 kg/cu m) and tensile strength of 35 psi (240 kPa) per ASTM D 1623, and with water absorption less than 0.02 g/cc per ASTM C 1083.
3. Either material indicated above.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    a. Do not leave gaps between ends of joint fillers.
    b. Do not stretch, twist, puncture, or tear joint fillers.
    c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

F. Provide joint configuration to comply with recommendations of sealant manufacturer unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that installations with repaired areas are indistinguishable from original work.

END OF SECTION 07905

SECTION 08111 - STANDARD STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following products manufactured in accordance with SDI Recommended Standards:

1. Doors: Flush, hollow or composite construction standard steel doors for interior and exterior locations.
2. Assemblies: Provide standard steel door and frame assemblies as required for the following:

   a. Labeled and fire rated.
   b. Thermal rated (insulated).

3. Provide factory primed doors and frames to be field painted.

B. Painting primed doors and frames is specified in Division 9 Section "Painting."

C. Door hardware is specified in another Division 8 Section.

D. Glass and Glazing are specified in another Division 8 Section.

E. Building in of anchors and grouting of frames in masonry construction is specified in Division 4.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

C. Shop drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
2. Indicate coordinate of glazing frames and stops with glass and glazing requirements.

D. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors available for factory-finished doors and frames.

E. Label Construction Certification: For door assemblies required to be fire-rated and exceeding limitations of labeled assemblies, submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

1.4 QUALITY ASSURANCE

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI-100 and as herein specified.

B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies whose fire resistance characteristics have been determined per ASTM E 152 and which are labeled and listed by UL, Factory Mutual, Warnock Hersey, or other testing and inspecting organization acceptable to authorities having jurisdiction.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide manufacturer's certification that doors conform to all standard construction requirements of tested and labeled fire-rated door assemblies except for size.
2. Temperature Rise Rating: At stairwell enclosures, provide doors which have Temperature Rise Rating of 250 deg F (121 deg C) maximum in 30 minutes of fire exposure.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Contracting Officer and/or Project Managers; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inches spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

1. Standard Steel Doors and Frames:

   a. Ceco Corp.
   b. Curries Company.
   a. Fenestra Corp.
   d. Pioneer Industries.
   e. Steelcraft Manufacturing Co.

2. Prefinished Interior Steel (Door) Frames Only:

   a. Dunbarton Corp. (Rediframe Product).
   b. Timely.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, or drawing quality, ASTM A 642, hot dipped galvanized in accordance with ASTM A 525, with A60 or G60 coating designation, mill phosphatized.

D. Supports and Anchors: Fabricate of not less than 18-gage sheet steel; galvanized where used with galvanized frames.

E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize in compliance with ASTM A 153, Class C or D as applicable.

F. Shop Applied Paint: Apply after fabrication.

1. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints complying with ANSI A224.1, "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames."

2.3 DOORS

A. Provide metal doors of types and styles or grades and models indicated on drawings or schedules.

B. Provide metal doors of SDI grades and models specified below or as indicated on drawings or schedules:

1. Interior Doors: ANSI/SDI-100, Grade II, heavy-duty, Model 3 or 4, minimum 18-gage cold-rolled sheet steel faces.
2. Exterior Doors: ANSI/SDI-100, Grade III, extra heavy-duty, Model 4, minimum 16-gage galvanized steel faces.

C. Door Louvers: Provide sightproof stationary louvers for interior doors where indicated, constructed of inverted V-shaped or Y-shaped blades formed of 24-gage cold-rolled steel set into minimum 20-gage steel frame.

2.4 FRAMES

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 18-gage cold-rolled steel.

1. Fabricate frames with mitered or coped corners, welded construction for exterior applications and knocked-down for field assembly at interior applications.
2. Form exterior frames from 16-gage galvanized steel.

B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

C. Plaster Guards: Provide minimum 26-gage steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.5 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-100 requirements.

1. Internal Construction: Manufacturer's standard honeycomb, polyurethane, polystyrene, unitized steel grid, vertical steel stiffeners, or rigid mineral fiber core with internal sound deadener on inside of face sheets where appropriate in accordance with SDI standards.
2. Clearances: Not more than 1/8 inch at jambs and heads except between non-fire-rated pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.

B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel.

E. Fabricate exterior doors, panels, and frames from galvanized sheet steel in accordance with SDI-112. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gage inverted steel channels.

F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

G. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236 or ASTM C 976 on fully operable door assemblies.

1. Unless otherwise indicated, provide thermal-rated assemblies with U factor of 0.41 Btu/(hr x sq ft x deg F.) or better.

H. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Series Specifications for door and frame preparation for hardware.

1. For concealed overhead door closers, provide space, cutouts, reinforcing and provisions for fastening in top rail of doors or head of frames, as applicable.

I. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at project site.

J. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.

K. Shop Painting: Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.

1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
2. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

L. Glazing Stops: Minimum 20 gage steel or .040-inch-thick aluminum.

1. Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw applied removable glazing beads on inside of glass, louvers, and other panels in doors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames," unless otherwise indicated.

1. In masonry construction, locate 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry Tee anchors.
2. Install fire-rated frames in accordance with NFPA Standard No. 80.
3. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In closed steel stud partitions, attach wall anchors to studs with screws.

C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI-100.

1. Install fire-rated doors with clearances as specified in NFPA Standard No. 80.

3.2 ADJUST AND CLEAN

A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.

C. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 08111

SECTION 08331 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes overhead coiling metal doors.

B. Types of overhead coiling doors include the following:

1. Insulated overhead doors.

C. Operation of overhead coiling doors include the following:

1. Electric motor operation.

D. Provide complete operating door assemblies including door curtains, guides, counterbalance mechanism, hardware, operators, and installation accessories.

E. Field painting is specified in Division 9.

F. Electrical connections for powered operators and accessories are specified in Division 16.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data, roughing-in diagrams, and installation instructions for each type and size of overhead coiling door.

1. Provide operating instructions and maintenance information.
2. Provide information describing fire-release system including electrical rough-in instructions.

C. Shop drawings for special components and installations that are not dimensioned or detailed in manufacturer's data sheets.

D. UL label certification for oversized fire-rated doors and frames that each assembly has been constructed with materials and methods equivalent to requirements for labeled construction.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Furnish each overhead coiling door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

1. Furnish overhead coiling door units by one manufacturer for entire project.

B. Insert and Anchorages: Furnish inserts and anchoring devices that must be set in concrete or built into masonry to install units. Provide setting drawings, templates, instructions, and directions to install anchorage devices. Coordinate delivery with other work to avoid delay.

1. See concrete and masonry Sections of these specifications regarding installation of inserts and anchorage devices.

C. Wind Loading: Design and reinforce overhead coiling doors to withstand a 20-psf (950 Pa) (85-mph (135 km/hr)) wind-loading pressure.

D. Provide manufacturer's standard UL-labeled smoke detectors and electromechanical door-holder-release devices where indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Apton Rolling Doors, A Gichner Systems Group, Inc.
2. Atlas Roll-Lite Overhead Doors/Div. of MASCO.
3. Ceco/Windsor Door--Div. of the Ceco Corp.
4. Overhead Door Corp.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand required wind loading, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of material gage recommended by door manufacturer for size and type of door required, and as follows:

1. Steel Door Curtain Slats: Structural quality, cold-rolled galvanized steel sheets complying with ASTM A 446, Grade A, with G90 (ASTM A 446M, Grade A, with Z275) zinc coating, complying with ASTM A 525 (ASTM A 525M).

B. Endlocks: Malleable iron castings galvanized after fabrication, secured to curtain slats with galvanized rivets. Provide locks on alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Windlocks: Malleable iron castings secured to curtain slats with galvanized rivets. Unless otherwise recommended by door manufacturer, provide windlocks on doors exceeding 16 feet (4.8 m) wide. Space windlocks approximately 24 inches (600 mm) o.c. on both edges of curtain.

D. Bottom Bar: Consisting of two angles, each not less than 1-1/2 x 1-1/2 x 1/8 inch (38 x 38 x 3 mm) thick, either galvanized or stainless steel or aluminum extrusions to suit type of curtain slats.

1. Provide a replaceable gasket of flexible vinyl or neoprene between angles as a weather seal and cushion bumper for manually operated doors, unless shown as an overlapping joint.

E. Curtain Jamb Guides: Fabricate curtain jamb guides of steel angles, or channels and angles with sufficient depth and strength to retain curtain loading. Build up units with minimum 3/16-inch (5-mm) thick steel sections, galvanized after fabrication. Slot bolt holes for track adjustment.

F. Secure continuous wall angle to wall framing with a minimum of 3/8-inch (10-mm) bolts at not more than 30 inches (750 mm) o.c., unless closer spacing recommended by door manufacturer. Extend wall angles above door opening head to support coil brackets, unless otherwise indicated. Place anchor bolts on exterior wall guides so they are concealed when door is in closed position. Provide removable stops on guides to prevent over-travel of curtain and a continuous bar for holding windlocks.

G. Weather Seals: Provide vinyl or neoprene weatherstripping for exterior exposed doors, except where otherwise indicated. At door heads, use 1/8-inch (3-mm) thick continuous sheet secured to inside of curtain coil hood.

At door jambs, use 1/8-inch (3-mm) thick continuous strip secured to exterior side of jamb guide.

2.3 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of adjustable steel helical torsion spring, mounted around a steel shaft and in a spring barrel, and connected to door curtain with required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of hot-formed structural-quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support roll-up of curtain without distortion of slats and to limit barrel deflection to not more than 0.03 inch per foot (2.5 mm per meter) of span under full load.

C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast steel barrel plugs to secure ends of springs to barrel and shaft.

D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel in size required to hold fixed spring ends and carry torsional load.

E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate with bell mouth guide groove for curtain.

F. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head and act as weather seal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.

1. Fabricate steel hoods for doors of not less than 0.0276-inch (0.7-mm) thick hot-dip galvanized steel sheet with G 90 (Z275) zinc coating, complying with ASTM A 525 (ASTM A 525M).
2. Furnish automatic drop baffle to guard against passage of smoke or flame.
3. Fabricate aluminum hoods for aluminum doors of Alloy 3003 or 5052 aluminum sheet not less than 0.032-inch (0.8-mm) thick, mill finish.

2.4 PRIME PAINTING

A. General: Shop-clean and -prime ferrous metal surfaces, exposed and unexposed, except tightly joined and lubricated surfaces and galvanized metal, with door manufacturer's standard rust-inhibitive primer. Use primer that is compatible with finish painting.

B. General: Shop-clean and -prime ferrous metal and galvanized surfaces, exposed and unexposed, except tightly joined and lubricated surfaces, with door manufacturer's standard rust-inhibitive primer. Use primer that is compatible with finish painting.

2.5 ELECTRIC DOOR OPERATORS

A. General: Furnish electric door operator assembly of size and capacity recommended and provided by door manufacturer; complete with electric motor and factory-prewired motor controls, gear-reduction unit, solenoid-operated brake, remote control stations, control devices, conduit and wiring from controls to motor and central stations, and accessories required for proper operation.

B. Provide hand-operated disconnect or a mechanism for automatically engaging a sprocket-and-chain operator and releasing brake for emergency manual operation. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

C. Design operator so that motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

D. Door Operator Type: Provide wall- or bracket-mounted door operator units consisting of electric motor, worm gear drive from motor to reduction gear box, chain or worm gear drive from reduction box to gear wheel mounted on counterbalance shaft, and a disconnect-release for manual operation. Provide motor and drive assembly of horsepower and design as determined by door manufacturer for size of door required.

E. Electric Motors: Provide high-starting torque, reversible, Class A insulated electric motors with overload protection. Size motor to move door in either direction, from any position, at not less than 2/3 foot per second (0.2 m/s) nor more than 1 foot per second (0.3 m/s).

1. Coordinate wiring requirements and current characteristics of motors with building electrical system.
2. Furnish open drip-proof type motor.
3. Furnish totally enclosed, nonventilated type motors, fitted with plugged drain, for exterior applications and where indicated.

F. Automatic Reversing Control: Furnish each door with an automatic safety switch, extending the full width of door bottom, and located within neoprene or rubber astragal mounted to bottom door rail. Contact with switch before fully closing will immediately stop downward travel and reverse direction to fully opened position.

1. Connect to control circuit through retracting safety cord and reel, or self-coiling cable.
2. Provide electrically actuated automatic bottom bar.
3. Provide pneumatically actuated automatic bottom bar.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to final shop drawings, manufacturer's instructions, and as specified.

1. Install fire-rated doors to comply with NFPA 80.

B. After completing installation, including work by other trades, lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion.

1. Test door closing when activated by smoke-detector fire-release system. Reset door-closing mechanism after successful test.

C. Train Owner's maintenance personnel on procedures and schedules related to door operation, servicing, preventive maintenance, and procedures for resetting closing devices after activation.

END OF SECTION 08331

SECTION 08520 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes commercial-grade aluminum window units of the performance class indicated. Window types required include:

1. Horizontal sliding windows.
2. Projected windows.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Glass and glazing are included in Division 8 Section “Glass and Glazing”.

1.3 DEFINITIONS

A. Combination Windows: Where two or more different types of operating sash are included in the same window unit and share a common frame, the unit is considered a "Combination Aluminum Window."

B. Dual windows are window units that have both a prime and a secondary window combined in a single composite unit. The prime window element is used to protect the building from climatic elements. The secondary window is used for energy conservation.

C. Hinged emergency access/egress windows are side-hinged units that swing out to provide a means for emergency exit.

D. Performance class number included as part of the window designation system is the actual design pressure in pounds per sq. ft. used to determine the structural test pressure and water test pressure.

1. Structural test pressure, windload test, is equivalent to 150 percent of the design pressure.
2. Water leakage resistance test pressure is equivalent to 15 percent of the design pressure with 2.86 psf as a minimum.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide aluminum window units that comply with performance requirements specified, as demonstrated by testing manufacturer's corresponding stock systems according to test methods indicated.

B. Design Requirements: Comply with structural performance, air infiltration, and water penetration requirements indicated in AAMA 101 for type, grade, and performance class of window units required.

1. Optional Performance Class Requirements: Where the required design pressure exceeds the minimum for the specified window grade, comply with requirements of AAMA 101, Section 3, "Optional Performance Classes" for higher than minimum performance class.
2. Design wind velocity at the project site is 70 mph.

C. Testing: Test each type and size of required window unit through a recognized independent testing laboratory or agency, in accordance with ASTM E 330 for structural performance, with ASTM E 283 for air infiltration, and with ASTM E 547 for water penetration. Provide certified test results.

D. Sound Insulation Construction: Fabricate aluminum window units that have been certified to provide a sound transmission class (STC) rating of at least 40 when tested in accordance with ASTM E 90 and classified according to ASTM E 413.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

1. Product data for each type of window required, including:

a. Construction details and fabrication methods.
b. Profiles and dimensions of individual components.
c. Data on hardware, accessories, and finishes.
d. Recommendations for maintenance and cleaning of exterior surfaces.

2. Shop drawings for each type of window required. Include information not fully detailed in manufacturer's standard product data and the following:

   a. Layout and installation details, including anchors.
   b. Elevations of continuous work at 1/4-inch scale and typical window unit elevations at 3/4-inch scale.
   c. Full-size section details of typical composite members, including reinforcement.
   d. Hardware including operators.
   e. Glazing details.
   f. Accessories.

3. Samples for Initial Color Selection: Submit samples of each specified finish on 12-inch-long sections of window members. Where finishes involve normal color variations, include sample sets showing the full range of variations expected.
4. Certification: Provide certification by a recognized independent testing laboratory or agency showing that each type, grade, and size of window unit complies with performance requirements indicated.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed installation of aluminum windows similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance.

B. Standards: Requirements for aluminum windows, terminology and standards of performance, and fabrication workmanship are those specified and recommended in AAMA 101 and applicable general recommendations published by AAMA.

C. Single-Source Responsibility: Provide aluminum window units from one source and produced by a single manufacturer.

D. Design Concept: The drawings indicate the size, profiles, and dimensional requirements of the aluminum window types required and are based on the specific type and model indicated. Aluminum windows by other manufacturers may be considered provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Contracting Officer and/or Project Managers. The burden of proof of equality is on the proposer.

1.7 PROJECT CONDITIONS

A. Field Measurements: Check actual window openings by accurate field measurement before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit of window units.

1.8 WARRANTY

A. Aluminum Window Warranty: Submit a written warranty, executed by the window manufacturer, agreeing to repair or replace window units that fail in materials or workmanship within the specified warranty period. Failures include but are not necessarily limited to:

1. Structural failures including excessive deflection, excessive leakage, or air infiltration.
2. Faulty operation of sash and hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

B. Warranty Period: 3 years after the date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Horizontal Sliding Windows:

a. Acorn Building Components, Inc.
b. Capitol Products Corporation.
c. TRACO.
d. Heritage Window and Door Inc.

2.2 MATERIALS

A. Aluminum Extrusions: Provide alloy and temper recommended by the window manufacturer for the strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength and not less than 0.062 inch thick at any location for main frame and sash members.

B. Fasteners: Provide aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by the manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components of window units.

1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard noncorrosive pressed-in splined grommet nuts.
2. Exposed Fasteners: Except where unavoidable for application of hardware, do not use exposed fasteners. For application of hardware, use fasteners that match the finish of the member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Window Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron complying with the requirements of ASTM B 633; provide sufficient strength to withstand design pressure indicated.

D. Compression-Type Glazing Strips and Weather-stripping: Unless otherwise indicated, and at the manufacturer's option, provide compressible stripping for glazing and weather-stripping such as molded EPDM or neoprene gaskets complying with AAMA SG-1 or with ASTM D 2000 Designation 2BC415 to 3BC620, or molded PVC gaskets complying with ASTM D 2287, or molded expanded EPDM or neoprene gaskets complying with ASTM C 509, Grade 4.

E. Sliding-Type Weather-stripping: Provide woven pile weather-stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701.2.

1. Provide stripping with integral center-line barrier fin of semirigid plastic sheet of polypropylene.

F. Sealant: For sealants required within fabricated window units, provide type recommended by the manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating. Comply with Division 7 Section "Joint Sealants" of these specifications for selection and installation of sealants.

G. Glass-Fiber Mesh Insect Screen: Provide 18 by 16 or 18 by 14 mesh of plastic-coated glass-fiber threads, woven and fused to form a fabric mesh that is resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with requirements of ASTM D 3656.

2.3 HARDWARE

A. General: Provide the manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.

B. Four-Bar Friction Hinges: Comply with AAMA 904.1.

1. Friction Shoes: Provide friction shoes of nylon or other nonabrasive, nonstaining, noncorrosive, durable material.

C. Limit Device: Provide the manufacturer's standard concealed, friction adjuster adjustable stay bar limit device designed to restrict the ventilator opening.

2.4 ACCESSORIES

A. General: Provide the manufacturer's standard accessories that comply with indicated standards.

B. Insect Screens: Provide insect screens for each operable exterior sash or ventilator. Locate screens on the inside or outside of the window sash or ventilator, depending upon window type. Design windows and hardware to accommodate screens in a tight-fitting removable arrangement, with a minimum of exposed fasteners and latches.

1. Wickets: Provide sliding or hinged-type wickets, framed and trimmed for a tight fit and durability during handling.
2. Screen Frames: Fabricate frames of tubular-shaped extruded or formed aluminum members of 0.040-inch minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners. Finish frames to match window units.

C. Weather-stripping: Provide sliding-type weather-stripping where sash rails slide horizontally or vertically along the unit frame. Provide compression-type weather-stripping at the perimeter of each operating sash where sliding type is not appropriate.

1. Provide weather-stripping locked in to extruded grooves in the sash.

2.5 FABRICATION

A. General: Fabricate aluminum window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units.

1. Provide units that are reglazable without dismantling sash or ventilator framing.

B. Projected Frame: Square cut and punch all frame members and fasten with two each #10 stainless steel Phillips head sheet metal screws. All units are to be sealed with silicone sealant interior and exterior. All joints shall be hairline and water tight. Joinery methods must not discolor finish or be unsightly.

C. Projected Ventilation: Shall be mitered and mechanically crimped over two individual corner blocks, with a minimum of four crimps per corner. Prior to crimping each corner block shall be set and sealed in epoxy leaving hairline joinery then sealed with curtain wall sealant.

D. Insulated Panels: Insulated panels shall be similar and equal to those manufactured by Laminators, Inc. Panels shall consist of a laminated sandwich of corrugated polyallomer core 1/8" water-resistant hardboard substrates and stucco pattern aluminum skins. The entire sandwich shall be bonded under heat and pressure with top quality, permanently elastic neoprene contact adhesive. Panel's thicknesss shall be 1", U-factor shall be .18, maximum. Panels shall be installed in their openings using flexible setting blocks on the bottom edge with expansion space of at least ¼" provided around the panel perimeter to allow or thermal expansion. Exterior face of panels shall be seated against water penetration into the opening by means of vinyl weather-stripping built into the window system and/or elastic caulking sealant (glazing/sealants to match panel color). Weep holes for proper draining of the frame are required.

The exterior aluminum skin shall be smooth finished, prepared, applied and tested in accordance with the latest recommendations of the AAMA. Exterior panel face color shall be Sandstone, and pre-finished interior panel face color to match color of exterior panel face. Panels shall be kept dry prior to installation to avoid stains from wet packaging material.

Avoid mechanical fasteners such as nails, screws or bolts through the face of the panel since such fasteners would interfere with the normal thermal expansion and contraction of the panel skin. Panels must be installed according to manufacturer's instructions to assure proper service life.

D. Thermal-Break Construction: Fabricate window units with an integral concealed low-conductance thermal barrier, located between exterior materials and window members exposed on the interior, in a manner that eliminates direct metal-to-metal contact.

1. Provide thermal-break construction that has been in use for not less than 3 years, has been tested to demonstrate resistance to thermal conductance and condensation, and has been tested to show adequate strength and security of glass retention.
2. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.
3. Weepholes: Provide weepholes and internal passages to conduct infiltrating water to the exterior.
4. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.
5. Subframes: Provide subframes with anchors for window units, where shown, of profile and dimensions indicated but not less than 0.062-inch-thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units.
6. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, in the manner indicated.
7. Glazing Stops: Provide screw-applied or snap-on glazing stops, coordinated with glass selection and glazing system indicated. Finish glazing stops to match window units.

E. Preglazed Fabrication: Preglaze window units at the factory where possible and practical for applications indicated. Comply with glass and glazing requirements of the "Glass and Glazing" Sections of these Specifications and AAMA 101.

2.6 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the

Aluminum Association for designating aluminum finishes.

C. Class II Clear Anodized Finish: AA-M12C22A31 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Contracting Officer and/or Project Managersural, clear film thicker than 0.4 mil).

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect openings before beginning installation. Verify that rough or masonry opening is correct and the sill plate is level.

1. Masonry surfaces shall be visibly dry and free of excess mortar, sand, and other construction debris.
2. Metal surfaces shall be dry; clean; free of grease, oil, dirt, rust and corrosion, and welding slag; without sharp edges or offsets at joints.

3.2 INSTALLATION

A. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of the work.

B. Set window units plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place.

1. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with the requirements specified under paragraph "Dissimilar Materials" in the Appendix to AAMA 101.

C. Set sill members and other members in a bed of compound or with joint fillers or gaskets, as shown, to provide weathertight construction. Refer to the "Joint Sealer" sections of Division 7 for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the work.

1. Compounds, joint fillers, and gaskets to be installed after installation of window units are specified as work in another section in Division 7.

3.3 FIELD QUALITY CONTROL

A. Conduct on-site tests for air and water infiltration with the window manufacturer's representative present. The Contracting Officer and/or Project Managers will select units to be tested. Tests not meeting specified requirements and units having similar deficiencies shall be corrected at no cost to the Owner. Testing shall be performed by an accredited testing agency selected by the Contracting Officer and/or Project Managers.

1. Air Infiltration Tests: Conduct tests in accordance with the requirements of ASTM E 783. Allowable infiltration shall not exceed 1.5 times the amount indicated.

2. Water Resistance Tests: Conduct tests in accordance with the requirements of ASTM E 1105. No water leakage is permitted.

3.4 ADJUSTING

A. Adjust operating sash and hardware to provide a tight fit at contact points and at weather-stripping for smooth operation and a weathertight closure.

3.5 CLEANING

A. Clean aluminum surfaces promptly after installation of windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

B. Clean glass of preglazed units promptly after installation of windows. Comply with requirements of the "Glass and Glazing" section for cleaning and maintenance.

3.6 PROTECTION

A. Initiate and maintain protection and other precautions required through the remainder of the construction period, to ensure that, except for normal weathering, window units will be free of damage or deterioration at the time of Substantial Completion.

END OF SECTION 08520

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

B. All work shall be performed by mechanics skilled in their respective trades in accordance with the best practices of the trade, and in accordance with the requirements of the materials manufactured.

1.2 SUMMARY

A. The work to be done under this Section includes everything necessary for and incidental to complete execution of all finish and finishing hardware required to complete the work in an approved manner, and accordance with drawings and specifications.

B. Submit hardware schedule for approval.

1.3 WORK NOT INCLUDED

A. Cabinet hardware.

B. Window hardware.

C. Bi-fold door hardware.

1.4 REQUIREMENTS

A. Hardware shall conform to ANSI A 156.2. FS FF-H-00106 and with the applicable series of this specification as follows:

1. Building entrance doors, series 4000, grade 1 or series 1000, grade 2.

B. Hardware shall be delivered to the project site in manufacturer's original packages, identified and labeled for content.

C. Hardware shall be labeled as follows:

1. "Complies with applicable standard" or
2. "Complies with performance requirements of applicable standard".

D. Hardware of same function or operation shall be product of one manufacturer.

E. Furnish all hardware with required screws, bolts and fasteners necessary for proper installation. Hardware secured to metal shall be made to template.

D. Modification to hardware due to construction features of doors, or frames shall provide the specified functional and operative features.

E. Hardware, except hinges, including exposed trim, shall be removed or adequately covered during painting and finishing.

F. The hardware supplier shall secure from the General Contractor copies of all approve shop drawings submitted by the various sub-contractors. Coordinating with the above, furnish all required templates to the proper door and door frame manufacturers promptly so as not to delay the work.

G. Hardware to have UL Labels attached the product and coordinate with the Label Requirements of the doors and frames.

1.5 HARDWARE SCHEDULE

A. A hardware schedule shall be submitted for approval. Schedule shall include types and locations of hardware items, key-control symbols indicating keying system, manufacturer's name, number and type and all other pertinent descriptive information.

1.6 KEYING

A. Cylinder shall be keyed as directed by the Contracting Officer and/or Project Managers and/ or Owner.

B. All key shall be stamped DO NOT DUPLICATE.

C. Provide the following cut keys:

1. Three (3) Grandmaster Keys.

2. Six (6) of each Master Keys.
3. Three (3) change keys for each tenant apartment cylinder.
4. Two (2) change keys for all other cylinders.

1.7 ACCEPTABLE MANUFACTURERS

A. Butts, Hinges: Hager, Stanley, McKinney, PBB, Cal-Royal.

B. Locksets: Falcon, Russwin, Yale, Schlage, Cal-Royal. Apartment entries shall be equipped with H Series, interconnected locking by Schlage or equal (with 1" minimum throw dead bolt and ½" minimum throw dead latch, both retracted by a single action of the inside lever handle).

C. Door Closers: Durma, Norton, Yale, LCN, Cal-Royal, Russwin.

D. Spring Hinges: Stanley, Bommer, Hager, McKinney, PBB, Cal-Royal.

E. Door Stops-Surface Bolts: H.B. Ives, Quality, Hager, Cal-Royal, Solar, Rockwood. Use wall door stops wherever possible; if conditions do not permit, use floor stops.

F. Kickplates: Lindstrom Corp., Russwin, Hager, Rockwood.

G. Silencers: Gynn Johnson, Russwin, H.B. Ives, Baldwin.

H. Thresholds-Weatherstripping: National Guard, Reese, Hager, Pemko.

I. All doors shall have locksets with lever type handles unless notice otherwise (UNO).

1.8 FINISHES

A. Butts, hinges-factory prime coats for painting.

B. Locksets, door stops, other miscellaneous items-satin chromium (626).

1.9 HARDWARE LOCATION

A. Hardware in new frames shall be located in accordance with the following, except under circumstances covered by special templating:

Top Hinge:----------Centerline of hinge not more than 11" below

top of door.

Bottom Hinge:---------- Centerline of hinge not more than 13" above the finished floor line.

Intermediate Hinge:---------- Equidistant between top and bottom hinge.

Knob Lock and Strike---------- 40-5/16" above finished floor to centerline of lock strike.

Door Closers:---------- Install and adjust in accordance with template instructions. Size in accordance with manufacturer's recommendation. Use parallel arm installation on out-swinging doors and where conditions do not permit regular installation.

Door Pulls---------- 42" above finished floor to centerline of grip.

Door Knockers----------To be installed on doors so that centerline of viewer hole cut out shall be 56" above finished floor. Provide additional viewer 44"above finished floor at handicapped units.

Push Plates ---------- 45" above finished floor to centerline of plate.

Kick Plates ----------Install on push side of single acting doors, and on both sides of double acting doors. Bottom edge of plate should come to within ¼" of bottom of door.

Flush Bolts ---------- Install in edge of door in accordance with template instructions.

1.10 IDENTIFICATION SIGNS

A. Provide Signs for Applicable Doors Indicating: Athletic Storage and Pressroom, Boys and Girls Toilet Rooms.

1.11 PRODUCT SIZES AND DIMENSIONS

A. Closers and holders shall be sized according to manufacturer's catalogue recommendations.

B. Kick Plate width for single doors shall be 2" less than the door width, and for

pairs of door 1" less than door width.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 HARDWARE SETS

A. Following sets of hardware correspond to hardware symbols shown on the drawings. Where hardware set for single door is specified for a pair of doors, equip each leaf of pair of such pair of doors with set noted. Only such of following hardware sets as shown on drawings will be required.

HW 11
Butts A2112
Lock F20 with level handles
Deadlock E0151
Door Closer C02011
Kick
Plate
Door Stop L02161
Threshold J16130
WeatherStripping

HW-13
Butts A2112
F07 with level handles
Mop Plate
Door Stop L02101

HW-16
Butts A2111
Deadlock E0171
Lock F09 with lever
Handles
Door Closer C02021
Kick
Plate
Door Stop L02131
Threshold J16130

HW-17
3 Hinges A8381, welded to door and frame
Lockset F14 modified and with level handles
Door Closer C02021
Cylinder Guard
Threshold J163, 5" wide
Weatherstripping

HW21
4 Butts, Folger Adams
4-1/2 FM-ICS
Jimmy proof deadlock E06271-
Omit Lock Cylinder

HW-19
Butts A2111
Lock F20 with level handles
Weatherstripping
Threshold J15300, 5" wide

Door Holder L01291

HW-22
4 Butts, Folder Adams 4 ½
FM-ICS 2 Surface bolts, Ives 453 x 8"
Jimmy proof deadlock E06281
Handles
Door Closer C02021
Kick
Plate
Door Stop L02101

HW 26
Butts A2112
Lockset F19 with level
2 Door Holders L01291 SK1-94-001

END OF SECTION 08710

SECTION 08800 - GLASS AND GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

B. All work shall be performed by mechanics skilled in their respective trades in accordance with the best practices of the trade, and in accordance with the requirements of the materials manufactured.

C. Submit samples for approval.

1.2 SUMMARY

A. Section Includes: Glass including glass, insulated glass, bullet-resistant glass, laminated glass and mirrors.

B. Related Sections: Sections related to this section include:

1. Glazed Doors: Division 8 Door Sections.
2. Glazed Windows: Division 8 Window Sections.

C. Wire glass in hollow metal doors where shown on drawings.

D. Safety glass where shown.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM C1036-Specification for flat glass.
2. ASTM C1048-Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
3. ASTM C1172-Specification for Laminated Architectural Flat Glass.
4. ASTM E774-Specification for Sealed Insulating Glass Units.

B. American National Standards Institute (ANSI):
1. ANSI Z97.1-Safety Glazing Materials Used in Buildings-Safety Performance Specifications and Materials of Test.

C. Consumer Products Safety Commission (CPSC):

1. CPCS 16 CFR Part 1201-Safety Standard for Architectural Glazing Materials.

1.4 WORK NOT INCLUDED

A. Mirrors in Medicine Cabinets.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide glass which has been manufactured, fabricated and installed to maintain performance criteria as stated by manufacturer without defects, damage or failure.

1.6 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Submittal Procedures Sections.

B. Product Data: Submit product data, including manufacturer's SPEC-DATA® product sheet, for specified products.

C. Samples: Submit selection and verification samples for finishes, colors and textures.

D. Quality Assurance Submittals: Submit the following:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
3. Manufacturer's Instructions: Manufacturer's installation instructions.

E. Glass and glazing shall meet the test requirements of ANSI z-97.1 and the Consumer Product Safety Commission Federal Standard on Contracting Officer and/or Project Managers glazing materials.

F. Close-out Submittals: Submit the following:

1. Warranty: Warranty documents specified herein.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.

1. Refer to related sections of installer qualifications.

B. Regulatory Requirements: Glass and glazing shall be in compliance with ANSI Z97.1 and CPSC 16 CFR Part 1201 and other regulatory requirements of agencies having jurisdiction.

C. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.8 DELIVERY, STORAGE AND HANDLING

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.9 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not a limitation of , other rights Owner may have under the Contract Documents.

1. Warranty Period: 10 years commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 GLASS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Contact: 10200 NW 67th St., Tamarac, FL 33321; Telephone (800) 432-8132, (954) 724-1775, Fax (954) 724-9637.

B. Proprietary Product(s): Arch Glass Products.

1. Tempered Glass:
   a. Temper: Fully tempered glass.
   b. Dimensions: As indicated.
   c. Color: As selected from manufacturer's colors.

2. Insulated Glass:
   a. Glass (ASTM E774): Specify glass designation available from manufacturer.
   b. Spacer and Sealing System: Manufacturer's standard spacer and sealing system.
   c. Outer/Inner Lite: Specify outer and inner lite.
   d. Dimensions: As indicated.
   e. Color: As selected from manufacturer's colors.

3. Bullet-Resistant Glass:

a. Dimensions: As indicated.
b. Color: As selected from manufacturer's colors.

4. Laminated Glass:
   a. Outer Lite/Inner Lite/Plastic Interlayer:
   b. Performance Characteristics: Specify performance characteristics.
   c. Dimensions: As indicated.
   d. Color: As selected from manufacturer's colors.

5. Glass Material Standard:
   a. Float Glass: ASTM C1036, Type I, Class as required and Quality q3.
   b. Tempered Glass: ASTM C1048, Kind FT, Type, Class, Form as required, Quality q8.
   c. Insulating Glass: ASTM E774.
   d. Bullet-Resistant Glass:
   e. Laminated Glass: ASTM C1172.

D. Substitutions: No substitutions permitted.

E. Marquez Glasseries, Inc.

F. Interpane Glass Co.

G. Globe-Amerada Glass Co.

2.2 GLASS MATERIALS

A. 5/8 Inch Insulating Glass: Equal to Guardian Industries Corp., Insulating Glass, using 3/16 inch clear glass on the exterior and interior sides with ¼ inch air space.
B. Coated glass: Low – E insulated glass.

2.3 SEALANTS

A. One-part, medium modulus, high performance, neutral cure silicone sealant equal to one of the following:

1. Dow Corning, 791.
2. NUCO Industries, Inc. HiFlex 393.
3. Polymeric Systems, Inc. PSI-631.
4. Schnee-Morehead, Inc., SM5731 Poly-Glaze.
5. Tremco, Spectrem 2.

B. Type and Grade: S (single component) and NS (nonsag).

C. Class: 25.

2.4 GLAZING PUTTY

A. DAP 1012, UGL Glazol, or approved equal.

B. Glazing Compound for Metal Frames: Tremco Channel Glazing Compound, or Pecora #M251. Oil based putty will not be allowed. Color of compound shall match color of metal.

C. Provide clips, shims and setting blocks as required.

2.5 ACCESSIORES

A. Wrap-Around Protective Tape for Edges of Laminated Glass: Scotch Brand Transparent Tape No. 600, 3M Company, St. Paul, Minnesota, or approved equal.

B. Setting Blocks: Elastomeric materials with a Shore A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.6 FABRICATION OF GLASS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

2.7 SOURCE QUALITY

A. Source Quality: Obtain glass products from single manufacturer.

PART 3 – EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instruction.

3.2 EXAMINATION

A. Site verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.3 PREPARATION

A. Surface Preparation: Clean glazing channels and framing members to receive glass material. Remove harmful materials and coatings which may impair proper glazing procedures.

3.1 INSTALLATION

A. Glass Installation:

1. Comply with combined recommendations of manufacturers of glass, sealants, gaskets and other glazing material for installation of glass.
2. Install setting blocks, spacers and other accessories for glass installation.

B. Glazing operations shall conform to Flat Glass Marketing "Glazing Manual".

C. Deliver sufficient glass to site to allow for breakage.

D. See notes on drawings identifying tempered glass locations.

3.2 PROTECTION

A. Protection: Protect installed products from damage during construction.

3.6 CLEANING AND CLEAN UP

A. Thoroughly clean all glass and remove all labels, point spots, putty and other defacements.

B. Remove all excess materials from jobsite.

END OF SECTION 08800

SECTION 09255 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Non-load-bearing steel framing members for gypsum board assemblies.
2. Gypsum board assemblies attached to steel framing.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Cold-Formed Metal Framing" for load-bearing steel framing.
2. Division 7 Section "Sprayed-On Fireproofing" for fireproofing structural steel members concealed behind gypsum board assemblies.
3. Division 9 Section "Gypsum Sheathing" for installations over steel framing.

1.3 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms related to gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

A. Sound Transmission Characteristics: For gypsum board assemblies indicated to have STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined per ASTM E 90 and classified per ASTM E 413 by a qualified independent testing agency.

1.5 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

1.6 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Where fire-rated gypsum board assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire Resistance Ratings: As indicated by reference to GA File Numbers in GA-600 "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer.

C. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

D. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

E. Field Samples: On actual gypsum board assemblies, prepare field samples of at least 100 sq. ft. in surface area for the following applications. Simulate finished lighting conditions for review of in-place unit of work.

1. Wall surfaces indicated to receive nontextured paint finishes.
2. Ceiling surfaces indicated to receive nontextured paint finishes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.8 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.

B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F (10 deg C) for 48 hours prior to application and continuously after until dry. Do not exceed 95 deg F (35 deg C) when using temporary heat sources.

C. Ventilation: Ventilate building spaces, as required, for drying joint treatment materials. Avoid drafts during hot dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Steel Framing and Furring:

a. Dale Industries, Inc.
b. Dietrich Industries, Inc.
c. Gold Bond Building Products Div., National Gypsum Co.

2. Grid Suspension Assemblies:

a. Chicago Metallic Corp.
b. National Rolling Mills Co.

c. USG Interiors, Inc.

3. Gypsum Board and Related Products:

a. Georgia-Pacific Corp.
b. Gold Bond Building Products Div., National Gypsum Co.
c. United States Gypsum Co.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

A. General: Provide components complying with ASTM C 754 for materials and sizes unless otherwise indicated.

B. Cast-In-Place and Postinstalled Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials, with holes or loops for attaching hanger wires, and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined from testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Cast-in-place type designed for attachment to concrete forms.
2. Chemical anchor.
3. Expansion anchor.

C. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.

E. Hanger Rods: Mild steel and zinc-coated or protected with rust-inhibitive paint.

F. Flat Hangers: Mild steel and zinc-coated or protected with rust-inhibitive paint.

G. Angle-Type Hangers: Angles with legs not less than 7/8 inch wide, formed from 0.0635-inch-thick galvanized steel sheet complying with ASTM A 446 Coating Designation G90, with bolted connections and 5/16-inch-diameter bolts.

H. Channels: Cold-rolled steel, 0.05980-inch-minimum thickness of base (uncoated) metal and 7/16-inch-wide flanges, and as follows:

1. Carrying Channels: 1-1/2 inch deep, 475 lb per 1000 feet, unless

otherwise indicated.

2. Furring Channels: 3/4 inch deep, 300 lb per 1000 feet, unless otherwise indicated.
3. Finish: G-60 hot-dip galvanized coating per ASTM A 525 for framing for exterior soffits and where indicated.

I. Steel Studs for Furring Channels: ASTM C 645, with flange edges bent back 90 deg and doubled over to form 3/16-inch minimum lip (return), minimum thickness of base (uncoated) metal and minimum depth as follows:

1. Thickness: 0.0329 inch, unless otherwise indicated.
2. Depth: 2-1/2 inches, unless otherwise indicated.
3. Depth: 3-5/8 inches, unless otherwise indicated.
4. Protective Coating: Manufacturer's standard corrosion-resistant coating.

J. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth of 7/8 inch, and minimum thickness of base (uncoated) metal as follows:

1. Thickness: 0.0329 inch, unless otherwise indicated.
2. Protective Coating: Manufacturer's standard corrosion-resistant coating.

K. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, fabricated from steel sheet complying with ASTM A 525 or ASTM A 568 to form 1/2-inch-deep channel of the following configuration:

1. Single-Leg Configuration: Asymmetric-shaped channel with face connected to a single flange by a single slotted leg (web).
2. Double-Leg Configuration: Hat-shaped channel, with 1-1/2-inch-wide face connected to flanges by double slotted or expanded metal legs (webs).
3. Configuration: Either configuration indicated above.

L. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross furring members that interlock to form a modular supporting network.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS

A. General: Provide steel framing members complying with the following requirements:

1. Component Sizes and Spacings: As indicated but not less than that

required to comply with ASTM C 754 under the following maximum deflection and lateral loading conditions:

a. Maximum Deflection: L/240 at 5 lbf per sq. ft.

2. Protective Coating: Manufacturers standard corrosion-resistant coating.

B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 deg and doubled over to form 3/16-inch-wide minimum lip (return) and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1 Thickness: 0.0329 inch where indicated.
2. Depth: 4 inches where indicated.
3. Depth: 2-1/2 inches where indicated.

C. Furring Brackets: Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, minimum thickness of base (uncoated) metal of 0.0329 inch, designed for screw attachment to steel studs and steel rigid furring channels used for furring.

D. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, fabricated from steel sheet complying with ASTM A 525 or ASTM A 568 to form 1/2-inch-deep channel of the following configuration:

1. Single-Leg Configuration: Asymmetric-shaped channel with face connected to a single flange by a single slotted leg (web).
2. Double-Leg Configuration: Hat-shaped channel, with 1-1/2-inch-wide face connected to flanges by double-slotted or expanded metal legs (webs).
3. Configuration: Either configurtion indicated above.

E. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.4 GYPSUM BOARD PRODUCTS

A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end butt joints.

1. Thickness: Provide gypsum board in thicknesses indicated or, if not otherwise indicated, in either 1/2 inch or 5/8 inch thicknesses to comply with ASTM C 840 for application system and support spacing indicated.

B. Gypsum Wallboard: ASTM C 36 and as follows:

1. Type: Regular for vertical surfaces, unless otherwise indicated.
2. Type: Foil-backed where indicated.
3. Edges: Tapered and featured (rounded or beveled) for prefilling.
4. Thickness: 1/2 inch, unless otherwise indicated.
5. Thickness: 5/8 inch where indicated.
6. Thickness: As indicated.
7. Available Products: Subject to compliance with requirements, products that may be incorporated in the work where proprietary gypsum wallboard is indicated include, but are not limited to, the following:

   b. Gyprock Fireguard C Gypsum Board, Domtar Gypsum.
   c. Firestop Type C, Georgia-Pacific Corp.
   d. Fire-Shield Gridstone, Gold Bond Building Products Div., National Gypsum Co.

C. Exterior Gypsum Soffit Board: ASTM C 931, with manufacturer's standard edges, of type and thickness indicated below:

1. Type: Regular, unless otherwise indicated.
2. Thickness: 1/2 inch, unless otherwise indicated.

D. Available Products: Subject to compliance with requirements, cementitious backer units that may be incorporated in the work include, but are not limited to, the following:

1. DomCrete Cementitious Tile-Backer Board, Domtar Gypsum.
2. Glas-crete Cementitious Backer Board, Glascrete, Inc.
3. Wonder-Board, Glascrete, Inc.

2.5 TRIM ACCESSORIES

A. Accessories for Interior Installation: Corner beads, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal, plastic, or metal combined with paper, with metal complying with the following requirement:

   a. Sheet steel zinc-coated by hot-dip process.
   b. Sheet steel coated with zinc by hot-dip or electrolytic processes,

or with aluminum or rolled zinc.

2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:

   a. Cornerbead on outside corners, unless otherwise indicated.
   b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim unless otherwise indicated.
   c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
   d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
   e. One-piece control joint formed with V-shaped slot, with removable strip covering slot opening.

B. Zinc Accessories for Exterior Ceilings: Corner beads, edge trim, and control joints formed from rolled zinc complying with ASTM C 1047, in shapes indicated below by reference to ASTM C 1047:

1. Corner bead on outside corners, unless otherwise indicated.
2. Edge trim complying with ASTM C 1047, formed from rolled zinc, shape LC-Bead per Fig. 1, unless otherwise indicated.

C. Aluminum Accessories: Where indicated, provide manufacturer's standard extruded aluminum accessories of profile indicated or referenced by manufacturer's product designations, complying with the following requirements:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of finish indicated and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for alloy and temper 6063-T5.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering aluminum accessories that may be incorporated in the work include, but are not limited to, the following:

   a. Fry Reglet Corp.
   b. Gordon, Inc.
   c. MM Systems, Inc.

2.6 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.

1. Use pressure-sensitive or staple-attached open-weave glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.

C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

2. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
3. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer for this purpose.
4. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by the gypsum board manufacturer for this purpose.
5. For topping compound, use sandable formulation.

D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mixed Formulation: Factory-mixed product.
2. Job-Mixed Formulation: Powder product for mixing with water at project site.
3. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
4. Topping compound formulated for fill (second) and finish (third) coats.
5. All-purpose compound formulated for both taping and topping compounds.

E. Joint Compound for Cementitious Backer Unit: Material recommended by cementitious backer unit manufacturer.

2.7 ACOUSTICAL SEALANT

A. Latex Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
2. Product has flame-spread and smoke-developed ratings of less than 25 per ASTM E 84.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

C. Available Products: Subject to compliance with requirements, acoustical sealants that may be incorporated in the work include, but are not limited to, the following:

1. Acoustical Sealant:

a. AC-20 FTR Acoustical and Insulation Sealant, Pecora Corp.
b. SHEETROCK Acoustical Sealant, United States Gypsum Co.

2. Acoustical Sealant for Concealed Joints:

a. BA-98, Pecora Corp.
b. Tremco Acoustical Sealant, Tremco, Inc.

2.8 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum panels.

C. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot grouting hollow metal door frames.

D. Fastening Adhesive for Wood: ASTM C 557.

E. Fastening Adhesive for Metal: Special adhesive recommended for laminating

gypsum panels to steel framing.

F. Steel drill screws complying with ASTM C 1002 for the following applications:

1. Fastening gypsum board to steel members less than 0.03 inch thick.
2. Fastening gypsum board to wood members.
3. Fastening gypsum board to gypsum board.

G. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.

H. Corrosion-resistant-coated steel drill screws of size and type recommended by board manufacturer for fastening cementitious backer units.

I. Gypsum Board Nails: ASTM C 514.

J. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

K. Thermal Insulation: Material indicated below, of thickness and width to fill voids formed by Z-furring members:

1. Unfaced Mineral-Fiber Blanket Insulation: Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing):

a. Mineral-Fiber Type: Fibers manufactured from glass or slag.
b. Mineral-Fiber Type: Fibers manufactured from glass.
c. Mineral-Fiber Type: Fibers manufactured from slag.

2. Extruded Polystyrene Board Thermal Insulation: Rigid, cellular, thermal insulation with closed cells and integral high-density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for Type IV, and with the following surface-burning characteristics:

a. Flame-spread and smoke-developed ratings of 75 and 450, respectively, per ASTM E 84.

L. Polyethylene Vapor Retarder: ASTM D 4397, thickness and maximum permeance rating as follows:

1. 4.0 mils, 0.19 perms.
2. 6.0 mils, 0.13 perms.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

1. Furnish concrete inserts and other devices indicated to other trades for installation well in advance of time needed for coordination with other construction.

B. Before sprayed-on fireproofing is applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required, provide continuous units fastened to building structure not more than 24 inches o.c.

C. After sprayed-on fireproofing has been applied, remove only as much reproofing as needed to complete installation of gypsum board assemblies

without reducing thickness of fireproofing below that required to obtain fire-resistive rating indicated. Protect remaining fireproofing from damage.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.

1. Where building structure abuts ceiling perimeter or penetrates ceiling.
2. Where partition framing and wall furring abut structure except at floor.

a. Provide slip- or cushioned-type joints as detailed to attain lateral support and avoid axial loading.

D. Do not bridge building expansion and control joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.4 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

A. Screw furring members to wood framing.

B. Suspend ceiling hangers from building structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated

temperatures.

4. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Do not connect or suspend steel framing from ducts, pipes or conduit.

C. Sway-brace suspended steel framing with hangers used for support.

D. Install suspended steel framing components in sizes and at spacings indicated but not less than that required by the referenced steel framing installation standard.

1. Wire Hangers: 0.1620-inch (8-gage) diameter, 4 feet o.c.
2. Carrying Channels (Main Runners)): 1-1/2 inch, 4 feet o.c.
3. Rigid Furring Channels (Furring Members): 16 inches o.c.
4. Rigid Furring Channels (Furring Members): 24 inches o.c.

E. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring members or grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.

F. Wire-tie or clip furring members to main runners and to other structural supports as indicated.

G. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

H. For exterior soffits, install cross-bracing and additional framing to resist wind uplift according to details on Drawings.

3.5 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.

1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Cut studs 1/2 inch short of full height. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. For STC-rated and fire-resistive-rated partitions requiring partitions to extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

D. Terminate partition framing at suspended ceilings where indicated.

E. Install steel studs and furring in sizes and at spacings indicated but not less than that required by the referenced steel framing installation standard to comply with maximum deflection and minimum loading requirements specified:

1. Single-Layer Construction: Space studs at 16 inches o.c.

F. Install steel studs so that flanges point in the same direction and so that leading edges or ends of each gypsum board can be attached to open (unsupported) edges of stud flanges first.

G. Frame door openings to comply with details indicated, with GA-219, and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

H. Frame openings other than door openings to comply with details indicated or, if none indicated, in same manner as required for door openings. Install framing below sills of openings to match framing required above door heads.

I. Install thermal insulation as follows:

1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw attach short flange of furring channel to web of attached channel. Start from this furring channel with standard width insulation panel and continue in regular manner. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
4. Until gypsum board is installed, hold insulation in place with 10-inch staples fabricated from 0.0625-inch (16-gage)-diameter tie wire and inserted through slot in web of member.

J. Install polyethylene vapor retarder where indicated to comply with the following requirements:

1. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with mechanical fasteners or adhesives. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose mineral-fiber insulation.
2. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges, at perimeter of wall openings, and at lap joints; space fasteners 16 inches o.c.
3. Seal joints in vapor retarders caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with vapor retarder tape.
4. Repair any tears or punctures in vapor retarder immediately before concealing it with the installation of gypsum board or other construction.

3.6 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install sound attenuation blankets where indicated prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and avoid abutting end joints in the central area of each ceiling.

Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install wall/partition board panels to minimize the number of abutting end joints or avoid them entirely. Stagger abutting end joints not less than one framing member in alternate courses of board. At stairwells and other high walls, install panels horizontally with end abutting joints over studs and staggered.

E. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

F. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position adjoining panels so that tapered edges abut tapered edges, and field-cut edges abut field-cut edges and ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Avoid joints at corners of framed openings where possible.

G. Attach gypsum panels to steel studs so that the leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

H. Attach gypsum panels to framing provided at openings and cutouts.

I. Do not attach gypsum panels across the flat grain of wide-dimension lumber including floor joists and headers. Instead, float gypsum panels over these members using resilient channels or provide control joints to counteract wood shrinkage.

J. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors, and doors over 32 inches wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.

K. Form control joints and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.

L. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chase walls that are braced internally.

1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs

and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4-to-1/2-inch-wide joints to install sealant.

M. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4-inch-to-1/2-inch-wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

N. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum panels over wood framing, with floating internal corner construction.

O. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

P. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.7 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:

1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
3. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistive-rated assemblies. Use maximum-length panels to minimize end joints.
4. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install corner beads at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed or semiexposed. Provide edge trim type with face flange formed to receive joint compound except where other types are indicated.

1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install L-bead where edge trims can only be installed after gypsum panels are installed.
3. Install U-bead where indicated.
4. Install aluminum edge trim and other accessories where indicated.

D. Install control joints at locations indicated, and where not indicated according to ASTM C 840, and in locations approved by Architect for visual effect.

E. Install H-molding in exterior gypsum board assemblies where control joints are indicated. Install on cut or ends of gypsum panels, not on tapered edges.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration and levels of gypsum board finish indicated.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints except those with trim accessories having concealed face flanges not requiring taping to prevent cracks from developing in joint treatment at flange edges.

D. Apply joint tape over gypsum board joints and to trim accessories with concealed face flanges as recommended by trim accessory manufacturer and as required to prevent cracks from developing in joint compound at flange edges.

E. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.

1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistive-rated assemblies and sound-rated assemblies.
2. Level 5 for gypsum board surfaces indicated to receive gloss and semigloss enamels, nontextured flat paints, and where indicated.

F. Where level 5 gypsum board finish is indicated, apply joint compound combination specified for level 4 plus a thin, uniform skim coat of joint compound over entire surface. Use joint compound specified for the finish (third coat) or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Produce surfaces free of tool marks and ridges ready for decoration of type indicated.

G. Where level 1 gypsum board finish is indicated, apply joint compound specified for embedding coat.

H. Finish exterior gypsum soffit board using setting-type joint compounds to prefill joints and embed tape, and for first, fill (second) and finish (third) coats, with the last coat being a sandable product. Smooth each coat before joint compound hardens to minimize need for sanding. Sand between coats and after finish coat.

1. Painting exterior gypsum soffit board after finish coat has dried is specified in Division 9 Section "Painting."

I. Base for Acoustical Tile: Where gypsum board is indicated as a base for adhesively applied acoustical tile, install tape and a two-coat compound treatment, without sanding.

J. Finish glass-mat water-resistant gypsum backing board to comply with board manufacturer's directions.

3.10 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner suitable to Installer, that ensures gypsum board assemblies remain without damage or deterioration at time of Substantial Completion.

END OF SECTION 09255

SECTION 09300 - TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Unglazed ceramic mosaic tile.
2. Glazed wall tile.
3. Stone thresholds.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 2 Section "Selective Demolition" for removal of existing tile.
2. Division 3 Section "Concrete Work" for monolithic slab finishes specified for tile substrates.
3. Division 7 Section "Joint Sealers" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Shop drawings indicating tile patterns and locations and widths of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1. Locate precisely each joint and crack in tile substrates by measuring, record measurements on shop drawings, and coordinate them with tile joint locations, in consultation with Architect.

D. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type and composition of tile indicated. Include samples of grout and accessories involving color selection.

E. Master grade certificates for each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

F. Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile and tile setting and grouting products with requirements indicated.

G. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, plus other information specified.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the work.

B. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

C. Installer Qualifications: Engage an experienced Installer who has successfully completed tile installations similar in material, design, and extent to that indicated for project.

D. Field-Constructed Mock-Up: Before installing tile, erect mock-ups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of work.

1. Locate mock-ups on site in location and size indicated or, if not indicated, directed by Architect.
2. Erect mock-ups in presence of Architect.
3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain Architect's acceptance of mock-ups before start of final unit of work.
5. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of work.

    a. When directed, demolish and remove mock-ups from project site.
    b. Accepted mock-ups in undisturbed condition at time of Substantial Completion may become part of completed unit of work.

E. Preinstallation Conference: Conduct conference at project site to comply with requirements of Division 1 Section "Project Meetings".

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If despite these precautions coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at 50 deg F (10 deg C) or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

1.7 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Unglazed Quarry Tile:

a. American Olean Tile Co., Inc.
b. Dal-Tile Corp.
c. Mid-State Tile Co.
d. Summitville Tiles, Inc.

2. Glazed Wall Tile:

a. American Olean Tile Co., Inc.
b. Dal-Tile Corp.
c. Mid-State Tile Co.
d. United States Ceramic Tile Co.

3. Dry-Set Mortars and Grouts:

a. American Olean Tile Co., Inc.
b DAP Inc. Div.; USG Corp.
c. L & M Mfg. Inc.
d. Laticrete International Inc.
e. Mapei Corp.

4. Polyvinyl-Acetate-Based Latex-Portland Cement Dry Mortar Mix:

a. Laticrete International Inc.

5. Water-Cleanable Tile Setting Epoxy Adhesives:

a. American Olean Tile Co., Inc.
b. Atlas Minerals & Chemicals, Inc.
c. Summitville Tiles, Inc.

6. Commercial Portland Cement Grouts:

a. American Olean Tile Co., Inc.
b. Custom Building Products
c. C-Cure Chemical Co.
d. L & M Mfg. Inc.

7. Manufacturers of Chemical-Resistant Joint Sealants:

a. Atlas Minerals & Chemicals Inc.
b. Pennwalt Corp.

2.2 PRODUCTS, GENERAL

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.

1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials compling with the following requirements:

1. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.

1. Where tile is indicated for installation in swimming pools, on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies that this type of mounting is suitable for these kinds of uses and has been successfully used on other projects.

F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE PRODUCTS

A. Unglazed Ceramic Mosaic Tile: Provide factory-mounted flat tile complying with the following requirements:

1. Composition: Natural clay with abrasive admixture.
2. Nominal Facial Dimensions: 2 inches by 2 inches.
3. Nominal Thickness: 1/4 inch.
4. Face: Plain with cushion edges.

B. Glazed Wall Tile: Provide flat tile complying with the following requirements:

1. Nominal Facial Dimensions: 4-1/4 inches by 4-1/4 inches.
2. Nominal Thickness: 5/16 inch.
3. Face: Plain with modified square edge or cushion edge.
4. Face: Pattern of design indicated, with manufacturer's standard edge.
5. Mounting: Factory back-mounted.

C. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:

1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
2. Shapes: As follows, selected from manufacturer's standard shapes:

a. Base for Portland Cement Mortar Installations: Coved.
b. Base for Thinset Mortar Installations: Straight.
c. Wainscot Cap for Thinset Mortar Installations: Surface bullnose.
d. External Corners for Thinset Installations: Surface bullnose.
e. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide a reduction in thickness from 1/2 inch to 1/4 inch across nominal 4 INCH dimension.

D. Accessories for Glazed Wall Tile: Provide vitreous china accessories of type and size indicated and in color and finish to match adjoining glazed wall tile.

1. One roll paper holder at each water closet.

2.4 STONE THRESHOLDS

A. General: Provide stone that is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and for abrasion resistance where exposed to foot traffic, a minimum hardness of 10 per ASTM C 241.

1. Provide white, honed marble complying with MIA Group "A" requirements for soundness.

2.5 WATERPROOFING FOR THINSET TILE INSTALLATIONS

A. Polyethylene Sheet Waterproofing: Manufacturer's standard proprietary product consisting of composite sheets, 60 inches wide by a nominal thickness of 0.030, composed of an inner layer of chlorinated polyethylene sheet faced on both sides with laminated high-strength nonwoven polyester material, designed for embedding in latex-portland cement mortar, and as substrate for latex-portland cement mortar setting bed.

B. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. Polyethylene Sheet Waterproofing:

a. "Nobleseal TS"; Noble Co. (distributed by H.B. Fuller Co.)

2.6 SETTING MATERIALS

A. Dry-Set Portland Cement Mortar: ANSI A118.1.

B. Latex-Portland Cement Mortar: ANSI A118.4, composition as follows:

1. Prepackaged dry mortar mix composed of portland cement, graded aggregate, and the following dry polymer additive in the form of a reemulsifiable powder to which only water is added at job site.

a. Dry Polymer Additive: Manufacturer's standard.
b. Dry Polymer Additive: Polyvinyl acetate or ethylene vinyl acetate.
c. Dry Polymer Additive: Ethylene vinyl acetate.

C. Chemical-Resistant, Water-Cleanable Ceramic Tile Setting and Grouting Epoxy: ANSI A118.3.

2. Provide product capable of resisting continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, as certified by mortar manufacturer for intended use.

D. Water-Cleanable Tile-Setting Epoxy Adhesive: ANSI A118.3.

E. Modified Epoxy Emulsion Mortar: ANSI A118.8.

F. Organic Adhesive: ANSI A136.1, Type I.

2.7 GROUTING MATERIALS

A. Commercial Portland Cement Grout: ANSI A118.6, color as indicated.

B. Dry-Set Grout: ANSI A118.6, color as indicated.

C. Latex-Portland Cement Grout: ANSI A118.6, color as indicated, composition as follows:

1. Prepackaged dry grout mix composed of portland cement, graded aggregate, and the following dry polymer additive in the form of a reemulsifiable powder to which only water is added at job site.

d. Dry Polymer Additive: Ethylene vinyl acetate.

e. Dry Polymer Additive: Polyvinyl acetate or ethylene vinyl acetate.

2. Latex additive (water emulsion) serving as replacement for part or all of gauging water, added at job site with dry grout mixture, with type of latex and dry grout mix as follows:

a. Latex Type: Manufacturer's standard.
b. Dry Grout Mixture: Dry-set grout specified or supplied by latex additive manufacturer. Use latex additive without retarder with dry-set grout.

1) Application: Use dry-set grout combined with latex additive for grouting joints in glazed wall tile.

c. Dry Grout Mixture: Commercial portland cement specified or supplied by latex additive manufacturer.

1) Application: Use commercial portland cement grout combined with latex additive for grouting joints in floor tile unless otherwise indicated.

d. Dry Grout Mixture: An on-the-job-mixture of white or gray portland cement and white or colored fine graded aggregate that complies with latex additive manufacturer's requirements.

A. Chemical-Resistant Epoxy Grout: ANSI A118.3, color as indicated.

1. Provide product capable of resisting continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, as certified by mortar manufacturer for intended use.

B. Chemical-Resistant Furan Grout: ANSI A118.5.

C. Grout for Pregrouted Tile Sheets: Same silicone rubber used in factory pregrouted sheets.

2.8 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with requirements of Division 7

Section "Joint Sealers," including ASTM C 920 as referenced by Type, Grade,

Class, and Uses.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part Mildew-Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

D. Multipart Pourable Urethane Sealant for Use T: Type M; Grade P; Class 25; Uses T, M, A, and as applicable to joint substrates indicated, O.

E. Chemical-Resistant Sealants: For chemical-resistant floors, provide sealants compatible with chemical-resistant mortars and grouts, approved for use indicated by manufacturers of both mortar/grout and sealant and with chemical-resistance properties equivalent to mortar/grout.

F. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. One-Part Mildew-Resistant Silicone Sealant:

   a. "Dow Corning 786"; Dow Corning Corp.
   b. "SCS 1702"; General Electric Co.
   c. "863 #345 White"; Pecora Corp.
   d. "Rhodorsil 6B White"; Rhone-Poulenc Inc.
   e. "Proglaze White"; Tremco Corp.

2. Multipart Pourable Urethane Sealant:

   a. "Chem-Calk 550"; Bostik Construction Products Div.
   b. "Vulkem 245"; Mameco International, Inc.
   c. "Urexpan NR-200"; Pecora Corp.
   d. "THC-900"; Tremco Corp.

2.9 MISCELLANEOUS MATERIALS

A. Metal Edge Strips: Zinc alloy or stainless steel terrazzo strips, 1/8-inch wide at top edge with integral provision for anchorage to mortar bed or substrate unless otherwise indicated.

B. Temporary Protective Coating: Provide product indicated below that is

formulated to protect exposed surfaces of tile against adherence of mortar and grout, is compatible with tile and mortar/grout products, and is easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, fully refined, tasteless, odorless, containing at least 0.5 percent oil with a melting point of 120 deg F (49 deg C) to 140 deg F (60 deg C) per ASTM D 87.
2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as a temporary protective coating for tile.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not

factory blended, either return to manufacturer or blend tiles at project site before installing.

B. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:

1. Petroleum paraffin wax, applied hot.
2. Grout release.
3. Petroleum paraffin wax or grout release.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.

B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealers."

H. Grout tile to comply with the requirements of the following installation standards:

1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.
2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.
3. For chemical-resistant furan grouts, comply with ANSI A108.8.

I. At showers, tubs and similar wet areas, install cementitious backer units and treat joints to comply with manufacturer's instructions for type of application indicated.

3.4 WATERPROOFING FOR THINSET TILE INSTALLATIONS

A. Install waterproofing in compliance with waterproofing manufacturer's instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 FLOOR INSTALLATION METHODS

A. Ceramic Mosaic Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:

1. Portland Cement Mortar: ANSI A108.1

a. Bond Coat: Dry-set portland cement mortar on cured bed, ANSI A108.5.

b. Bond Coat: Portland cement paste or dust coat on plastic bed or

the following thin-set mortar on cured bed, ANSI A108.5, at Contractor's option:

1) Latex-portland cement mortar.
2) Dry-set portland cement mortar.

c. Concrete Subfloors, Interior, Waterproofing Membrane: TCA F121.
d. Grout: Dry-set.

2. Organic Adhesive: ANSI A108.4.

a. Concrete Subfloors, Interior: TCA F116.
b. Grout: Latex-portland cement.

3. Latex-Portland Cement Mortar: ANSI A108.5.
4. Dry-Set Portland Cement Mortar: ANSI A108.5.

a. Concrete Subfloors, Interior: TCA F113.
b. Grout: Sand-portland cement.
c Grout: Chemical-resistant epoxy.

3.6 WALL TILE INSTALLATION METHODS

A. Install types of tile designated for wall application to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:

1. Portland Cement Mortar: ANSI A108.1.

a. Masonry or Concrete, Interior: TCA W211 (bonded).
b. Grout: Dry-set.
c. Grout: Elastomeric grout for pregrouted sheets.

2. Organic Adhesive: ANSI A108.4.

a. Solid Backing, Interior: TCA W223.
b. Grout: Latex-portland cement.

3. Latex-Portland Cement Mortar: ANSI A108.5.
4. Dry-Set Portland Cement Mortar: ANSI A108.5.

a. Masonry, Interior: TCA W202.

b. Grout: Dry set.
c. Grout: Elastomeric for pregrouted sheets.

3.7 CLEANING AND PROTECTION

A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09300

SECTION 09512 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Ceilings composed of acoustical tiles and concealed suspension systems.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 9 Section "Acoustical Panel Ceilings" for ceilings composed of acoustical panels and exposed suspension systems.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Coordination drawings for reflected ceiling plans drawn accurately to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension system members.
2. Method of attaching suspension system hangers to building structure.
3. Initial direct-access openings.
4. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
5. Minimum Drawing Scale: 1/4 inch = 1 foot.

D. Samples for initial selection in the form of manufacturer's color charts consisting of actual acoustical tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type of tile indicated.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that show compliance of acoustical tile ceilings and components with the building code in effect for the project.

G. Product test reports from a qualified independent testing agency that are based on its testing of current products for compliance of acoustical tile ceilings and components with requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed acoustical tile ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:

1. Fire-response tests are performed by a qualified testing and inspecting agency. Qualified testing and inspecting agencies include Underwriters Laboratories (UL), Warnock Hersey, or another agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Surface-burning characteristics of acoustical tiles comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
3. Acoustical tile ceilings indicated are identical in materials and construction to those tested for fire resistance per ASTM E 119.
4. Fire-resistance-rated, acoustical tile ceilings are indicated by design designations listed in the UL "Fire Resistance Directory," in the Warnock Hersey "Certification Listings," or in the listing of another qualified testing and inspecting agency.
5. Products are identified with appropriate markings of applicable testing and inspecting agency.

C. Single-Source Responsibility for Ceiling Tile: Obtain each type of acoustical ceiling tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the work.

D. Single-Source Responsibility for Suspension System: Obtain each type of concealed suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the work.

1. Obtain both acoustical ceiling units and suspension system from the same manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles and suspension system components to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Space Enclosure and Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical tiles and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1. Acoustical Ceiling Tile: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
2. Suspension System Components: Furnish quantity of each component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, acoustical tiles that may be incorporated in the work include, but are not limited to, the following:

1. Non-Fire-Resistance-Rated, Nodular, Cast, or Molded, Mineral-Base Tile:

a. Celotone Natural Fissured; The Celotex Corporation.
b. Acoustone "F" Fissured; USG Interiors, Inc.

2. Fire-Resistance-Rated, Water-Felted, Mineral-Base Tile:

a. Fire Guard Fissured; Armstrong World Industries, Inc.
b. Auratone Fire Code Omni Fissured; USG Interiors, Inc.

2.2 ACOUSTICAL TILE, GENERAL

A. Acoustical Tile Standard: Provide manufacturer's standard tiles of 2’-0” x 4’-0” x 5/8” thick or of configuration indicated, that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring Noise Reduction Coefficient (NRC): Type E-400 (plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from the test surface) per ASTM E 795.
2. Test Method for Ceiling Attenuation Class (CAC): Where acoustical tile ceilings are specified to have a CAC, provide units identical to those tested per ASTM E 1414 by a qualified testing agency.

B. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical tiles are indicated by reference to ASTM E 1264 pattern designations and not to manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

C. Tile Characteristics: Comply with requirements indicated on each Acoustical Tile Ceiling Product Data Sheet at the end of this Section, including those referencing ASTM E 1264 classifications.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated.

1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

C. Attachment Devices: Size for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

1. Cast-In-Place and Postinstalled Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attachment of hangers of type indicated and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined by testing per ASTM E 488, conducted by a qualified testing agency.

c. Type: Cast-in-place anchors.
d. Type: Expansion anchors.
e. Corrosion Protection: Carbon steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).
f. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 alloy 304 or 316 for bolts; alloy 304 or 316 for anchor.

2. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attachment of hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung), will be less than the yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Hanger Rods: Mild steel, zinc coated, or protected with rust-inhibitive paint.

F. Flat Hangers: Mild steel, zinc coated, or protected with rust-inhibitive paint.

G. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide, formed with 0.0396-inch- (1-mm-) thick galvanized-steel sheet complying with ASTM A 446, G 90 (ASTM A 446M, Z 275) Coating Designation, with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

H. Sheet-Metal Edge Moldings and Trim: Type and profile indicated, or if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical tile edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

I. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's product designations, complying with the following requirements:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of finish indicated and with not less than

the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for alloy and temper 6063-T5.

2. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.4 mil (0.010 mm) or thicker).
3. Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.4 mil (0.010 mm) or thicker).

    a. Color: Light bronze.
    b. Color: Medium bronze.
    c. Color: Dark bronze.
    d. Color: Black.

4. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel according to paint manufacturer's specifications for cleaning, conversion coating, and applying organic coating.

    a. Organic Coating: Manufacturer's standard thermosetting coating system with a minimum dry film thickness of 0.8 to 1.2 mil (0.0203 to 0.0305 mm).
    b. Color: As selected by Architect from manufacturer's standard colors.
    c. Color: Match color of finish on flanges of suspension system surfaces.
    d. Color: Match Architect's sample.

5. Available Manufacturers: Subject to compliance with requirements, manufacturers offering aluminum accessories that may be incorporated in the work include, but are not limited to, the following:

    a. Fry Reglet Corporation.
    b. Gordon, Inc.
    c. MM Systems, Inc.

2.4 NON-FIRE-RESISTANCE-RATED, CONCEALED SUSPENSION SYSTEMS

A. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with prepainted or electrolytic zinc-coated, cold-rolled steel sheet; other characteristics as follows:

1. Structural Classification: Intermediate-duty system.
2. Access: Upward, with initial access openings of size indicated below and located throughout the ceiling within each module formed by main runners and cross runners, with additional access available by progressively removing remaining acoustical tiles:
3. Access: Downward, with initial access openings of size indicated below and located throughout the ceiling within each module formed by main runners and cross runners, with additional access available by progressively removing remaining acoustical tiles:

    a. Initial Access Opening: In each module, 24 by 48 inches (610 by 1220 mm).

B. Indirect-Hung Suspension System: Main and cross runners roll formed from prepainted or electrolytic zinc-coated, cold-rolled steel sheet; other characteristics as follows:

1. Structural Classification: Intermediate-duty system.
2. Carrying Channels: Cold-rolled steel, 0.059850-inch (1.52-mm) minimum (uncoated) base metal thickness, 7/16-inch- (11.1-mm-) wide flanges by 1-1/2-inch- (38.1-mm-) deep steel channels, 475 lb per 1000 feet (0.707 kg/m), with rust-inhibitive paint finish.
3. Access: Where access is indicated, provide special cross runners or split splines to accommodate removal of acoustical units in indicated access areas. Identify access tile with manufacturer's standard unobtrusive markers for each access unit.

C. Available Products: Subject to compliance with requirements, suspension systems that may be incorporated in the work include, but are not limited to, the following:

1. Direct-Hung, Double-Web Suspension System:

    a. Prelude Concealed Tee System (w/7300 m.r.); Armstrong World Industries, Inc.
    b. 1200/211 Concealed Access System; Chicago Metallic Corporation.
    c. 211 Concealed Access System; Chicago Metallic Corporation.
    d. X Concealed Grid; USG Interiors, Inc.

2. Indirect-Hung Suspension System:

    a. Concealed Z System; (w/Z3920 m.r.); Armstrong World Industries, Inc.
    b. DD Concealed Grid; USG Interiors, Inc.

2.3 FIRE-RESISTANCE-RATED, CONCEALED SUSPENSION SYSTEMS

A. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with prepainted or electrolytic zinc-coated, cold-rolled steel sheet; other characteristics as follows:

1. Structural Classification: Intermediate-duty system.
2. Access: Upward, with initial access openings of size indicated or, if not indicated, as selected by Architect from opening sizes approved for the fire-resistance-rated assembly indicated. Locate initial access openings throughout the ceiling within each module formed by main runners and cross runners, and make additional access available through progressively removing remaining acoustical tiles.
3. Access: Downward, with initial access openings of size indicated or, if not indicated, as selected by Architect from opening sizes approved for the fire-resistance-rated assembly indicated. Locate initial access openings throughout the ceiling within each module formed by main runners and cross runners, and make additional access available through progressively removing remaining acoustical tiles.

B. Indirect-Hung, Snap-In Suspension System: Main and cross runners roll formed from electrolytic zinc-coated, cold-rolled steel sheet; other characteristics as follows:

1. Structural Classification: Heavy-duty system.
2. Carrying Channels: Cold-rolled steel, 0.059850-inch (1.52-mm) minimum (uncoated) base metal thickness, 7/16-inch- (11.1-mm-) wide flanges by 1-1/2-inch- (38.1-mm-) deep steel channels, 475 lb per 1000 feet (0.707 kg/m), with rust-inhibitive paint finish.
3. Access: Downward access system composed of main runners designed and fabricated to receive snap-in cross runners, with main runners connected to carrying channels that are attached by hangers to building structure, with units in any location removable by inserting a special hooked tool between tiles into a slot at the end of the cross runner and disengaging it from main runner.

C. Available Products: Subject to compliance with requirements, suspension systems that may be incorporated in the work include, but are not limited to, the following:

1. Direct-Hung, Double-Web Suspension System:

a. Prelude Concealed Tee System (w/8300 m.r.); Armstrong World Industries, Inc.
b. Fire Front 1250 Concealed Access System; Chicago Metallic Corporation.

c. Fire Front 250 Concealed Access System; Chicago Metallic Corporation.
d. DXL Concealed Grid; USG Interiors, Inc.

2. Indirect-Hung, Snap-In Suspension System:

a. Accessible Tile System (ATS)(w/B975 m.r.); Armstrong World Industries, Inc.

2.4 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
2. Product has flame-spread and smoke-developed ratings of less than 25 per ASTM E 84.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

C. Available Products: Subject to compliance with requirements, acoustical sealants that may be incorporated in the work include, but are not limited to, the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
b. SHEETROCK Acoustical Sealant; United States Gypsum Company.

2. Acoustical Sealant for Concealed Joints:

a. BA-98; Pecora Corp.
b. Tremco Acoustical Sealant; Tremco, Inc.

2.5 MISCELLANEOUS MATERIALS

A. Tile Adhesive: Type as recommended by tile manufacturer, bearing UL label for Class 0-25 flame spread.

B. Staples: 5/16-inch- (7.94-mm-) long, divergent point staples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other Sections.

1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordinating other work.

B. Testing Substrates: Before installing adhesively applied tile on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

C. Measure each ceiling area and establish the layout of acoustical tile to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders, and conform to the layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical tile ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."

1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.

2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
3. CISCA Recommendations for Acoustical Ceilings: Comply with CISCA "Recommendations for Direct-Hung Acoustical Tile and Lay-In Panel Ceilings."
4. CISCA Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies."
5. U.B.C. Standard for Ceiling Suspension Systems: U.B.C. Standard No. 47-18.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Splay hangers only where required, and if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
7. Secure bracing wires to ceiling suspension members and to supports with a minimum of 4 tight turns. Fasten bracing wires to concrete with cast-in-place or postinstalled anchors.

8. Do not support ceilings directly from permanent metal forms. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
9. Do not attach hangers to steel deck tabs.
10. Do not attach hangers to steel roof deck. Attach hangers to structural members.
11. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches (200 mm) from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not over 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.18 mm in 3.66 m). Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Arrange directionally patterned acoustical tiles as follows:

1. In the manner indicated on reflected ceiling plans.
2. Install tiles with pattern running in one direction parallel to long axis of space.
3. Install tiles with pattern running in one direction parallel to short axis of space.
4. Install tiles in a basket-weave pattern.

F. Install acoustical tiles in coordination with suspension system. Place splines or suspension system flanges into kerfed edges so that tile-to-tile joints are closed by double lap of material.

1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced at 12 inches (305 mm) o.c.
3. Fabricate access units for special suspension system access members and tile units modified as required to allow for removal of access units.

4. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

G. Adhesive Installation: Install acoustical tile by cementing to substrate, using amount of adhesive and procedure recommended by tile manufacturer and as follows:

1. Remove loose dust from backs of tiles by brushing and then priming them with a thin coat of adhesive.
2. Install splines in joints between tiles; maintain level of the bottom surface of tiles to a tolerance of 1/8 inch in 12 feet (3.18 mm in 3.66 m) and not exceeding 1/4 inch (6.35 mm) cumulatively.
3. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.

H. Stapled Installation: Fasten acoustical tile to substrate using a minimum of 2 staples per tile that are installed in flanges of tile and as follows:

1. Form double-lapped joint between tiles by securely pressing tile tongues into corresponding tile grooves.
2. Maintain level of the bottom surface of tiles to a tolerance of 1/8 inch in 12 feet (3.18 mm in 3.66 m) and not exceeding 1/4 inch (6.35 mm) cumulatively. Shim tile or correct substrate as required to maintain tolerance.
3. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.

3.4 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09512

SECTION 09660 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Vinyl composition floor tile.

B. Resilient wall base, reducer strips, and other accessories installed with resilient floor tiles are specified in Division 9 Section "Resilient Wall Base and Accessories."

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

1. Certification by tile manufacturer that products supplied for tile installation comply with local regulations controlling use of volatile organic compounds (VOC's).

C. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors and patterns available for each type of resilient floor tile indicated.

D. Product certificates, in lieu of laboratory test reports when permitted by Contracting Officer and/or Project Manager, signed by manufacturer certifying that each product complies with requirements.

E. Maintenance data for resilient floor tile, to include in Operating and Maintenance Manual specified in Division 1.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Floor Tile: Obtain each type, color, and pattern of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the work.

B. Fire Performance Characteristics: Provide resilient floor tile with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 watts per sq cm or more per ASTM E 648.
2. Smoke Density: Less than 450 per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver tiles and installation accessories to project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, project identification, and shipping and handling instructions.

B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).

C. Store tiles on flat surfaces. Move tiles and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.6 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).

B. Do not install tiles until they are at the same temperature as the space where they are to be installed.

C. Close spaces to traffic during tile installation.

1.7 SEQUENCING AND SCHEDULING

A. Install tiles and accessories after other finishing operations, including painting, have been completed.

B. Do not install tiles over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

1.8 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

1. Furnish not less than one box for each 50 boxes or fraction thereof, of each class, wearing surface, color, pattern and size of resilient floor tile installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, resilient floor tiles that may be incorporated in the work include, but are not limited to, the products specified in each Product Data Sheet at end of this Section.

2.2 RESILIENT TILE

A. Vinyl Composition Floor Tile: Products complying with ASTM F 1066, Composition 1 (nonasbestos formulated), and with requirements specified in Vinyl Composition Floor Tile Product Data Sheet at end of this Section.

2.3 INSTALLATION ACCESSORIES

A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.

B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.

C. Adhesives (Cements): Water-resistant type recommended by tile manufacturer to suit resilient floor tile products and substrate conditions indicated.

D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine areas where installation of tiles will occur, with Installer present, to verify that substrates and conditions are satisfactory for tile installation and comply with tile manufacturer's requirements and those specified in this Section.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
2. Finishes of subfloors comply with tolerances and other requirements specified in Division 3 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive tile.

B. Use trowelable leveling and patching compounds per tile manufacturer's directions to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

D. Broom or vacuum clean substrates to be covered by tiles immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.3 INSTALLATION

A. General: Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in project.

B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.

C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction.

D. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

E. Extend tiles into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

G. Install tiles on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly adhere edges to perimeter of floor around covers and to covers.

H. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.

I. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.

J. Hand roll tiles where required by tile manufacturer.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing tile installation:

1. Remove visible adhesive and other surface blemishes using cleaner recommended by tile manufacturers.
2. Sweep or vacuum floor thoroughly.
3. Do not wash floor until after time period recommended by resilient floor tile manufacturer.
4. Damp-mop tile to remove black marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile manufacturer.

1. Apply protective floor polish to tile surfaces that are free from soil, visible adhesive, and surface blemishes.

    a. Use commercially available, metal, cross-linked acrylic product acceptable to tile manufacturer.
    b. Coordinate selection of floor polish with Owner's maintenance service.

2. Cover tiles with undyed, untreated building paper until inspection for Substantial Completion.
3. Do not move heavy and sharp objects directly over tiles. Place plywood or hardboard panels over tiles and under objects while they are being moved. Slide or roll objects over panels without moving panels.

C. Clean tiles not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of project. Clean tiles using method recommended by manufacturer.

1. Strip protective floor polish that was applied after completing installation prior to cleaning.
2. Reapply floor polish after cleaning.

END OF SECTION 09660

SECTION 09670 - SEAMLESS FLOORING

PART 1 GENERAL

1.01 SCOPE

A. Provide all labor and materials for a seamless, decorative, epoxy flooring material, including all surface preparation, primers, and finish coats.
B. Related work specified elsewhere:
   1. Concrete - Division 3
   2. Thermal & Moisture Protection - Division 7

1.02 ACCEPTABLE MANUFACTURERS AND INSTALLER

A. DUR-A-FLEX, Inc. (Design Basis).
B. General Polymers Corp.
C. Chem-Coat Industries, Inc.
D. Installer, who has technical qualifications, currently certified in writing, and facilities to install specified systems.

1.03 DELIVERY AND STORAGE

A. Material shall be delivered to job-site in clean, clearly labeled containers and inspected by installer prior to start of job.
B. Material shall be stored in a dry, enclosed area protected from the elements. Temperature of storage area shall be kept between 60º and 90ºF.

1.04 ENVIRONMENTAL REQUIREMENTS

A. New concrete shall be cured no less than 28 days under good conditions. Concrete sub-floors on or below grade shall be properly equipped with vapor barriers and perimeter drains.
B. Adequate utilities, including electric, water, heat (between 60º and 90ºF) and lighting of no less than 80 ft. candles measured at floor surface to be supplied by Owner/General Contractor.
C. Work area shall be free of other trades during, and for a period of 24 hours, after floor installation.
D. Protection of finished floor from damage by subsequent trades is the responsibility of General Contractor.

1.05 WARRANTY

A. Contractor to submit a [one] year warranty against defects in material and workmanship upon completion of installation.

PART 2 PRODUCTS

2.01 PRODUCT DESCRIPTION

A. 1/8" DUR-A-QUARTZ multiple-component, decorative, institutional flooring system, by DUR-A-FLEX, Inc. (Design basis)

2.02 PHYSICAL PROPERTIES

DUR-A-QUARTZ "BM" EPOXY FLOORING PHYSICAL PROPERTIES		
Mix Ratio (Dur-A-Glaze #4)	1 part hardener, 2 parts resin	
Pot Life	Approximately 22 minutes at 70°F**	
Hardness, Shore D	ASTM D-2240	75 - 80
Compressive Strength	ASTM D-695	17,500 psi
Tensile Strength	ASTM F-638	4,000 psi
Tensile Elongation	ASTM F-638	7.50%
Flexural Strength	ASTM D-790	6,250 psi
Linear Shrinkage	ASTM D-2566	0.02%
Coefficient of Linear Expansion	12°F to 140°F	
in./in./degrees F	ASTM D-696	20 x 10*
Bond Strength to Concrete	ACI - 403	335 psi, concrete fails
Shear from Steel Plate	MIL D-3134	1,050 psi
Indentation	MIL D-3134	25
Impact Resistance	MIL D-3134	No cracking or delamination
Elevated Temperature	MIL D-3134	No slip or flow
Water Absorption	ASTM D-570	0.04%
Electrical Conductivity	Non-conductive	
Flammability	ASTM D-635	Self-extinguishing
Abrasion Resistance Taber Abrader CS-17 wheels, 2000 gm. Load, 1000 cycles	avg. 24.0 mg. loss	
Toxicity	non-toxic, USDA approved	

2.2 PRODUCT PACKAGING

A. All materials used shall be precision mixed on site with manufacturer supplied mix and measure apparatus to ensure a timely, accurate mix ratio and minimize waste.

PART 3 EXECUTION

3.01 PREPARATION

A. Concrete preparation to include use of a solution of muriatic acid to create a profiled substrate, combined with "dust-free" diamond grinding for all edges and areas.
See "Preparation/Application Details" Showcase for details on specific substrates.

3.02 PRODUCT INSTALLATION

A. Floor installation shall strictly adhere to manufacturer's current written instructions.
B. Apply 16 mil flood coat of DUR-A-GLAZE #4 with a notched squeegee and back-roll with a quality non-shed roller.
C. Broadcast Q-28 Colored Quartz to excess, and allow to cure.
D. Sweep up excess Colored Quartz.
E. Repeat steps B & C.
F. All garbage and debris shall be properly disposed of.

3.03 DETAILS

A. Moving cracks and joints shall be thoroughly routed and vacuumed clean, then filled with DUR-A-FILLER #2.
B. Surface deviations to be pre-patched with patching compound comprised of DUR-A-GLAZE #4 and No-Sag #2 or Q28 Quartz.
C. A 4" or 6" integral cove base to be installed at perimeter walls.
D. Prime surface with Elast-O-Coat membrane as per manufacturer's recommendation.

END OF SECTION

SECTION 09678 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. Extent of resilient tile base and accessories, including locations and details, are indicated on drawings and in schedules.

B. Resilient tile flooring is specified elsewhere in a Division-9 Section.

C. Conductive resilient flooring is specified elsewhere in a Division-9 Section.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and installation instructions for each type of resilient base and installation accessory required. Include methods of installation for each type of substrate.

1. Submit written data on physical characteristics, durability, resistance to fading and flame resistance characteristics.

B. Maintenance Data: Include data in Maintenance Manual specified in Division-1.

C. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated traffic and use conditions. Include precautions against materials and methods which mat be detrimental to finishes and performance.

D. Shop Drawings: Submit shop drawings showing location and extent of resilient base. Indicate columns, doorways, partitions, built-in cabinets, and stairs. Show installation details at special conditions.

E. Samples for Initial Selection Purposes: Submit manufacturer's standard sample sets in form of pieces cut from actual resilient base sections and showing full range of standard colors and patterns available for each type of resilient base indicated.

F. Samples for Verification Purposes: Submit the following:

1. 12" samples of each type of resilient base specified.

G. Prepare samples from the same material to be used for the work.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm (material producer) with not less than 3 years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.

B. Single Source Responsibility: Provide resilient base produced by a single manufacturer for each type required, including adhesives.

1.5 TESTING

A. Test Reports: Submit certified test reports evidencing compliance with requirements for the following:

1. Fire performance characteristics.
2. Physical properties indicated.

B. Fire Performance Characteristics: Provide resilient base that is identical to that tested for the following fire performance requirements, according to test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

1. Surface Burning Characteristics: As follows:

a. Flame Spread: Not more than 25.
b. Test Method: ASTM E 84.

2. Critical Radiant Flux: As follows:

a. Rating: Not less than 0.45 Watts per sq. centimeter.

b. Test Method: ASTM E 648.

3. Smoke Density from Burning or Decomposition of Plastic: As follows:

a. Rating: Not more than 62.5 percent.
b. Test Method: ASTM D 2843.

4. Optical Smoke Density: As follows:

a. Rating: Not more than 450.
b. Test Method: ASTM E 662.

C. Physical Properties: Provide resilient base that is identical to that tested for the following physical properties, according to the test method indicated.

D. Certification: Submit manufacturer's certificate stating that materials furnished comply with specified requirements.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, pattern name, quality or grade, fire hazard classification, and lot number. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling.

B. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

C. Maintain storage area at 55 deg F (13 deg C) and under 50 percent relative humidity.

1.7 PROJECT CONDITIONS

A. Maintain minimum temperature of 65 deg F (18 deg C) and maximum 85 deg F (30 deg C) in spaces to receive resilient base for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Maintain minimum temperature of 55 deg F (13 deg C) where work is complete.

1.8 SEQUENCING AND SCHEDULING:

A. Sequence resilient base installation with other work to minimize possibility of damage and soiling during remainder of construction period.

1.9 WARRANTY

A. Manufacturer's Limited Warranty.

1.10 MAINTENANCE

A. Replacement Materials: After completion of work, deliver not less than 2% of each type, color, and pattern of resilient base, exclusive of material required to properly complete installation. Furnish accessory components as required. Furnish replacement materials from same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated into the work include:

1. Manufacturers of Vinyl Wall Base:

a. Armstrong World Industries, Inc.
b. Azrock Floor Products Division, Azrock Industries, Inc.
c. Johnson Rubber Co., Inc.
d. Kentile Floors, Inc.
e. Vinyl Plastics, Inc.

2.2 WALL BASE

A. General - Flexible ribbed-back straight and preformed or molded corner units with factory-cut ends.

B. Material Composition - Provide wall base which complies with:

1. FS SS-W-40 Type II (vinyl)
2. Height: 6".
3. Style: Cove (standard 5/8" toe).
4. Thickness: .080".

5. Finish: Standard.

2.3 FINISHES

A. Provide materials in colors and patterns (if applicable) as selected by Architect from manufacturer's standard colors and patterns.

B. Provide materials in colors and patterns (if applicable) as specified by Architect for custom ground, color and pattern imprint materials.

C. Installation Accessories:

1. Wall Base Adhesive: Waterproof bonding, quick setting to permit positioning before full bond; to suit material and substrate conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for resilient base and accessories to determine if they are free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Notify Architect/Designer in writing of all conditions detrimental to proper completion of the work. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install resilient accessories after other finishing operations, including painting and installation of flooring materials, have been completed.

B. Install resilient accessories using methods indicated in strict compliance with manufacturer's printed instructions. Do not place seam joints in traffic areas.

C. Tightly cement resilient accessories to subbase without open cracks, voids, raising or puckering at joints, telegraphing of adhesive or other surface

imperfections.

D. Apply wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

F. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

G. Apply resilient accessories to stairs as indicated and in strict accordance with manufacturer's installation instructions.

3.3 CLEANING

A. Remove any excess adhesive or other blemishes using cleaner recommended by resilient accessory manufacturer.

B. Remove surplus materials, rubbish and debris resulting from resilient accessory installation upon completion of the work; leave areas of installation in neat, clean condition.

3.4 PROTECTION

A. Advise contractor of protection needed to ensure that resilient accessories will be without damage or deterioration at time of substantial completion.

END OF SECTION 09678

SECTION 09680 - CARPET

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes carpet, carpet cushion, and installation.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 9 Sections "Resilient the Flooring for materials, abutting carpet.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of carpet material, carpet cushion, and installation accessory required. Submit written data on physical characteristics, durability, fade resistance, and flame resistance characteristics.

C. Shop drawings showing layout and seaming diagrams. Indicate pile or pattern direction and locations and types of edge strips. Indicate columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet. Show installation details at special conditions.

D. Samples for verification purposes in manufacturer's standard size, showing full range color, texture, and pattern variations expected. Prepare samples from the same material to be used for the work. Submit the following:

1. 12-inch- square samples of each type of carpet material required.
2. 6-inch-square samples of each type of carpet cushion.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firm whose carpet materials comply with the "Use of Materials Bulletin UM-44C" published by U.S. Department of Housing and Urban Development (HUD) and are currently listed in HUD 's "Certified Products Directory" and so identified by imprint on back of carpet.

B. Carpet Surface Burning Characteristics: Provide carpet identical to that tested for the following fire performance characteristics, per test method indicated below, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify carpet with appropriate markings of applicable testing and inspecting agency.

1. Testing Method: DOC FF 1-70.
2. Rating: Pass.

C. Cushion Surface Burning Characteristics: Provide carpet cushion identical to that tested for the following fire performance characteristics, per test method indicated below by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify carpet cushion with appropriate markings of applicable testing and inspecting organization.

1. Testing Method: DOC FF 1-70.
2. Rating: Pass.
3. Testing Method: ASTM E 84.
4. Flame Spread: 25 or less.
5. Smoke Developed: 450 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.

B. Store materials on-site in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity. Lay flat, blocked off ground. Maintain minimum temperature of 68 deg F (20 deg C) at least three days prior to and during installation in area where materials are stored.

1.6 PROJECT CONDITIONS

A. Substrate Conditions: No condensation within 48 hours on underside of 4-foot polyethylene sheet, fully taped at perimeter to substrate.

B. Substrate Conditions: pH of 9 or less when substrate wetted with potable water and pHydrion paper applied.

1.7 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnished extra materials matching products installed as described below, packaged with protective covering for storage, and identified with labels describing contents.

1. Carpet: Before installation begins, furnish quantity of full-width for each type of material equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 CARPET

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Carpet Cushion:

a. Ludlow Carpet Cushion.
b. Olin Corp., Omalon Carpet Foundation
c. Uniroyal, Inc.

2. Detail Carpet: Carpet shall be 26 oz. Yarn weight per square yard with the following dimensions.

Style Name	To be selected by Architect.
Style Number	To be selected by Architect
Tufted Yarn Weight	260z.
Dye Method	100% Solution Dyed.
Construction	Tufted Textured Loop Pile
Fiber	100% Nylon
Tufted Pile Height	187 in.
Finished Pile Thickness	159 in.
Stitches Per Inches	11.25
Gauge	1/10
Primary Backing	Polypropylene
Secondary Backing	Polypropylene
Total Weight	63.5 oz.
Density	5886 oz.

Weight Density	153
NBS Smoke Density	
Chamber Flaming	Less than 450
Electrostatic Propensity	Permanent Static Control
Width	12 ft.
Wear Warranty	Ten Year Commercial Life Time Edge Ravel & Zippering

- Product specifications are derived from averages, resulting from normal manufacturing tolerances in yarn, fiber, temperature, humidity, and color, and may vary within normal industry tolerance. Performance is not affected by such variances.

2.2 INSTALLATION ACCESSORIES

A. Carpet Edge Guard: Extruded or molded heavy-duty vinyl or rubber of size and profile indicated; minimum 2-inch-wide anchorage flange; manufacturer's standard colors.

B. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

C. Carpet Adhesive: Water-resistant and nonstaining as recommended by carpet manufacturer to comply with flammability requirements for installed carpet.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clear away debris and scrape up cementitious deposits from concrete surfaces to receive carpet; apply sealer to prevent dusting.

B. Patch holes and level to a smooth surface. Seal powdery or porous surfaces with sealer recommended by carpet manufacturer.

3.2 INSTALLATION

A. Comply with carpet manufacturer's recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under door in closed position; do not place seams perpendicular to doorframe, in direction of traffic through doorway. Do not bridge building expansion joints with continuous carpet.

B. Extend carpets under removable flanges and furnishings and into alcoves and closets of each space.

C. Provide cutouts where required, and bind cut edges where not concealed by protective edge guards or overlapping flanges.

D. Install carpets edge guard where edge of carpet is exposed; anchor guards to substrate.

E. Install with pattern parallels to walls and borders.

F. Install carpet by trimming edges, butting cuts with seaming cement, and taping and/or sewing seams to provide sufficient strength for stretching and continued stresses during life of carpet.

G. Fit sections of carpet prior to application of adhesive. Trim edges and butts cuts with seaming cement.

H. Apply adhesive uniformly to substrate in accordance with manufacturer's instructions. Butts edges tight to form seams without gaps. Roll entire area lightly to eliminated air pockets and ensure uniform bond.

3.3 CLEANING

A. Remove adhesive from carpet surface with manufacturer's recommended cleaning agent.

B. Remove and dispose of debris and unusable scrapes. Vacuum with commercial machine with face-beater element. Remove soil. Replace carpet where soil cannot be removed. Remove protruding face yarn.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, to ensure carpet is not damaged or deteriorated at the time of Substantial Completion.

END OF SECTION 09680

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes surface preparation and field painting of the following:

1. Exposed exterior items and surfaces.
2. Exposed interior items and surfaces.
3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

a. Elevator entrance doors and frames.
b. Elevator equipment.
c. Finished mechanical and electrical equipment.
d. Light fixtures.
e. Distribution cabinets.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Foundation spaces.
b. Furred areas.
c. Ceiling plenums.
d. Pipe spaces.
e. Duct shafts.
f. Elevator shafts (Interior)).

3. Finished metal surfaces include the following:

a. Anodized aluminum.
b. Stainless steel.

4. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.
b. Linkages.
c. Sensing devices.
d. Motor and fan shafts.

5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:

1. Division 2 Section "Hot-Mix Asphalt Paving" for traffic-marking paint.
2. Division 5 Section "Structural Steel" for shop priming structural steel.
3. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
4. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
5. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.
6. Divisions 15 and 16: Painting of mechanical and electrical work is specified in Divisions 15 and 16, respectively.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.

3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.

1. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
2. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.

C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.

1. Quantity: Furnish the Owner with extra paint materials in the quantities indicated below:

a. Exterior, Flat Acrylic Paint: One case of each color applied.
b. Exterior, Semigloss Acrylic Enamel: 2 gal. (7.57 L) of each color applied.
c. Exterior, Full-Gloss Alkyd Enamel: 2 gal. (7.57 L) of each color applied.
d. Interior, Flat Acrylic Paint: One case of each color applied.
e. Interior, Semigloss Acrylic Enamel: 2 gal. (7.57 L) of each color applied.

2. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. (3.785 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, products listed in the paint schedules.

B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:

1. Duron.
2. Ralph Lauren

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated

under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide color selections made by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted.

If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
    b. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

    a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer.

After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.

c. When transparent finish is required, backprime with spar varnish.

4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

6. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
7. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
8. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

G. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

H. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

I. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:

1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the project will be taken, identified, sealed, and certified in the presence of the Contractor.
2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:

a. Quantitative material analysis.
b. Abrasion resistance.

c. Apparent reflectivity.
d. Flexibility.
e. Washability.
f. Absorption.
g. Accelerated weathering.
h. Dry opacity.
i. Accelerated yellowness.
j. Recoating.
k. Skinning.
l. Color retention.
m. Alkali and mildew resistance.

3. The Owner may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Contracting Officer and/or Project Manager.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

A. Concrete, and Masonry (Other than Concrete Masonry Units): Provide the following finish systems over exterior concrete, stucco, and brick masonry surfaces:

1. Flat Acrylic Finish: 2 finish coats over a primer.

a. Primer: Alkali-resistant, exterior, acrylic-latex primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).

1) P & L: Primer not required over this substrate.

b. First and Second Coats: Flat, exterior, acrylic-emulsion paint applied at spreading rate recommended by the manufacturer

to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).

1) P & L: Z/F 1900 Series Vapex Flat House Paint.

B. Wood Trim: Provide the following finish systems over exterior wood trim:

1. Medium-Shade, Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.

a. Primer: Exterior, acrylic-latex primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).

1) P & L: S/D 1002 Suprime "2" Exterior Latex Wood Primer.

b. First and Second Coats: Semigloss, waterborne, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).

1) P & L: Z/F 3100 Series Aqua Royal Latex House & Trim Finish.

2. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a rust-inhibitive primer.

a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).

1) P & L: S/D 1009 Suprime "9" Interior/Exterior Alkyd Metal Primer.

b. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) P & L: Z/F 3100 Series Aqua Royal Latex House & Trim Finish.

D. Aluminum: Provide the following finish systems over exterior aluminum surfaces:

1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.

a. Primer: Rust-inhibitive, acrylic- or alkyd-based, metal primer, as recommended by the manufacturer for use over aluminum, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).

1) P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.

b. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) P & L: Z/F 3100 Series Aqua Royal Latex House & Trim Finish.

3.8 INTERIOR PAINT SCHEDULE

A. Concrete and Masonry (Other than Concrete Masonry Units): Provide the following paint systems over interior concrete and brick masonry surfaces:

1. Odorless, Flat Alkyd Finish: 2 finish coats over a primer.

   a. Primer: Alkali-resistant, latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.1 mils (0.028 mm).

      1) P & L: Z/F 1004 Suprime "4" Interior Latex Wall Primer.

   b. First and Second Coats: Odorless, flat, alkyd, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3.0 mils (0.076 mm).

      1) P & L: S/D 6700 Series Lyt-All Flowing Flat.

B. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block units:

   1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a block filler.

      a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils (0.13 mm).

         1) P & L: Z 98 Pro-Hide Plus Latex Block Filler.

      b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

         1) P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.

C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

   1. Flat Acrylic Finish: 2 finish coats over a primer.

      a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) P & L: Z/F 1004 Suprime "4" Interior Latex Wall Primer.

b. First and Second Coats: Flat, acrylic-latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).

1) P & L: Z/F 2000 Series Vapex Latex Flat Wall Finish.

2. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.

a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) P & L: Z/F 1001 Suprime "1" 100 Percent Acrylic Multi-Purpose Primer.

b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.

C. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Flat Acrylic Finish: 2 finish coats over a primer.

a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).

1) P & L: S 4551 Tech-Gard High Performance Rust Inhibitor Primer.

b. First and Second Coats: Flat, acrylic-latex, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).

1) P & L: Z/F 4600 Series Accolade Interior Flat Enamel.

2. Semigloss, Acrylic-Enamel Finish: One finish coat over an enamel undercoater and a primer.

a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).

1) P & L: S 4551 Tech-Gard High Performance Rust Inhibitor Primer.

b. Undercoat: Alkyd, interior enamel undercoat or semigloss, acrylic-latex, interior enamel, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).

1) P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.

c. Finish Coat: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).

1) P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.

END OF SECTION 09900

SECTION 10155 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes toilet compartments and screens as follows:

1. Type: Solid-plastic, phenolic core.
2. Compartment Style: Overhead braced and floor anchored.
3. Screen Style: Wall hung.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for supports that attach units to overhead structural system.
2. Division 10 "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.

B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.

C. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

1. Ampco Products, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Capitol Partitions, Inc.
4. General Partitions Mfg. Corp.
3. Santana Products, Inc.

2.2 MATERIALS

A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.

B. Solid-Plastic, Phenolic Core: Solid phenolic core with melamine facing on both sides, fused to substrate without visible glue line or seam. Provide units with eased edges and with minimum 3/4-inch- (19-mm-) thick doors and pilasters and minimum 1/2-inch- (13-mm-) thick panels and screens. Provide melamine color as follows:

1. Color: One color in each room as selected by Architect from manufacturer's full range of colors.

C. Stirrup Brackets: Manufacturer's standard ear or U-brackets for attaching panels and screens to walls and pilasters of the following material:

1. Material: Chrome-plated, nonferrous, cast zinc alloy (zamac) or clear-anodized aluminum.

D. Full-Height (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:

1. Material: Clear-anodized aluminum.

E. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating

hardware and accessories of the following material:

1. Material: Chrome-plated, nonferrous, cast zinc alloy (zamac) or clear-anodized aluminum.
2. Full length hinges

F. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile in manufacturer's standard finish.

G. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip in manufacturer's standard finish.

H. Anchorages and Fasteners: Manufacturer's heavy duty exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.

1. Provide internal reinforcement in metal units for compartment-mounted hardware, accessories, and grab bars, as indicated.

B. Solid-Plastic, Polymer-Resin Compartments and Screens: Provide aluminum heat-sink strips at exposed bottom edges of HDPE units to prevent burning.

C. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions.

Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

D. Wall-Hung Screens: Provide units in sizes indicated of same construction and finish as compartment panels, unless otherwise indicated.

2. Provide metal-faced screens with integral full-height flanges for attachment to wall.
3. Provide V-shaped, metal-faced screens with manufacturer's standard sound-deadening core material bonded to inner surface of face sheets. Provide metal top and bottom caps. Fabricate screens to form unit that is a maximum of 6 inches (150 mm) wide at wall and 1 inch (25 mm) wide at its protruding end. Provide complete with concealed anchoring devices for attachment to wall and

mechanical leveling adjustment.

E. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be handicapped accessible.

1. Hinges: Manufacturer's standard self-closing, continuous type that can be adjusted to hold door open at any angle up to 90 degrees.
2. Latch and Keeper: Recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
6. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.

1. Secure panels to walls and panels with not less than 2 stirrup brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.2 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10155

SECTION 10200 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Fixed metal wall louvers.
2. Wall vents (brick vents).

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
2. Division 8 Section "Standard Steel Doors and Frames" for louvers in hollow metal doors and frames.
3. Division 9 Section "Painting" for field painting louvers.
4. Division 15 Section "Metal Ductwork" for ductwork connected to metal wall louvers.

1.3 DEFINITIONS

A. Louver Terminology: Refer to Air Movement and Control Association (AMCA) 501 for definitions of terms for metal louvers not otherwise defined in this Section or in referenced standards.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate, and install exterior metal wall louvers to withstand the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; or permanent damage to fasteners and anchors.

1. Wind Load: Uniform pressure (velocity pressure) of 20 lbf per sq. ft. (960 Pa), acting inwards or outwards.
2. Wind Load: Uniform pressures (velocity pressures) indicated on drawings, acting inwards or outwards.
3. Normal thermal movement is defined as that resulting from the following maximum change (range) in ambient temperature. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

    a. Temperature Change (Range): 100 deg F (56 deg C).

B. Air-Performance, Water-Penetration, and Air-Leakage Ratings: Provide louvers complying with performance requirements indicated as demonstrated by testing manufacturer's stock units of height and width indicated. Test units according to AMCA 500.

1. Perform testing on unpainted, cleaned, degreased units.
2. Perform water-penetration testing on louvers without screens.
3. Equivalent Air-Performance Ratings: Louvers having less free area than that specified or having a lower free area velocity at the static pressure loss specified may be considered for the work provided their total air performance is equivalent to that specified. The burden of proof of equivalency is on the Contractor. For louvers to be considered equivalent, the product of their free area, for the size specified, and their free area velocity at the static pressure loss specified must be at least equal to the product of the specified free area and velocity. Also, their free area velocity at the static pressure loss specified must not result in water penetration of more than 0.01 oz. per sq. ft. (3.1 g/sq. m) of free area, and they must meet all other requirements.

C. Airborne Sound Transmission Loss: Provide acoustical louvers complying with airborne sound transmission loss ratings indicated, as demonstrated by testing manufacturer's stock units according to ASTM E 90.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Shop drawings of louver units and accessories.

Include plans, elevations, sections, and details showing profiles, angles, and spacing of louver blades; unit dimensions related to wall openings and construction; free areas for each size indicated; profiles of frames at jambs, heads, and sills; and anchorage details and locations.

1. For installed products indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.

D. Wiring diagrams detailing power, signal, and control systems, clearly differentiating between manufacturer-installed wiring and field-installed wiring.

E. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.

F. Product test reports evidencing compliance of units with performance requirements indicated.

G. Product certificates signed by louver manufacturers certifying that their products comply with the specified requirements and are licensed to bear the AMCA seal based on tests made according to AMCA 500 and complying with the AMCA Certified Ratings Program.

H. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain louvers and vents from one source and by a single manufacturer where alike in one or more respects regarding type, design, and factory-applied color finish.

B. Welding Standards: Comply with applicable provisions of D1.2 "Structural Welding Code--Aluminum," and D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

C. Engineer Qualifications: A professional engineer legally authorized to practice in the jurisdiction where the project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of louvers similar to this project in material, design, and extent and that have a record of successful in-service performance.

D. SMACNA Standard: Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.

E. UL and NEMA Compliance: Provide motors and related components for motor-operated adjustable louvers that are listed and labeled by UL and comply with applicable NEMA standards.

1.7 PROJECT CONDITIONS

A. Field Measurements: Check actual louver openings by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1. Where field measurements cannot be made without delaying the work, guarantee opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Louvers:

a. Airline Products Co.
b. Airstream Products Div., Penn Ventilator Co., Inc.
c. Greenheck Fan Corp.

2. Metal Wall Vents:

a. Airline Products Co.
b. Airolite Co.
c. Greenheck Fan Corp.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to produce required finish.

C. Galvanized-Steel Sheet: ASTM A 526 (ASTM A 526M) or ASTM A 527, G90 (ASTM A 527M, Z 275) zinc coating, mill phosphatized.

D. Fasteners: Of same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are corrosive or incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

E. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

F. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

G. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

2.3 FABRICATION, GENERAL

A. General: Fabricate louvers and vents to comply with requirements indicated for design, dimensions, materials, joinery, and performance.

B. Assemble louvers in shop to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Maintain equal louver blade spacing to produce uniform appearance.

E. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances of louvers, adjoining construction, and perimeter sealant joints.

F. Include supports, anchorages, and accessories required for complete assembly.

G. Provide vertical mullions of type and at spacings indicated but not more than recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less. At horizontal joints between louver units, provide horizontal mullions except where continuous vertical assemblies are indicated.

H. Provide sill extensions and loose sills made of same material as louvers where indicated or required for drainage to exterior and to prevent water penetrating to interior.

I. Join frame members to one another and to fixed louver blades as follows, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary:

1. With fillet welds, concealed from view; or mechanical fasteners; or a combination of these methods; as standard with louver manufacturer.

2.4 FIXED, EXTRUDED-ALUMINUM WALL LOUVERS

A. Horizontal, Drainable, Fixed-Blade Louvers: Extruded-aluminum frames and louver blades, designed to collect and drain water to exterior at sill by means of gutters in front edges of blades and channels in jambs and mullions, complying with the following requirements:

1. Louver Depth: 6 inches (150 mm), unless otherwise indicated.
2. Frame Thickness: 0.081 inch (2.06 mm), unless otherwise indicated.
3. Performance Requirements: As follows, determined by testing units 48 inches (1220 mm) wide by 48 inches (1220 mm) high per AMCA 500:

    a. Free Area: Not less than 7.50 sq. ft. (0.697 sq. m).
    b. Static Pressure Loss: Not more than 0.14 inch wg (35 Pa) at an airflow of 900 fpm (4.57 m/s) free area intake velocity.
    c. Water Penetration: Not more than 0.01 oz. per sq. ft. (3.1 g/sq. m) of free area at an airflow of 900 fpm (4.57 m/s) free area velocity when tested for 15 minutes.

4. AMCA Seal: Mark units with the AMCA Certified Ratings Seal.

2.5 FIXED, FORMED-METAL WALL LOUVERS

A. Horizontal, Drainable, Fixed-Blade Louvers: Frames and louver blades fabricated from metal of kind and in form indicated below, designed to collect and drain water to exterior at sill by means of gutters in front edges of blades and channels in jambs and mullions, complying with the following requirements:

1. Blade Metal and Thickness: Galvanized-steel sheet, 0.0635 inch (1.61 mm), unless otherwise indicated.
2. Frame Metal and Thickness: Same as louver blades, unless otherwise indicated.
3. Louver Depth: 4 inches (100 mm), unless otherwise indicated.
4. Blade Angle: 37 degrees, unless otherwise indicated.

5. Performance Requirements: As follows, determined by testing units 48 inches (1220 mm) wide by 48 inches (1220 mm) high per AMCA 500:

a. Free Area: Not less than 8.00 sq. ft. (0.743 sq. m).
b. Static Pressure Loss: Not more than 0.08 inch wg (20 Pa) at an airflow of 800 fpm (4.06 m/s) free area intake velocity.
c. Water Penetration: Not more than 0.01 oz. per sq. ft. (3.1 g/sq. m) of free area at an airflow of 850 fpm (4.32 m/s) free area velocity when tested for 15 minutes.

6. AMCA Seal: Mark units with the AMCA Certified Ratings Seal.

2.6 LOUVER SCREENS

A. General: Provide louvers with screens at locations indicated.

B. General: Provide each exterior louver with louver screens complying with the following requirements:

1. Screen Location for Adjustable Louvers: Exterior face, unless otherwise indicated.
2. Screening Type: Insect screening where indicated.

C. Secure screens to louver frames with stainless-steel machine screws, spaced 6 inches (150 mm) maximum from each corner and at 12 inches (300 mm) o.c. between.

D. Louver Screen Frames: Fabricate screen frames with mitered corners to louver sizes indicated and to comply with the following requirements:

1. Metal: Same kind and form of metal as indicated for louver frames to which screens are attached.

   a. Reinforce extruded-aluminum screen frames at corners with clips.

2. Finish: Same finish as louver frames to which louver screens are attached.

E. Louver Screening for Aluminum Louvers: Fit aluminum louver screen frames with screening covering louver openings and complying with the following requirements:

1. Insect Screening: 18-by-18 (1.4-by-1.4-mm) mesh formed with 0.009-inch- (0.23-mm-) diameter stainless-steel wire.

F. Louver Screening for Galvanized-Steel Louvers: Fit galvanized-steel louver screen frames with screening and complying with the following requirements:

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1. Insect Screening: 18-by-18 (1.4-by-1.4-mm) mesh formed with 0.009-inch- (0.23-mm-) diameter stainless-steel wire.

2.7 WALL VENTS (BRICK VENTS)

A. Extruded-Aluminum Wall Vents: Extruded-aluminum louvers and frames not less than 0.125 inch (3.18 mm) thick and assembled by welding; with 18-by-14 (1.4-by-1.8-mm) mesh aluminum insect screening on inside face; incorporating weepholes, continuous drip at sill, and integral waterstop on inside edge of sill; of load-bearing design and construction.

2.8 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Finish louvers after assembly.

2.9 ALUMINUM FINISHES

A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

B. Conversion-Coated and Factory-Primed Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below).

1. Organic Coating: Air-dried primer of not less than 2.0 mils (0.051 mm) dry film thickness.

C. Class II, Clear Anodic Finish: AA-M12C22A31] Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.4 mil (0.010 mm) or thicker] complying with AAMA 607.1.

D. Class I, Color Anodic Finish: AA-M12C22A42/A44 [Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.7 mil (0.018 mm) or thicker] complying with AAMA 606.1 or AAMA 608.1.

1. Color: Light bronze.

E. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 603.8 except with minimum dry film thickness of 1.5 mils (0.038 mm), medium gloss.
2. Color: As indicated by manufacturer's color designations.

F. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

a. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

2.10 GALVANIZED-STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants followed by a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas followed by an application of galvanizing repair paint to comply with ASTM A 780.

B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately following cleaning and pretreating.

C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat, with not less than a 1.0-mil (0.025-mm) dry film thickness for topcoat. Comply with paint manufacturer's instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils (0.051 mm).

1. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION

A. Locate and place louver units plumb, level, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items that cannot be refinished in the field to the shop, make required alterations, and refinish entire unit, or provide new units.

F. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses, where required to make louver joints weathertight. Comply with Division 7 Section "Joint Sealants" for sealants applied during installation of louver.

3.3 ADJUSTING AND PROTECTION

A. Protect louvers and vents from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of Substantial Completion.

B. Restore louvers and vents damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by Architect, remove damaged units and replace with new units.

1. Clean and touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

C. Test operation of adjustable wall louvers and adjust as needed to produce fully functioning units that comply with requirements.

3.4 CLEANING

A. Periodically clean exposed surfaces of louvers and vents that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Rinse surfaces thoroughly and dry.

END OF SECTION 10200

SECTION 10420 – METAL LOGO PLAQUES AND SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes prefabricated metal logo plaque custom made for Anacostia Senior High School logo design, and metal signs for rest rooms.

B. Related Sections:

1. Division 1- Color Design
2. Division 4- Masonry
3. Division 7 –Thermal and Moisture Protection
4. Division 7-Insulation

1.4 SUBMITTAL

A. See Section 01300 for submit requirements.

B. Submit samples of metals and manufacturer's specifications describing logo plaque and sign.

C. Submit shop drawings of actual logo plaque and signs.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plaque: Cast bronze, ASTM B584, plaque with Anacostia Senior High School logo design casted into face of plaque. Plaque shall have concealed corrosion-proof fastenings. Profile of plaque and edge design shall be as specified in Section 01800, Color Design. Furnish all necessary accessories and fasteners. Acceptable manufacturers: Lake Shore Industries, Champion Ornamental Castings, Inc., and Metal Arts.

B. Signs: Cast aluminum, manufacturer's standard design conforming to American Disabilities Act. Signs shall have two-inch high letters with brailled surfaces. Signs shall have concealed fastenings. Provide sign with letters "Boys Toilet" and sign it "Girls Toilet".

PART 3 - EXECUTION

3.1 INSTALLATION

A. Securely install signs and logo with concealed fastenings in accordance with manufacturer's instructions and approved shop drawings. Make preparation in masonry to receive built-in logo and accessories.

3.2 CLEANING

A. Clean and polish logo and signs.

END OF SECTION 10420

SECTION 10425 - SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following types of Signs:

1. Panel Signs.
2. Cast Metal Plaques.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 8 Section 0811-Standard Steel Doors and Frames.
2. Division 4 Section 4200-Unit Masonry.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.

C. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

1. Provide message list for each sign required, including large-scale details of wording and layout of lettering.
2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of work in other Sections.
3. Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
4. Furnish full-size rubbings for metal plaques.

D. Wiring diagrams from the manufacturer for illuminated sign units.

E. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for initial selection of color, pattern, and texture:

a. Cast Acrylic Sheet and Plastic Laminate: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.
b. Aluminum: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate, showing the full range of colors available.

1.4 QUALITY ASSURANCE

A. UL and NEMA Compliance: Provide lighting fixtures and electrical components for illuminated signs that are labeled and listed by UL and comply with applicable NEMA standards.

B. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

C. Design Criteria: The drawings indicate sizes, profiles, and dimensional requirements of signs. Other signs with deviations from indicated dimensions and profiles may be considered, provided deviations do not change the design concept. The burden of proof of equality is on the proposer.

1.5 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the

following:

1. Manufacturers of Panel Signs:

   a. Andco Industries Corp.
   b. APCO Graphics, Inc.
   c. Architectural Graphics, Inc.
   d. Best Manufacturing Co.
   e. Mohawk Sign Systems.

2. Manufacturers of Cast Plaques:

   a. Best Manufacturing Co.
   b. Lake Shore Markers.
   c. Metal Arts, Division of L & H Manufacturing Co.
   d. The Southwell Company.

2.2 MATERIALS

A. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM D 790, a minimum allowable continuous service temperature of 176 deg F (80 deg C), and of the following general types:

   1. Transparent Sheet: Where sheet material is indicated as "clear," provide colorless sheet in matte finish, with light transmittance of 92 percent, when tested in accordance with the requirements of ASTM D 1003.
   2. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer's standards.

B. Plastic Laminate: Provide high-pressure plastic laminate engraving stock with face and core plies in contrasting colors, in finishes and color combinations indicated or, if not indicated, as selected from the manufacturer's standards.

C. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.

D. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.

E. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by the aluminum producer and finisher for the casting process used and for the use and finish indicated.

F. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

G. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 PANEL SIGNS

A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

B. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:

1. Edge Condition: Rounded.
2. Edge Color for Plastic Laminate: Edge color same as background.
3. Corner Condition: Corners rounded to radius indicated.

C. Framed Panel Signs: Fabricate frames to profile indicated; comply with the following requirements for materials and corner conditions:

1. Material: Injection molded ABS plastic.

a. The manufacturer has the option of using any material listed above.

2. Corner Condition: Corners rounded to radius indicated.
3. Laminated Sign Panels: Permanently laminate face panels to backing sheets of material and thickness indicated using the manufacturer's standard process.

D. Brackets: Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit sign panel construction and mounting conditions indicated. Factory-paint brackets in a color matching the background color of the sign panel.

E. Graphic Content and Style: Provide sign copy that complies with the requirements

indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.

F. Engraved Copy: Machine-engrave letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth. Use high-speed cutters mechanically linked to master templates in a pantographic system or equivalent process capable of producing characters of the style indicated with sharply formed edges.

1. Engraved Plastic Laminate: Engrave through the exposed face ply of the plastic laminate sheet to expose the contrasting core ply.
2. Engraved Metal: Fill engraved copy with enamel.
3. Engraved Opaque Acrylic Sheet: Fill engraved copy with enamel.
4. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with enamel. Apply opaque background color coating to the back face of acrylic sheet.

    a. Engrave the copy to produce a minimum indentation depth of 1/32 inch and a minimum stroke width of 1/4 inch.

5. Subsurface-Engraved Acrylic Sheet: Reverse-engrave the back face of clear acrylic sheet. Fill resulting copy with enamel. Apply opaque background color coating over enamel-filled copy.

D. Subsurface Copy: Apply copy to the back face of clear acrylic sheet forming the panel face by process indicated to produce precisely formed opaque images, free from rough edges.

1. Use reverse silk-screen process to print copy; overspray the copy with an opaque background color coating.
2. Use Dupont "Chromalin" heat and pressure-laminated photopolymer film system to form copy and background color.

    a. The manufacturer has the option of selecting either process indicated above.
    b. The manufacturer has the option of selecting either process indicated above, or using subsurface engraving process, as appropriate to the copy form and the economics of production.

3.5 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.

B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations

and applications recommendations.

C. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

1. Class II Clear Anodized Fine Satin Finish: AA-M31C21A31 (Mechanical Finish: Fine satin directional textured; Chemical Finish: Fine matte etched finish; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).
2. Class II Clear Anodized Medium Satin Finish: AA-M31C22A31 (Mechanical Finish: Fine satin directional textured; Chemical Finish: Medium matte etched finish; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).
3. Baked Enamel Finish: AA-M4xC12C42R1x (Mechanical Finish: Manufacturer's standard, other nondirectional textured; Chemical Finish: Chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.

a. Organic Coating: Thermosetting modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils, medium gloss.

1) Color: As indicated by reference to the manufacturer's standard color designations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.

1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:

1. Shim Plate Mounting: Provide concealed aluminum shim plates 1/8 inch thick, with predrilled and countersunk holes, at locations indicated and where other mounting methods are not practicable. Attach the plate with fasteners and anchors suitable for secure attachment to the substrate. Attach panel sign units to the plate using the method specified above.

C. Bracket-Mounted Units: Provide the manufacturer's standard brackets, fittings, and

hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer's directions.

D. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.

1. Flush Mounting: Mount letters with backs in contact with the wall surface.

3.2 CLEANING AND PROTECTION

A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 10425

SECTION 10505 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Athletic lockers, including the following:

a. Single-tier.
b. Double-tier.

2. Locker room benches.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section "Cast-in-Place Concrete" for concrete base.
2. Division 6 Section "Miscellaneous Carpentry" for wood furring and grounds.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: Manufacturer's printed data including materials, accessories, construction, finishes, assembly, and installation instructions for lockers and benches.

C. Shop Drawings: Layout and dimensions of metal lockers and benches. Indicate relationship to adjoining surfaces. Show locker elevations and details, fillers, trim, base, sloping tops, and accessories. Include locker numbering sequence. Indicate installation and anchorage requirements.

D. Samples for Initial Color Selection: Manufacturer's color charts showing a full range of available colors.

E. Maintenance Instructions: Instructions for cleaning lockers and for adjusting, repairing, and replacing locker doors and latching mechanisms.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain locker units and accessories from one manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.

B. Protect lockers from damage during delivery, handling, storage, and installation.

C. Deliver master keys, control keys, and combination control charts to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Lyon Metal Products Inc.
2. Penco Products.
3. Republic Storage Systems Co., Inc.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the products specified in each Metal Locker Product Data Sheet at the end of this Section.

2.2 MATERIALS

A. Steel Sheet: ASTM A 366 (ASTM A 366M), commercial-quality, stretcher-

leveled, cold-rolled carbon steel sheet, stretcher leveled, free of buckling, scale, and surface imperfections.

B. Expanded Metal: ASTM F 1267, 0.070-inch- (1.7-mm-) thick minimum, 3/4-inch (19-mm) mesh, flattened carbon steel with at least 70 percent open area.

C. Hot-Dip Zinc-Coated Steel Sheet: ASTM A 526 (ASTM A 526M), commercial-quality, zinc-coated, carbon-steel sheet, hot-dip galvanized according to ASTM A 525 (ASTM A 525M) with A 60 (ZF 180) or G 60 (Z 180) coating designation.

D. Stainless-Steel Sheet: ASTM A 167, Type 302 or 304, stretcher-levelled stainless-steel

sheet. Roller-apply texture to doors in manufacturer's standard pattern.

E. Fasteners: Heavy-duty zinc- or nickel-plated steel; slotless-type exposed bolt heads; self-locking nuts or lock washers for nuts on moving parts.

F. Equipment: Manufacturer's standard plated steel hooks or coat rods.

2.3 ATHLETIC LOCKERS

A. Body: Form tops and bottoms of 0.0598-inch (1.5-mm) minimum steel sheet.

1. Form backs of 0.0478-inch (1.2-mm) minimum steel sheet.
2. Form sides and intermediate partitions of 0.0598-inch (1.5-mm) minimum perforated steel sheet.

B. Frames: Form welded frames of 0.0598-inch (1.5-mm) minimum steel sheet channels or 0.1046-inch (2.6-mm) minimum steel angles.

1. Cross Frames: Form intermediate channel cross frames for double- or triple-tier lockers of 0.0598-inch (1.5-mm) minimum steel sheet.

C. Shelf: Form shelf for single-tier lockers of 0.0598-inch (1.5-mm) minimum perforated steel sheet.

D. Door: Form door of perforated steel sheet with flanged edges, 0.0598 inch (1.5 mm) minimum for multi-tier gym units and 0.0747 inch (1.9 mm) minimum for other units.

1. Reinforcing: Brace or reinforce inner face of doors over 15 inches (381 mm) wide.

E. Door: 0.070-inch (1.7-mm) expanded metal welded to 0.1046-inch (2.6-mm) minimum steel angle frame with manufacturer's standard steel sheet lock panel welded to each side of door.

1. Reinforcing: Brace inner face of 24-inch- (610-mm-) wide, expanded-mesh, and single-tier doors.

F. Hinges: Heavy-duty, 0.050-inch- (1.2-mm-) thick minimum steel, full-loop, 5- or 7-knuckle, tight pin, 2 inches (51 mm) high minimum. Weld to inside of frame and secure to door with not less than 2 factory-installed fasteners that are completely concealed and tamperproof when door is closed.

1. Provide at least 3 hinges for each door 42 inches (1067 mm) and higher and at least 2 hinges for each door less than 42 inches (1067 mm) high.

G. Provide perforated sides, intermediate partitions, and doors in manufacturer's standard configuration of the following shape:

1. Perforation Shape: Diamond.

H. Recessed Handle and Latch: Manufacturer's standard housing to form a recess for latch lifter and locking devices; nonprotruding latch lifter containing strike and eye for padlock; and automatic, prelocking, pry-resistant latch with latching action as follows:

1. Single-Tier Lockers: Not less than 3-point latching.
2. Double- Tier Lockers: Not less than 2-point latching.

I. Single-, Double-, and -Tier Locker Latching: Manufacturer's standard 3-point latch engaging frame at top, bottom, and jamb, with projecting turn handle having provisions for padlock.

J. Multiple-Tier Locker Latching: 1-point latch with lock slip for locking with padlock.

2.4 LOCKS

A. Fabricate lockers to receive the following locking devices:

1. Built-In, Combination Lock: Key-controlled, 3-number dialing combination lock, with combination change made automatically with a control key. Provide bolt operation as follows:

a. Bolt Operation: Automatically locking deadbolt.

2.5 LOCKER ACCESSORIES

A. Equipment: Furnish each locker with the following items, unless otherwise shown:

1. Single-, Double-, and -Tier Units: 1 double-prong ceiling hook, and not fewer than 2 single-prong wall hooks.
2. Lockers 18 Inches (457 mm) Deep or Greater: Provide coat rod in lieu of ceiling hook.

B. Number Plates: Manufacturer's standard etched, embossed, or stamped, nonferrous-metal number plates with numerals not less than 3/8 inch (9 mm) high. Number lockers in sequence indicated. Attach plates to each locker door, near top, centered, with at least 2 fasteners of same finish as number plate.

C. Continuous Metal Base: Steel sheet, channel or zee profiled for stiffness, fabricated in lengths as long as practicable to enclose base and base ends of lockers without

additional fastening devices.

1. Minimum Thickness: 0.0598 inch (1.5 mm).

D. Individually Sloping Tops: Manufacturer's standard 0.0239-inch (0.61-mm) minimum steel sheet sloped top.

E. Recess Trim: Manufacturer's standard 0.0478-inch (1.2-mm) minimum steel sheet trim with concealed fastening clips.

F. Filler Panels: 0.0478-inch (1.2-mm) minimum steel sheet, factory fabricated.

G. Finished End Panels: Manufacturer's standard 0.0239-inch (0.61-mm) minimum steel sheet end-finishing panels to conceal exposed ends of nonrecessed lockers.

2.6 LOCKER ROOM BENCHES

A. Bench Tops: Manufacturer's standard 1-piece units with laminated maple top approximately 9-1/2 inches (240 mm) wide by 1-1/4 inches (32 mm) thick. Round all corners, sand smooth, and apply manufacturer's standard transparent sealer coating.

B. Pedestals: Manufacturer's standard heavy duty steel pedestal supports. Furnish all fastenings and anchorages. Apply manufacturer's standard baked-enamel finish to pedestals.

1. Type: Manufacturer's standard heavy-duty pedestal with top flange and base, floor anchored.
2. Color: To match locker units.

2.7 FABRICATION

A. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch. Weld frame members together to form a rigid, 1-piece structure.

1. Form locker body panels, doors, shelves and accessories from 1-piece steel sheet unless otherwise indicated.
2. Preassemble lockers by welding all joints, seams, and connections. Grind exposed welds flush.

2.8 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Finish all steel surfaces and accessories, except prefinished stainless-steel and chrome-

plated surfaces.

C. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering prior to shipment.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within 1/2 of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and they are assembled or installed to minimize contrast.

2.9 STEEL SHEET FINISHES

A. Surface Preparation: Solvent-clean surfaces complying with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel complying with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling), and phosphatize surfaces.

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-enamel finish consisting of a thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve a minimum dry film thickness of 1.1 mils (0.028 mm) on doors, frames, and legs, and 0.7 mil (0.018 mm) elsewhere.

1. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

2.10 GALVANIZED-STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants followed by a conversion coating of type suited to organic coating applied over it. Clean welds, mechanical connections, and abraded areas and follow with an application of the galvanizing repair paint, specified below, to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-enamel finish consisting of a thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve a minimum dry film thickness of 1.1 mils (0.028 mm) on doors, frames, and legs, and 0.7 mil (0.018 mm) elsewhere.

1. Color and Gloss: As selected by Architect from manufacturer's standard choices for color and gloss.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install metal lockers complete with accessories according to manufacturer's recommendations. Install plumb, level, rigid, and flush.

B. Assemble knock-down lockers with standard fasteners according to manufacturer's recommendations with no exposed fasteners on door faces and face frames.

C. Connect together welded locker groups with standard fasteners according to manufacturer's recommendations, with no exposed fasteners on face frames.

D. Anchor lockers to floors and walls at intervals recommended by manufacturer but no greater than 36 inches (910 mm). Install anchors through back-up reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.

E. Install recess trim to recessed lockers using concealed fasteners. Provide hairline joints and concealed splice plates.

F. Install sloping top units to lockers using concealed fasteners. Provide hairline joints and concealed splice plates.

G. Install finished end panels to conceal exposed ends of nonrecessed lockers.

H. Install locker benches complying with manufacturer's instructions.

1. Uniformly space pedestals not more than 72 inches (1830 mm) apart. Securely fasten to bench top and anchor to floor.

3.2 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Clean interior and exposed exterior surfaces and polish stainless-steel and nonferrous metal surfaces.

C. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.

D. Touch up marred finishes, or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

PRODUCT DATA SHEET 1 – METAL LOCKER PRODUCT

A. Description: [ML#] Refer to manufacturer's literature.
B. Locker Classification: Athletic
C. Locker Material: Steel sheet, zinc-coated steel sheet, and stainless-steel sheet.
D. Locker Fabrication: Welded.
E. Locker Arrangement: Single –Tier and Double -Tier.
F. Door Style: Louvered vents, security vents, perforated vents, expanded metal, and Flush with concealed vents.
G. Hinges: Standard hinge.
H. Sides/Backs: Solid, perforated, expanded metal, and as required.
I. Shelf: Perforated.
J. Base: Continuous Base
K. Handle/Latch: Recessed.
L. Locking: Built in combination lock, dead bolt.
M. Color[s]: As selected by Contracting Officer and/or Project Managers from manufacturer's full range of colors.
N. Products: Provide from one of the following:

1. Republic Storage Systems, Inc.
   a. Heavy Duty Ventilated Lockers

2. Penco Products
   a. Invincible Athletic Lockers

3. Lyon Metal Protect
   a. Quiet II Lockers.

END OF SECTION 10505

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Fire extinguishers.
2. Fire extinguisher cabinets.
3. Fire extinguisher mounting brackets.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 4 Section "Masonry ".
2. Division 9 Section “Gypsum Wall”.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

C. Samples for initial selection purposes in the form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of cabinet finish indicated or exposed to view.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.

B. Coordination: Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated and provided by Owner under separate Contract.

C. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

D. FM-Listed Products: Fire extinguishers approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher with FM marking.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Ansul Fire Protection.
2. Badger-Powhatan.
3. Larsen's Manufacturing Co.

2.2 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.

B. Multipurpose Dry Chemical Type: UL-rated 1-A:10-B:C, 2-1/2-lb nominal capacity, in enameled steel container.

2.3 MOUNTING BRACKETS

A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.

1. Provide brackets for extinguishers not located in cabinets.
2. Provide brackets for extinguishers not located in cabinets and for those located in cabinets.

2.4 CABINETS

A. Construction: Manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

B. Fire-Rated Cabinets: UL listed with UL listing mark with fire-resistance rating of wall where it is installed.

C. Cabinet Type: Suitable for containing the following:

1. Fire extinguisher.

D. Cabinet Mounting: Suitable for the following mounting conditions:

1. Semirecessed: Cabinet box (tub) partially recessed in walls of shallow depth.

E. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.

1. Trimless: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet.

a. Provide recessed flange, of same material as box, attached to box to act as plaster stop.

2. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

a. Rolled-edge trim with 1-1/4-inch backbend depth.
b. Trim Metal: Enameled steel.

F. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

1. Enameled Steel: Manufacturer's standard finish, hollow steel door construction with tubular stiles and rails.

a. Acrylic: Textured.
b. Acrylic: Smooth.

2. Door Glazing: Fully tempered float glass complying with ASTM C 1048, Condition A, Type I, Quality q3, Kind FT, Class as follows:

a. Class 1 (clear).

G. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location.

1. Application Process: Silk screen.

H. Identify bracket-mounted extinguishers with FIRE EXTINGUISHER in red letter decals applied to wall surface. Use letter size, style, and location as selected by Contracting Officer and/or Project Manager.

I. Door Style: Manufacturer's standard design.

1. Full-Glass Panel: Float glass, 1/8 inch thick.
2. Duo Panel: Float glass, 1/8 inch thick.
3. Break Glass Panel: Float glass, 1/8 inch thick, with inside latch and lock.
4. Frameless Tempered Full-Glass Panel: Frosted, tempered float glass with polished edges and inside surface etched with lettering or design indicated.
5. Solid Panel: Full flush opaque panel of material indicated.

a. Silk-screen lettering or design.

6. Full-Acrylic Panel: Frameless, 1/2-inch-thick clear acrylic.
7. Bubble Type: One-piece molded clear plastic.

J. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.

2.5 FINISHES FOR CABINETS, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

2.6 STEEL CABINET FINISHES

A. Surface Preparation: Solvent-clean surfaces complying with SSPS-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5 (white metal blast cleaning) or SSPC-SP 8 (pickling).

B. Factory-Priming for Field-Painted Finish: Apply shop primer specified below immediately following surface preparation and pretreatment.

1. Shop Primer: Manufacturer's or fabricator's standard fast-curing, lead-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Baked-Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard two-coat baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils.

1. Color and Gloss: Manufacturer's standard color and gloss designations. Paint the following:

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine rough-in for hose vales, hose racks, and cabinets to verify locations of piping connections prior to cabinet installation.

B. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.

2. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
3. Fasten mounting brackets and cabinets to structure, square and plumb.

END OF SECTION 10522

SECTION 10800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

B. All work shall be performed by mechanics skilled in their respective trades in accordance with the best practices of the trade, and in accordance with the requirements of the materials manufactured.

C. Submit cuts for approval before ordering materials. Show installation details.

1.2 SUMMARY

A. This section includes toilet and bath accessory items as scheduled.
   1. Division 8 sections for glass and glazing
   2. Division 9 sections for accessories specified under ceramic tiles
   3. Toilet Compartments under division 10

B. Coordinate with division 4 sections for proper installation of surface mounted or recessed items of this sections.

1.3 SUBMITTALS

A. General: Submit the following according to Division 1 sections
B. Product Data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles mounting method, specified options, and finishes.
C. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toiulet accessory item provided for project.

1.4 QUALITY ASSURANCE

A. Inserts and Anchorage: Furnish accessory manufactures' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

1.5 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.6 WARRANTY

A. Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.

B. Warranty Period: 15 years from date of Substantial Completion.

1. The warranty period shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements og the Contract Documents.

1.7 MATERIALS

A. Where accessories are set with screws, provide the necessary inserts, screws and bolts as required to provide suitable anchorage. Use brass screws or bolts for securing concealed members and use oval head chromium plated screws and bolts where exposed.

PART 2 – PRODUCTS

A. ACCEPTABLE MANUFACTURERS

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories that may be incorporated in the work, include, but are not limited to the following:

A. Manufacturers: Parker, Bobrick, Miami Carey, Franklin Brass Florestone Parker & Co. Bradley is acceptable. Parker or Bobrick Catalogue numbers used as design basis.

1. Toilet Tissue Holder: Roll-in reserve dispenser: Fabricate of stainless steel for mounting indicated below, size to store and dispense either 4-1/2" diameter or 5" dia. Core tissue rolls, with reserve roll placed in service by automatic release or by action of manual release bar. Hinge front of unit with pivot hinge and secure with tumbler lockset. No. 1217 Metal Roller (Parker) or B-685 (Bobrick) (Design Basis).
   a. Mounting: Surface mounted.
   b. Single roll dispenser: Sized to accommodate core type tissue to 5" diameter roll.
   c. Fabrication: Spindleless, chrome – plated, steel construction with tension – spring delivery control; designed for surface mounting, self-locking device extends through core and prevents core removal until roll is empty.
2. Grab Bars: Stainless steel type: No. 10 (12", 24", 42") (Parker) (Design Basis). Mount with backing plate across studs to hold a minimum of 250 pounds for 5 minutes. Clearance: 1-1/2" clearance between wall surface and inside face of bar. Gripping surface to be smooth satin-

finish.

3. Paper towel dispenser: Surface Mounted Towel Dispensers: Fabricate of stainless steel with hinged front equipped with tumbler lockset. Provide pierced slots at sides as refill indicators. Capacity, not less than 300 C-fold or 400 multifold paper towels without special adapters.No. 694 (Parker), B-262 (Bobrick).
4. Waste receptacle-surface mounted: No. 603A (Parker) or B-279 (Bobrick).
5. Mirror: B165 (Bobrick), 18"x30" at 64x30 and locker rooms.
6. Surface mounted medicine cabinets 18"x30" Press Building.
7. Shower Receptors 36"x36", and H/C 60" X 42".
8. Shower Curtain- (Creative Healthcare Products, Inc.)
9. Coat Hooks: Metal wall mounted epoxy coated multiple coat hooks, installed and mounted at heights indicated.

B. MATERIALS, GENERAL

Stainless steel: ANSI Type 302/304, with polished No. 4 finish, 0.034" (22 gage) min. thickness

Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04" (20 gage) min.. Surface preparation and metal pretreatment as required for applied finish.

Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

Mirror Glass: Nominal 6.00 mm (0.23 ") thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering electroplated copper coating, and protective organic coating.

Stainless Steel Mirror Surfaces: Not less than 0.04" (20 gage) AISI Type 302/304 stainless steel sheet, stretcher-leveled with No. 8 polished mirror finish. Bond to ¼" minimum hardboard backing.

Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

Fasteners: Screws, bolts, and other devices of same material as accessory unit, or galvanized steel where concealed.

PART 3 – EXECUTION

3.1 A. INSTALLATION

1. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at height indicated.
2. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.
3. Install grab bars to withstand a downward load of at least 250lbf, complying with ASTM 446.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 10800

SECTION 11230 – EXTERIOR SCOREBOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the electric scoreboard complete with control unit and structural support system.

B. System Description:

1. Electrically controlled football scoreboard with features and accessories for track, and field events.
2. Control Unit: Microprocessor controlled, compatible with scoreboard and athletic events.

C. Related Sections:

1. Division 2 Earthwork
2. Division 3 Concrete Work
3. Division 7 Thermal & Moisture Protection
4. Division 9 Paint
5. Division 16 Electrical

1.3 SUBMITTALS

A. See Section 01300 for requirements.

B. Shop Drawings: Indicate layout, scoreboard features, materials, components, fasteners, equipment, finishes, method of installation and assembly, supplementary support or bracing, controls, and service rough-in.

C. Product Data: Provide data on scoreboard unit including color and finishes, control unit, accessories.

D. Samples: Submit two samples 12x12 inch in size illustrating panel finish and color.

E. Manufacturer's Installation Instructions: Indicate electrical system, support system, special procedures and perimeter conditions requiring special attention.

F. Manufacturer's Certificate: Certify that Products meet or exceed UL specified requirements.

1.4 OPERATION AND MAINTENANCE DATA

A. Operation and Maintenance Data: Include operating equipment, controls, accessories, service and maintenance schedules.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle product as required by manufacturer.

B. Wrap and crate finished components and assemblies at factory to prevent damage or marring of surfaces during shipping and handling.

C. Do not deliver materials or assemblies to site until installation spaces are ready to receive units.

1.8 FIELD MEASUREMENTS

A. Verify that scoreboard location and field measurements are as indicated on shop drawings and are as approved by Contracting Officer.

1.9 COORDINATION

A. Coordinate with concrete work and electrical service.

1.10 WARRANTY

A. Provide five years warranty.

B. Warranty: Include coverage of all scoreboard and control unit components.

PART 2 - PRODUCTS

2.1 MANUFACTURER AND PRODUCT

A. Novco Scoreboard Company Product: Model 7424-B or approved equal.

2.2 FOOTBALL SCOREBOARD WITH 1/10TH SECOND TRACK TIMER-MODEL 7424-B, AS MANUFACTURED BY NOVCO SCOREBOARD CO., OR APPROVED EQUAL

A. General: Scoreboard, UL Listed/CSA certified, remotely operated from one (1) control station. Scoreboard shall display minutes, seconds, 1/10th seconds, two (2) team scores, period, ball on, down, yards to go, ball possession, using low voltage 100% Solid State 2-Wire cable multiplex system, quartz crystal controlled.

B. Scoreboard: Size 10 feet long by 10 feet 6 inches high and 8 inches deep, constructed of aluminum.

1. Scoreboard Color: Green with 1" white outlines striping. Four (4) brackets provided for mounting.

C. Control (Center):

1. Model MPC-4 Microprocessor-based operator control with carrying case. ConstructED of gray highly break-resistant plastic, size 12"x12"x5". Includes remote hand held time switch, twenty-five (25) feet of cable with connectors, keyboard overlay.
2. Control Features: Bright traveling alpha-numeric dot matrix LED display, lithium cell battery backup to retain memory, self test mode, powder on-off switch, alternate time switch, internal beeper which acknowledges each entry, multiple scoreboard control capability.
3. Additional Features: Time of day display, time out timer with warning, interval horn, up-count auto stop/horn, 1/10th second's display during last minute. Control shall be designed and equipped to operate

manufacturer's scoreboards for baseball sports by interchange of keyboard overlay.

D. Delay of Game Timers: Provide delay of game timers MPC control shall be capable of operating delay of game timers at the same time as scoreboard(s).

E. Dimmer: Lamp intensity day-night dimmer activated from operator's control center keyboard.

F. Lamp Banks: 4x7 matrix, recessed individual aluminum reflectors, 15 watt frosted, 120-volt lamps, 24" high.

G. Timing bi-directional, UP or DOWN count. Any number of minutes or seconds can be directly set capacity 0:00-99:59. Timer displays $1/10^{th}$ seconds during the final minute of the period by shifting the numerals on the time display of the scoreboard to show seconds to the left of the colon and $1/10^{th}$ seconds to the right of the colon. Decimal lights instead of the colon when the $1/10^{th}$ seconds are fully displayed on the $1/10^{th}$ seconds lamp bank and there is no shifting of timer numerals. In place of displaying game time on the scoreboard, the "time out" time may be displayed or the "time of day". Time if day shall also be displayed on the scoreboard after the MPC control is unplugged.

H. Team Scores: Two (2) scores. Scores shall be designed to be selectively set to any number, capacity 0-99. Additive mode also provided.

I. Scoreboard Displays and Other Features:

1. Period: Registers 0-9.
2. Ball on: Registers 0-99.
3. Down: Registers 0-9.
4. Yards to go: Registers 0-99.
5. Ball Possession Indicators: Two (2) units shaped in the form of a football.
6. Horn: Loud solid state horn located in scoreboard. Sounds automatically at 0:00 for a minimum of two (2) seconds. Operator may select to omit automatic horn. Horn may be sounded manually at anytime.
7. Captions: Words, Home, Guests, Down, YDS to Go, Qtr., Ball on, and be White 15" high.
8. Control Cable: Provide type and length required for project, beveled scoreboard and press burclay.

J. Power: Scoreboard, 120/240 volts, 40/20 amps, and 3W+G, 60 Hz. Control Center, 120 volts, 10 watts, 60 Hz. Each requires earth ground.

K. Electrical Connections and Service: Specification Division 16.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions and location of scoreboard.

B. Verify that surfaces, prepared openings, and roughed-in utilities are ready to receive works and as indicated on shop drawings and as instructed by the manufacturer.

C. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Assemble and install components in accordance with manufacturer's instructions and details on the drawings.

B. Scoreboard shall be provided completely rewired, with flexible waterproofed connection for service as specified herein. Scoreboards shall be installed in accordance with manufacturer's instructions. Mounting of board shall be as specified herein. Required control cable from scoreboard to control sockets shall be provided with equipment.

C. Post shall be centered in postholes and set in 3000 psi concrete mixed in accordance with Division 3 Concrete, and beveled away from posts in all directions. Postholes shall be not less than 5 feet deep and 18 inches wide.

D. In place Scoreboard shall withstand 20-psi wind load.

E. Seal joints and services through walls with sealant to provide moisture and vapor seal.

3.3 FIELD QUALITY CONTROL

A. Test and adjust scoreboard and control equipment to ensure performance conforms to specified requirements.

B. Operate and test full range of functions over a continuous 4 hours period, recording physical data on operating equipment.

C. Provide three copies of a written quality control test reports.

D. Shut off equipment and controls and lock doors to prevent operation or access by unauthorized persons.

3.4 CLEANING

A. Remove temporary protection from prefinished surfaces.

B. Wash and clean exposed surfaces on the outside.

3.5 DEMONSTRATION

A. Provide systems demonstration.

B. Demonstrate in the presence of the Project Manager the operation, function, and maintenance of scoreboard, control unit and keyboards and its associated equipment.

END OF SECTION 11230

SECTION 13070 – TICKET BOOTH WINDOW

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes prefabricated glazed window with talk-thru port and deal tray.

B. RELATED SECTIONS

1. Division 8- Doors and Windows
2. Division 6- Carpentry
3. Division 4-Masonry
4. Division 7-Themal & Moisture Protection

1.3 SUBMITTALS

A. See Section 01300 for requirements.

B. Shop Drawings: Ticket booth windows, showing materials, design, construction and installation, including sill.

C. Manufacturer's Literature and Data: Ticket booth windows.

D. Manufacturer's Certificates: Submit certificates stating that bullet resistant glass meets the requirements of Underwriter Laboratories, Inc. or the specified ballistic class.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver products with labels intact. Labels shall identify product completely, in manufacturer's original, unopened containers, where possible.

B. Store in accordance with manufacturer's recommendation, protected against the elements and contamination or damage.

C. Handle in such manner as to prevent damage to products or finish.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A264, Type 304.

B. Extruded Aluminum: ASTM B221, 6063 alloy, T5 temper.

C. Bullet resistive glazing material shall comply with Underwriters Laboratories, Inc., Standard 725, Class III Ballistic Level and conforming to the following:

1. Bullet Resistive Glass: Multi-laminated glass with polyvinyl butyryl plastic interlayer between the panes of glass. The thickness of each pane of glass shall be in accordance with the manufacturer's standard practice. Total thickness shall be as indicated on the drawings.

2.2 FABRICATION

A. Frames shall be 0.1196-inch thick stainless steel, continuous around the glazed opening and with integral glazing stop on exterior side and removable glazing stop on the opposite side. Miter and weld removable stops at corners, and secure to frames with countersunk screws, space as required for Type III ballistic level.

B. Talk-thru unit shall be six inch diameter stainless steel unit with offset holes in the exterior and interior sides of the unit. Units shall be exterior type similar to Model No. 6-FR by Creative Industries, Inc., and have same ballistic resistance as the glass.

C. Counter shall be 0.1196-inch thick stainless steel of size and design shown, complete with stainless steel deal tray.

D. Factory set and glaze bullet resistive glazing material as required for Class III ballistic level and permitting expansion and contraction while maintaining a vapor tight seal. Install Talk-thru unit at the factory.

2.3 FINISHES

A. Stainless Steel: Mechanical Finish No. 4 in accordance with the NAAMM Metal Finishes Manual.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide three anchors per jamb; anchor types shall be designed to accommodate the wall construction.

B. Set glazed window and deal tray in place and securely anchor in place. No. Fastenings shall be exposed on the exterior.

C. All joints shall be tightly fitted and caulked as specified.

3.2 CLEANING

A. Clean all surfaces, including glass, and protect them from damage. Remove stain discoloration's from metal work.

END OF SECTION 13070

SECTION 13125 - METAL BLEACHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. Provide labor, material, equipment and supervision necessary to complete installation of permanent steel grandstand, including the following:

B. Drawings and specifications are provided to set the basic parameters of the various pre-manufactured bleacher seating units.

1. Steel Substructure
2. Decking System
3. Concrete Foundation

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturers must have ten years of experience in the manufacturer of bleachers and grandstand; welders must be AWS certified; manufacturing capability according to various code compliance's.

B. Installation Qualifications: Experience in the proper installation of grandstands.

C. Source Quality Control: Mill Test Certification.

1.4 SITE CONDITIONS

A. Field Site:

1. Owner to make site accessible.
2. Owner to verify site locations benchmarks.

B. Underground Utility Line: Owner to clearly mark all underground utilities and obstructions and Owner to relocate all that conflict with grandstand.

C. Soil Test: Furnish by Owner.

1.5 BUILDING CODES

A. Owner confirms the building code that applies to this project is BOCA 1996 DC Building Code –1999 Supplement.

1.6 WARRANTY

A. Manufacturer shall under warranty for a period of one year beginning at Date of Substantial Completion for projects install permanent Grandstand. The grandstand is warranted to be free from defect in materials and workmanship in the course of manufacturer. This warranty excludes any other defects resulting from abnormal use in service, accidental or intentional damage or any occurrences beyond manufacturer's beyond manufacturer's control.

1.7 MAINTENANCE

A. Owner is to conduct annual inspection and required maintenance of grandstand to ensure safe conditions. It is also recommended that a professional engineer or registered architect perform inspections biennially.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal building systems that may be incorporated in the work include but are not limited to the following:

1. Southern Bleacher Company: Horizontal Beam Design with gross seating capacity of 3390 in 11 sections. Press Box Support Structure _37'-4" x_24'-5".

B. Southern Bleacher Co.

C. Bleacher International Inc.

2.2 PERMANENT STEEL GRANDSTAND

A. Product Description:

1. Horizontal Beam Design: Vertical columns are placed 18 feet 0 inches on center laterally and as shown on center front to back. All horizontal beams are wide flange beams. Traverse bays are free of cross-bracing and total length of the grandstand.
2. Stringers: Stringers are wide flange with steel angle rise and depth fabrication and are placed at 6 feet on center.
3. Front Walkways:
   a. Clear width 65 inches.
   b. Elevated 21.33 feet above grade at benchmark.

4. Entry stairs to be firmly anchored to uniformly poured concrete bases.
   a. Stair rise 1-28 inches per BOCA Building Code with aluminum closure.
   b. Stair tread Depth: 11 inches per BOCA Building Code.
   c. Guardrails on stair to be 24 inches above leading edge of step with intermediate rail spacing at 5-1/2 inches.
   d. Stairs to have handrail extension. The handgrip portion of handrails shall not be less than 1-1/2 inches in cross-sectional dimension or the shape shall provide an equivalent gripping surface with no shop corner. The top of handrails and handrail extensions shall be placed not less than 34 inches or more than 38 inches above the nosing of trends and landings. Handrails shall be continuous the full length of the stairs and shall extend in the direction of the stair run not less than 12 inches beyond the bottom riser. Ends shall be returned or shall intermediate in newel posts or safety terminals.
5. Aisles:
   a. Aisles with seating on both sides to have 34-inch high handrail with intermediate rail at approximately 22 inches above tread.
   b. Anodized aluminum handrails with rounded ends are discontinuous to allow access to seating through a space 22 inches (min.) to 36 inches (max.).
   c. (If applicable) Half steps shall provide equal rise and run throughout aisle. Each shall have aisle nosing with black powder coat finish. If colored riser is specified for seating area, the aisle nose and riser closure shall be of same finish.
6. Deckling:
   a. Riser per row 6.5 inches, depth per row 24 inches.
   b. Each seat 17 inches above its respective tread.
   c. Decking Arrangement:

      (1) Interlock Aluminum Decking System.
      (2) Aluminum Bench Seat.

a. 2x10, Die#62380 (standard)

7. Guardrailing: To be at all sides of bleacher, entry stairs and ramps, portals, and landings. Railing to be anodized aluminum with end plugs of end of straight runs and/or elbows at corner. All guardrails shall be secured to angle rail risers by galvanized fasteners. Railing shall be 42" above any adjacent seat. Guardrailing on sides and back shall include 9 gauge galvanized chain link fencing fastened in place with galvanized fasteners and aluminum ties.
8. Ramps:
   a. Slope: 1 in 12.
   b. Guardrail to be 34 inches above ramp with intermediate rail spacing at 6 inches.
   c. Ramps to have handrail extension. The handgrip portion of handrails shall not be less than 1-1/2 inches or more than 2 inches in cross-sectional dimension or the shape shall provide an equivalent gripping surface. The handgrip portion of handrails shall have a smooth surface with no sharp corners. The top of handrails and handrails extensions shall be placed not less than 34 inches or more than 38 inches above the ramp surface. Handrails shall be continuous the full length of the ramp and shall extent in the direction of the ramp not less than 12 inches beyond the end of the ramp. Ends shall be returned or shall terminate in newel posts or safety terminals.
9. Handicap Provision:
   a. Quantity of Wheelchair Spaces: 16.
   b. Riser area adjacent to wheelchair spaces to have intermediate construction so 12 inch spheres cannot pass through opening.

B. Materials/Finishes

1. Substructures:
   a. Structural shapes meet one of the following ASTM Specifications: A36, A36/A572 grade 50, A572 grade 50, A529-50, or A500 grade B.
   b. Shop connections are seal welds.
   c. After fabrication, all steel is hot-dipped galvanized to ASTM-A123 specifications.
   d. Painted steel finish is unacceptable.

2. Extruded Aluminum:
   a. Tread Planks: Extruded aluminum alloys 6063-T6 mill finish.
   b. Joint sleeve assembly to be inserted in flat plank to maintain true alignment in joining together two plank pieces.

Extruded aluminum alloy, 6063T6, mill finish. Splice cover is unacceptable between two flat plank pieces joined in a straight line.

c. Railing: Extruded aluminum alloy, 6063T6 clear anodized 204R1, AA-M10C22A31, Class II.

3. Accessories:
   a. Channel End Caps: Aluminum alloys 6063T6, clear anodized 204R1, Class II. Polyethylene end cap is unacceptable.
   b. Cast End Cap: Aluminum 319 alloy cast finish. (Required for back rest and RS plank only).
   c. Hardware:
      (1) Bolts, Nuts: Hot-dipped galvanized or plated.
      (2) Hold-Down Clip Assembly: Aluminum alloys 6061-6T, mill finish.
      (3) Structural Hardware: Equal to or greater than hot-dipped galvanized ASTM-A307. No connections utilizing high strength bolts are classed as slip critical.

   d. Aisle Nose and Stair Nose: Aluminum alloy, 6063T6, black powder coat finish.
      (1) Optional Powder: Coat Colors.

2. All manufactured connections to be shop welded.
   a. Manufactured by certified welders conforming to AWS Standard.

C. Fabrication:
   1. Design Load:
      a. Live Load: 100-psf grass horizontal projection.
      b. Lateral Sway Load: 24-plf. Seat planks.
      c. Perpendicular Sway Load: 10-plf. Seat planks.
      d. Live Load of Seat and Tread Plank: 120 plf.
      e. Guardrail: Per 1996 BOCA Building Code.
      f. Windload: 13-18 PSF.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All work performed by technicians experienced in bleacher seating installation.

B. Project as per approved shop drawings.

3.2 FIELD QUALITY CONTROL

A. Foundation: Footings for the grandstand shall provide sufficient bearing area at bottom to support all loads of the grandstand. Depth and design of footings shall be determined by Owner-supplied soil test. Hot-dipped galvanized anchor bolts shall be secured in the concrete footings. Concrete shall attain working strength of 3,000 psi.

3.3 CLEAN-UP

A. Clean up all debris caused by work of this section.

END OF SECTION 13125

SECTION 14000 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. OMITTED

1.2 SUMMARY

A. This Section includes the following hydraulic elevators:

1. Passenger elevators.(2,500 lbs, 150 ft/min) with inside dimensions of 6'8" wide by 4'8" deep.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Excavation to accommodate plunger-cylinder assembly is specified in a Division 2 section. Where indicated, furnish steel tube or well and coordinate delivery with related excavation work.
2. Setting of sleeves, inserts, and anchoring devices in concrete is specified in a Division 3 section.
3. Subsills and structural framing of hoistway entrances are specified in Division 5 Section "Metal Fabrications."
4. Field painting of hoistway entrances is specified in Division 9 Section "Painting."
5. Ventilation of hoistway(s) and machine room(s) is specified in Division 15.
6. Electrical service to each elevator, including fused disconnect switch, is specified in Division 16 sections.

1.3 DEFINITIONS

A. Hydraulic elevators are hereby defined to include systems in which cars are hoisted either directly or indirectly by action of a hydraulic plunger and cylinder (jack); with other components of the work including fluid storage tank, pump, piping, valves, car enclosures, hoistway entrances, control systems, signal equipment, guide rails, electrical wiring, roping, buffers, and devices for operating, dispatching, safety, security, leveling, alarm, maintenance, and similar required performances

and capabilities.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Elevator schedules indicate required performances, controls, capacities, features, and finishes for each elevator or group of elevators and are included at end of this Section.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

B. Product data for each principal component or product of each elevator, including certified test reports on required testing. Indicate capacities, sizes, performance and operating characteristics, features of control system, finishes, and similar information. Indicate any variations from specified requirements.

C. Shop drawings including dimensioned drawings showing plans, elevations, sections and large-scale details indicating service at each landing, coordination with building structure and relationships with other construction, and details of car enclosures and hoistway entrances. Include elevatoring diagrams to indicate elevator service to each level and include excavation requirements for jack.

D. Wiring diagram detailing wiring for power, signal and control systems differentiating clearly between manufacturer-installed wiring and field-installed wiring. Indicate maximum and average power demands.

E. Samples of exposed finishes of car enclosures, hoistway entrances, and signal equipment. Provide 6 to 8 inch (150 to 200 mm) square samples of sheet materials and 10 to 12 inch (250 to 300 mm) lengths of running trim members.

F. Maintenance Manuals: Bound manual for each elevator or group of elevators, with operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information.

G. Certificates and Permits: Provide Owner with copies of all inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of elevators.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage the elevator manufacturer or an installer approved by the elevator manufacturer and who has completed elevator installations similar in material, design, and extent to that indicated for Project which have resulted in installations with a record of successful in-service performance.

B. Regulatory Requirements: In addition to local governing regulations, comply with applicable requirements of ASME/ANSI A17.1, Safety Code for Elevators and Escalators (hereafter referred to as the "Code").

1.7 WARRANTY

A. Special Project Warranty: Provide special project warranty, signed by Contractor, Installer, and Manufacturer, agreeing to replace, repair, or restore defective materials and workmanship of elevator work during warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

1. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty period is 12 months starting on date of Substantial Completion.

B. Warranties: Provide coincidental product warranties where available for major components of elevator work. Submit with maintenance manuals.

1.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Provide full maintenance service by skilled, competent employees of the elevator installer for period of 12 months following Date of Substantial Completion. Include monthly preventive maintenance performed during normal working hours. Include repair or replacement of worn or defective parts or components and lubricating, cleaning, and adjusting as required for proper elevator operation in conformance with specified requirements. Include 24-hours-per-day, 7-days-per-week emergency callback service. Exclude only repair or replacement due to misuse, abuse, accidents, or neglect caused by persons other than installer's personnel.

B. Continuing Maintenance Service: Installer shall provide a continuing maintenance proposal to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date construction contract maintenance requirements are concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:

1. Dover Elevator Corp.
2. Otis Elevator Co.
3. Schindler Elevator Corp.
4. U.S. Elevator/Cubic Corp.

2.2 MATERIALS AND COMPONENTS

A. General Requirement: Provide manufacturer's standard pre-engineered elevator systems that will comply with or fulfill the requirements of elevator schedule sheets at end of this Section or, at manufacturer's option, provide custom-manufactured elevator systems that will fulfill requirements. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard pre-engineered elevator systems and as required for a complete system.

B. Hydraulic Machines and Elevator Equipment: Provide manufacturer's standard single-acting under-the-car hydraulic plunger-cylinder unit for each elevator, with electric pump-tank-control system equipment in machine room as indicated.

C. Piping: Provide size, type, and weight piping recommended by manufacturer, and provide isolation couplings to prevent sound/vibration transmissions from power unit.

D. Inserts: Furnish required concrete inserts and similar anchorage devices for the installation of guide rails, machinery, and other components of elevator work where installation of devices is indicated as work of another specification section.

E. Car Frame and Platform: Manufacturer's standard welded steel units.

1. For freight elevators, provide special heavy-duty units where indicated for power truck loading, designed to withstand impacts and wheel loadings indicated.

2.3 CONTROL SYSTEMS

A. General: Provide manufacturer's standard control system for each elevator or group of elevators as required to provide automatic or group automatic operation of the type indicated and defined in the Code as "Operations."

B. Single Elevator Control - Passenger: Provide solid-state "Selective Collective Automatic Operation," as defined in ASME/ANSI A17.1.

2.4 SIGNAL EQUIPMENT

A. General: Provide signal equipment for each elevator or group of elevators to comply with requirements indicated below.

1. Provide illuminated hall-call and car-call buttons that light up when activated and remain lighted until call or other function has been fulfilled; fabricate of acrylic or other permanent translucent plastic.
2. Except for buttons and illuminated signal elements, fabricate signal equipment with exposed surfaces of stainless steel with manufacturer's standard directional polish or satin finish.
3. Car Control Stations: Provide car control station in each car with flush-mounted metal faceplates containing call button for each landing served and other buttons, switches, and controls required for specified car operation and control. Mount as shown or scheduled at height complying with ASME/ANSI A117.1. If not otherwise indicated, mount in return panel adjacent to car door. Provide operating device symbols as required by Code. Mark other buttons and switches with manufacturer's standard identification for required use or function.

a. Provide two-car control stations in each passenger elevator; equip only one with required keyed control switches (if any).
b. Where indicated, equip each freight elevator with auxiliary car control station mounted on side of car at height to facilitate operation by lift-truck operator without leaving truck.

4. Car Position Indicator: For passenger elevator cars, provide either illuminated-signal type or digital-display type, located near top of each car or in car control station. Include direction-of-next-travel signal if not provided in car control station.

    a. In addition to visual indicator, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.

5. Hall Push-Button Station: Provide hall push-button station at each landing for each elevator or group of elevators, but not less than one station for each 4 elevators in a group.

    a. For each group of passenger elevators, locate between 2 elevators at center of group or at location most convenient for approaching passengers. Provide unit with flat faceplate designed for flush-mounting on wall with body of unit recessed in wall.
    b. Provide 2-button station where passengers can travel either direction; 1-button station where only one direction of travel is available and indicate which direction that is.

6. Hall Lanterns: Provide units with illuminated "up" and "down" signal arrows, but provide single arrow where only one direction is possible. Provide units projecting from faceplate for ease of angular viewing, except provide flush units where a location in hoistway entrance frame is indicated. Match materials, finishes, and mounting method of hall push-button stations.

    a. At manufacturer's option, hall lantern signals may be placed either above or beside each hoistway entrance or in both jambs of entrance frame for each elevator. Mount at minimum of 6 ft. (1800 mm) above finished floor.
    b. Provide special oversized hall lantern signals at ground floor.

    c. In conjunction with each hall lantern device, provide an audible signal to indicate that a car is arriving in response to a hall call and to indicate direction of car travel. Signal shall sound once for up direction of travel and twice for down direction.

7. Hall Position Indicator: Provide illuminated-signal type or digital-display type, located above each hoistway entrance at ground floor. Match materials, finishes, and mounting method of hall push-button stations.

a. At manufacturer's option, ground-floor hall lantern signals may be integrated with hall position indicators.

8. Telephone: Provide rough-in for telephone hand set in each car, contained in flush-mounted cabinet and complete with identification and instructions for use. Provide a fireman's telephone cabinet or fireman's telephone jack in main elevator lobby.
9. Alarm System: Provide emergency alarm bell properly located within building and audible outside hoistways, equipped to sound automatically in response to emergency stops and in response to "Alarm" button on each car control station.

2.5 PASSENGER ELEVATOR CAR ENCLOSURES

A. General: Provide manufacturer's standard pre-engineered car enclosures of the selections indicated. Include ventilation, lighting, ceiling finish, wall finish, access doors, doors, power door operators, sill (threshold), trim, accessories, and floor finish unless indicated as not work of this Section. Provide horizontal sliding doors of manufacturer's standard flush panel type, with operation and number of panels as indicated. Provide manufacturer's standard protective edge trim system for door and wall panels, except as otherwise indicated.

1. Materials and Fabrication: Provide selections as indicated for each car enclosure surface; provide manufacturer's standards, but not less than the following:

a. Enameled Steel Panels: Flush hollow-metal construction, fabricated from ASTM A 366 (ASTM A 366M) cold-rolled steel, commercial quality, Class 1, matte finish, stretcher leveled. Provide with factory-applied baked-on enamel finish; colors as selected by Architect.
b. Stainless Steel: AISI Type 302/304 with No. 4 satin finish.
c. Aluminum Sills: Cast or extruded aluminum, with grooved surface, 1/4 inch (6 mm) thickness, mill finish.
d. Plastic Laminate: High-pressure type complying with NEMA LD3, Type GP-50 0.050 inch (1.3 mm) nominal thickness); color, texture, and pattern as selected by Architect from standard products available in the industry.
e. Fabricate car door frame integrally with front wall of car.
f. Fabricate car with recesses and cutouts for signal equipment.
g. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent or open egg-crate plastic, of acrylic or other permanent rigid plastic complying with flammability requirements.

h. Vinyl Composition Tile Floor Covering: ASTM F 1066, Composition 1 (nonasbestos), 12 x 12 x 1/8 inch (300 x 300 x 3 mm) thick; color and pattern as selected by Architect from manufacturer's standard range.

2.6 PERSONAL PROTECTIVE DEVICES

A. Handrails: Provide manufacturer's standard stainless steel handrails on side walls and back wall unless otherwise indicated either continuous or segmented units.

B. Door Edge Protective Device: Provide retractable edge shoe on leading edges of elevator entrance doors that causes doors to stop and reopen upon contacting an obstruction in entrance.

C. Photo-Eye Detection Device: Provide electronic photo-eye device with timed cutout, projecting dual light beams across car entrance at 5 inch (125 mm) and 29 inch (725 mm) heights, that when interrupted will cause closing doors to stop and reopen. Provide keyed switch in car operating panel or toggle switch in service cabinet for disconnecting photo-eye protective device.

D. Proximity-Type Detection Device: Provide electronic proximity-type door reversal device with zone of detection that moves with doors. Presence of a person or object within zone of detection shall cause closing doors to stop and reopen.

E. Nudging Feature: After car doors are prevented from closing for a predetermined adjustable time period, through activation of detection device or door edge protective device, a loud buzzer shall sound and doors shall begin to close at reduced rate of speed. Doors shall continue to close unless door edge protective device is activated, which shall cause doors to reopen. Process shall repeat continuously until obstruction is removed from entrance.

2.7 PASSENGER HOISTWAY ENTRANCES

A. General: Provide manufacturer's standard, pre-engineered, hollow metal type, sliding, door-and-frame hoistway entrances complete with track systems, hardware, safeties, sills, and accessories. Match car enclosure doors for size, number of door panels, and door panel movement. Provide frame-section size and profile to coordinate with hoistway wall construction as indicated.

1. Where gypsum-board wall construction is indicated, fabricate frames with reinforced head sections; provide sufficient strength without support from wall lintels.

B. Materials and Fabrication: Provide selections indicated that comply with manufacturer's standards, but not less than the following:

1. Enameled Frames: Formed steel with manufacturer's standard baked synthetic enamel finish, colors as selected by Architect.
2. Stainless Steel Frames: Formed stainless steel sheet, AISI Type 302/304 with No. 4 satin finish.
3. Primed Steel Panels: Flush hollow-metal construction, fabricated from ASTM A 366 (ASTM A 366M) cold-rolled steel, commercial quality, Class 1, matte finish, stretcher leveled. Provide with factory-applied, rust-inhibitive enamel prime coat finish.
4. Enameled Steel Panels: Flush hollow-metal construction, fabricated from ASTM A 366/A366M cold-rolled steel, commercial quality, Class 1, matte finish, stretcher leveled. Provide with factory-applied baked-on enamel finish; colors as selected by Architect.
5. Stainless Steel Door Panels: Flush stainless steel construction, AISI Type 302/304 with manufacturer's standard directional polish or satin finish.
6. Plastic Laminate Door Panels: Flush steel construction with applied finish of high-pressure-type, 0.05 inch (1.3 mm) thick plastic laminate complying with NEMA LD3; color, pattern, and texture as selected by Architect from standard products available in the industry; manufacturer's standard exposed door panel edge trim.
7. Aluminum Sills: Extruded aluminum, with grooved surface, 1/4 inch (6 mm) thickness, mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to commencing elevator installation, examine hoistways, hoistway openings, pits, and machine rooms, as constructed; verify all critical dimensions and examine supporting structure and all other conditions under which elevator work is to be installed. Notify Contractor in writing of any dimensional discrepancies or other conditions detrimental to the proper installation or performance of elevator work. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 INSTALLATION OF ELEVATOR SYSTEM

A. General: Comply with manufacturer's instructions and recommendations for work

required during installation.

B. Excavation for Jack: Drill excavation in elevator pit to accommodate installation of plunger-cylinder unit; comply with applicable requirements of Division 2 "Excavation" sections.

1. Install casings with waterproof seals at pit floor and with waterproof, high-pressure seal at bottom of casings.
2. Provide a second (inner) casing with welded waterproof, high-pressure seal at bottom and set inside outer (initial) casing.

C. Install plunger-cylinder units plumb and accurately centered for elevator car position and travel; anchor securely in place.

D. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

E. Coordination: Coordinate elevator work with work of other trades for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by Contractor to ensure dimensional coordination of the work.

F. Sound Isolation: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent transmission of vibrations to structure and thereby to eliminate sources of structure-borne noise from elevator system.

G. Install piping without routing underground, where possible. Where not possible, cover underground piping with permanent protective wrapping before backfilling.

H. Lubricate operating parts of systems, including ropes, if any, as recommended by manufacturers.

I. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

J. Leveling Tolerance: 1/2 inch (12 mm), up or down, regardless of load and direction of travel.

K. Set sills flush with finished floor surface at landings. Coordinate with other trades

to facilitate and ensure proper grouting of sills.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: Upon nominal completion of each elevator installation, and before permitting use of elevator (either temporary or permanent), perform acceptance tests as required and recommended by Code and by governing regulations or agencies.

B. Operating Tests: Load each elevator to its rated capacity and operate continuously for 30 minutes over its full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of pump motor (except submerged pumps) during 30-minute test period. Record failures of elevator to perform as required.

C. Advise Contractor, Owner, Architect, and inspection department of governing agencies in advance of dates and times tests are to be performed on elevators.

3.4 PROTECTION

A. At time of Substantial Completion of elevator work (or portion thereof), provide suitable protective coverings, barriers, devices, signs, or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

B. Provide similar protective measures for elevator units that will be placed in temporary service, including inspection and maintenance service during period of temporary service.

3.5 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.

B. Make a final check of each elevator operation with Owner's personnel present and just prior to date of Substantial Completion. Determine that control systems and operating devices are functioning properly.

END OF SECTION 14240

SECTION 15010 - BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:

1. Submittals.
2. Cutting and patching.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 15 Section "ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT," for factory-installed motors, controllers, accessories, and connections.
2. Division 15 Section "BASIC MECHANICAL MATERIALS AND METHODS," for materials and methods common to the remainder of Division 15, plus general related specifications including:

a. Access to mechanical installations.
b. Excavation for mechanical installations within the building boundaries, and from building to utilities connections.

1.3 SUBMITTALS

A. General: Follow the procedures specified in Division 1 Section "SUBMITTALS."

B. Increase, by the quantity listed below, the number of mechanical related shop drawings, product data, and samples submitted, to allow for required distribution plus two copies of each submittal required, which will be retained by the Mechanical Consulting Engineer.

C. Additional copies may be required by individual sections of these Specifications.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 MECHANICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate mechanical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
4. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
5. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
6. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form.

Where coordination requirements conflict with individual system requirements, refer conflict to the Contracting Officer and/or Project Manager.

8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
9. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
10. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 15 Section "BASIC MECHANICAL MATERIALS AND METHODS."
11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 1 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:

1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:

1. Uncover work to provide for installation of ill-timed work.
2. Remove and replace defective work.
3. Remove and replace work not conforming to requirements of the Contract Documents.
4. Remove samples of installed work as specified for testing.
5. Install equipment and materials in existing structures.

C. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new work.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

END OF SECTION 15010

SECTION 15260 – PIPING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Piping Insulation.

B. Jackets and Accessories.

1.2 RELATED WORK

A. Section 15010 'Basic Mechanical Requirements.

1.3 REFERENCES

A. ANSI/ASTM C195-Mineral Fiber Thermal Insulation Cement.

B. ANSI/ASTM C547-Mineral Fiber Performed Pipe Insulation.

C. ASTM C449-Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

D. ASTM E 84 – Surface Burning Characteristics of Building Materials.

E. NEPA 255- Surface Burning Characteristics of Building Materials.

F. UL 723- Service Burning Characteristics of Building Materials.

1.4 QUALITY ASSURANCE

A. Materials: Flame spread/fuel contributed/smoke developed rating of 50/25/50 in accordance with ASTM E84, NEPA 255 or UL 723.

1.5 SUBMITTALS

A. Submit product data.

B. Include product description, list of materials and thickness for each service, and location.

PART 2 - PRODUCTS

2.1 INSULATION

A. Glass fiber insulation; ANSI/ASTM C 547; "k" value of 0.24 at 75 degree F; non-combustible.

B. Expanded polystyrene; ANSI/ASTM C578; rigid closed cell; maximum water vapor transmission rating of 0.1 perms; "k" value of 0.23 at 75 degrees F.

2.2 JACKETS

A. Interior Applications:

1. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.
2. PVC Jackets: One piece, premolded type.

2.3 ACCESSORIES

A. Insulation Bands: ¾-inch wide; 0.007-inch thick aluminum.

B. Insulating Cement: ANSI/ASTM C195; hydraulic setting mineral wool.

C. Finishing Cement: ASTM C 449.

D. Fibrous Glass Cloth: Untreated; 9-oz/sq. yd. weight.

E. Adhesive: Compatible with insulation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install materials after piping has been tested and approved.

B. Continue insulation with vapor barrier through penetration.

C. In exposed piping, locates insulation and cover seams in least visible locations.

D. On insulated piping with vapor barrier, insulates fittings, valves, unions, etc.

E. Neatly finishes insulation at supports, protrusions, and interruptions.

F. Jackets:

1. Indoor, Concealed Applications: Insulated pipes conveying fluids below ambient temperature shall have vapor barrier jackets, factory-applied or field-applied. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe, and finish with glass cloth and vapor barrier adhesive.

2. Indoor, Exposed Application: Insulate as for concealed applications. Finish with canvas jacket; size for finish painting. Do not use PVC jackets.

3.2 SCHEDULE

PIPING	**TYPE**	**SIZE**	**INSULATION THICKNESS**
Domestic Hot Water Supply			1"
Domestic Cold Water			1"
Piping Exposed to Freezing			2"

END OF SECTION 15260

SECTION 15410– PLUMBING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Piping and pipe fitting.

B. Valves.

C. Sanitary Sewer Piping System.

D. Domestic Water Piping System.

E. Storm Water Piping System.

1.2 RELATED WORK

A. Section 2200-Earthwork.

B. Section 0900-Painting.

C. Section 15260-Piping Insulation.

D. Section 15010-Basic Mechanical Requirements.

E. Section 15430-Plumbing Specialists.

F. Section 15440- Plumbing Fixtures.

G. Section 15450-Plumbing Equipment.

1.3 REFERENCES

A. ANSI/ASME B16.3-Malleable Iron Threaded Fittings Class 150 NS 300.

B. ANSI/ASME B516.23-Cast Copper Alloy Solder Joint Drainage Fittings-DWV.

C. ANSI/ASME B516.29-Wrought Copper and Wrought Copper Alloy Solder Joint-Drainage Fittings-DWV.

D. ANSI/ASME Sec. 9 – Welding and Brazing Qualifications.

E. ANSI/ASTM B32 – Solder Metal.

F. ANSI/ASTM D2466- Poly Vinyl Chloride (PVC) Plastic PipeFittings, Schedule 40.

G. ANSI/AWS D1.1-Structural Welding Code.

H. ANSI/AWWA C105- Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

I. ANSI/AWWA C110-Ductile-Iron and Gray-Iron Fittings 3-inch through 48-inch, for Water and Other Liquids.

J. ANSI/AWWA C111- Rubber-Gasket Joints for Ductile from and Gray-Iron Pressure Pipe and Fittings.

K. ANSI/AWWA C151-Ductile-Iron Pipe, Centrifugally Cast in Metal Molds and Sand-Lined Molds, for Water or Other Liquids.

L. ASME-Boiler and Pressure Vessels Code.

M. ASTM A 53-Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

N. ASTM A 74-Cast Iron Soil Pipe and Fittings.

O. ASTM A120-Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.

P. ASTM A 234-Pipe Fittings and Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

Q. ASTM B88-Seamless Copper Water Tube.

R. ASTM B306-Copper Drainage Tube (DWV).

S. ASTM C564-Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

T. ASTM D1785-Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and 120.

U. ASTM D2235-Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

V. ASTM D2855-Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

W. ASTM D3034-Type PSM Poly (Vinyl Chloride) (PVD) Sewer Pipe and Fittings.

X. AWS A5.8-Brazing Filler Metal.

Y. AWWA C601-Standard Methods for the Examinations of Water and WasteWater.

Z. CISPI 305-Cast Iron Soil Pipe and Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

1.4 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

C. Welders Certification: In accordance with ANSI/ASME Sec. 9. ANSI/AWS D1.1.

1.5 SUBMITTALS

A. Submit product data.

B. Include data on pipe materials, pipe fittings, valves and accessories.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site.

B. Store and protect products.

C. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDNG

A. Cast Iron Pipe: ASTM A74, Service Weight. Fittings: Cast Iron. Joints: ASTM C564, with lead and oakum or neoprene gasketing systems.

2.2 WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, Hard Drawn Fittings: ANSI/ASME B16.23, Cast Brass of ANSI/ASME B16.29. Wrought Copper.

B. Joints: ANSI/ASTM B32, solder, Grade 95TA.

C. Galvanized Steel Pipe: ASTM A53 or A120, Schedule 40. Fittings: Cast iron. Joints: Grooved mechanical couplings.

2.3 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2-inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.

B. Dielectric Connections: Union with galvanized or plated steel threaded end copper solder end, water impervious isolation barrier..

2.4 GATE VALVES

A. Up to 2-Inches: Bronze body, non-rising stem and handwheel, inside screw, single double wedge or disc, solder threaded ends.

2.5 GLOBES VALVES

A. Up to 2-Inches: Bronze body, rising stem and handwheel, inside screw, renewable composition disc, solder screwed end, with backseating capacity.

2.6 RELIEF VALVES

A. Bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuate, capacities ASME certified and labeled.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tub ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Install piping to allow for expansion and contraction without stressing piping, joints or connected equipment.

E. Provide clearance for access to valves and fittings.

F. Slope water piping and arrange to drain at low points.

G. Establish invert elevations, slopes for drainage to ¼ inch per foot minimum except where noted otherwise. Maintain gradients.

H. Excavate and backfill in accordance with Section 02000.

I. Install bell and spigot with bell end upstream.

J. Install valves with stems upright or horizontal, not inverted.

3.3 APPLICATIONS

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream or valves and at equipment.

C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

D. Install valves to isolate equipment.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure PH of water to be treated is between 7.4 and 7.6.

C. Inject disinfectant, free chlorine in liquid, powder tablet or gas form.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at outlets.

E. Maintain disinfectant in system until residual equal to that on incoming water or 1.0 mg/L.

F. Flush disinfectant from system until residual equal to that on incoming water or 1.0 mg/L.

3.5 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services as indicated. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with water meter as required by the District of Columbia Water Department. Caulk enlarged sleeve and make watertight with pliable materials.

END SECTION 15410

SECTION 15430 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes plumbing specialties for the following:

1. Water distribution systems.
2. Soil, waste, and vent systems.
3. Storm drainage systems.

B. Related Sections include the following:

1. Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, basic installation requirements, and labeling and identifying requirements; and escutcheons, dielectric fittings, sleeves, and sleeve seals that are not in this Section.
2. Division 15 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.
3. Division 15 Section "Mechanical Identification" for labeling and identifying requirements.
4. Division 15 Section "Drainage and Vent Piping" for drainage and vent piping and connections.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Water Distribution Piping: 125 psig.
2. Soil, Waste, and Vent Piping: 10-foot head of water.
3. Storm Drainage Piping: 10-foot head of water.

1.4 SUBMITTALS

A. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly

of components; and piping and wiring connections for the following plumbing specialty products:

1. Backflow preventers.
2. Water regulators.
3. Balancing valves.
4. Thermostatic water mixing valves and water tempering valves.
5. Water hammer arresters.
6. Trap seal primer valves and systems.
7. Drain valves.
8. Hose bibbs, hydrants.
9. Cleanouts.
10. Floor drains.
11. Vent caps, vent terminals, and roof flashing assemblies.
12. Roof drains.
13. Sleeve penetration systems.

B. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 1. Include the following:

4. Backflow preventers.
2. Thermostatic water mixing valves and water tempering valves.
3. Trap seal primer valves and systems.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, dimensional requirements, and characteristics of plumbing specialties and are based on the specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

B. Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.

C. Listing and Labeling: Provide electrically operated plumbing specialties specified in this Section that are listed and labeled.

1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

D. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

E. Comply with NFPA 70, "National Electrical Code," for electrical components.

1.6 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Operating Key Handles: Furnish one extra key for each key-operated hose bibb and hydrant installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

1. Backflow Preventers:

a. Ames Co., Inc.
b. B & K Industries, Inc.
c. Cla-Val Co.
d. CMB Industries; Febco Div.
e. Conbraco Industries, Inc.
f. FLOMATIC Corp.
g. Grinnell Corp.; Mueller Co. Marketing Group for Hersey Products Div.
h. IMI Cash Valve.
i. Sparco, Inc.
j. Watts Industries, Inc.; Water Products Div.
k. Zurn Industries, Inc.; Wilkins Div.

2. Water Tempering Valves:

a. Conbraco Industries, Inc.
b. Heat-Timer Corp.
c. Holby Valve Co., Inc.
d. Honeywell Braukmann.
e. IMI Cash Valve.
f. Leonard Valve Co.
g. Sparco, Inc.
h. Watts Industries, Inc.; Water Products Div.

3. Water Hammer Arresters:

a. Amtrol, Inc.
b. Enpoco, Inc.

c. Josam Co.
d. Precision Plumbing Products, Inc.
e. Sioux Chief Manufacturing Co., Inc.
f. Smith: Jay R. Smith Mfg. Co.
g. Sparco, Inc.
h. Tyler Pipe; Wade Div.
i. Watts Industries, Inc.; Ancon Drain Div.
j. Watts Industries, Inc.; Water Products Div.
k. Zurn Industries, Inc.; Hydromechanics Div.

4. Trap Seal Primer Valves:

a. Enpoco, Inc.
b. Josam Co.
c. Precision Plumbing Products, Inc.
d. Smith: Jay R. Smith Mfg. Co.
e. Tyler Pipe; Wade Div.
f. Watts Industries, Inc.; Ancon Drain Div.
g. Watts Industries, Inc.; Water Products Div.
h. Zurn Industries, Inc.; Hydromechanics Div.

5. Roof Flashing Assemblies:

a. Elmdor/Stoneman Manufacturing Co.

6. Sleeve Penetration Systems:

a. ProSet Systems, Inc.

2.2 BACKFLOW PREVENTERS

A. General: ASSE standard, backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

1. 2-Inch NPS (DN50) and Smaller: Bronze body with threaded ends.
2. 2-1/2-Inch NPS (DN65) and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.

a. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body.

3. Interior Components: Corrosion-resistant materials.
4. Exterior Finish: Polished chrome-plate if used in chrome-plated piping system.
5. Strainer on inlet, if indicated.

B. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating

disc and atmospheric vent.

C. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

D. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and 2 independent check valves with intermediate atmospheric vent.

E. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves.

1. Pressure Loss: 12 psig (83 kPa) maximum, through middle one-third of flow range.

F. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; and test cocks with 2 positive-seating check valves.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle one-third of flow range.

G. Antisiphon-Pressure-Type Vacuum Breakers: ASSE 1020, suitable for continuous pressure application. Include shutoff valves, spring-loaded check valve, spring-loaded floating disc, test cocks, and atmospheric vent.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle one-third of flow range.

H. Dual-Check-Valve-Type Backflow Preventers: ASSE 1024, suitable for continuous pressure application. Include union inlet and 2 independent check valves.

I. Dual-Check-Valve-Type Backflow Preventers: ASSE 1032, suitable for continuous pressure application for carbonated beverage dispensers. Include stainless-steel body; primary and secondary checks; ball check; intermediate atmospheric-vent port for relieving carbon dioxide; and threaded ends, 3/8-inch NPS (DN10).

J. Laboratory Faucet Vacuum Breakers: ASSE 1035, suitable for continuous pressure application and chrome plated; consisting of primary and secondary checks; intermediate vacuum breaker; and threaded ends, 1/4- or 3/8-inch NPS

(DN8 or DN10) as required.

K. Reduced-Pressure Detector Assembly Backflow Preventers: ASSE 1047, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves; and bypass with displacement-type water meter, valves, and reduced-pressure backflow preventer.

1. Pressure Loss: 12 psig maximum, through middle one-third of flow range.

L. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; 2 positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer.

1. Pressure Loss: 5 psig maximum, through middle one-third of flow range.

M. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm flow and applications with up to 10-foot head (30-kPa) back pressure. Include 2 check valves; intermediate atmospheric vent; and nonremovable, ASME B1.20.7 garden-hose thread on outlet.

N. Back-Siphonage Backflow Vacuum Breakers: ASSE 1056, suitable for continuous pressure and backflow applications. Include shutoff valves, check valve, test cocks, and vacuum vent.

2.3 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASME A112.26.1M, ASSE 1010, or PDI-WH 201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M sizes A through F and PDI-WH 201 sizes A through F.

B. Hose Bibbs: Bronze body, with renewable composition disc, 1/2- or 3/4-inch NPS (DN15 or DN20) threaded or solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, nonremovable, drainable, hose-connection vacuum breaker.

1. Finish: Rough brass.
2. Finish: Chrome or nickel plated.
3. Operation: Wheel handle.
4. Operation: Operating-key (handle) type. Include operating key.

C. Roof Flashing Assemblies: Manufactured assembly made of 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch- (1.6-mm-) thick, lead flashing collar and skirt extending at least 8 inches (200 mm) from pipe with galvanized steel boot reinforcement, and counterflashing fitting.

1. Vent Cap: Open top, without cap.
2. Vent Cap: Low-silhouette model with vandal-proof vent cap.
3. Vent Cap: Extended model with field-installed, vandal-proof vent cap.

D. Deep-Seal Traps: Cast iron or bronze, with inlet and outlet matching connected piping, cleanout where indicated, and trap seal primer valve connection where indicated.

4. 2-Inch NPS (DN50): 4-inch- (100-mm-) minimum water seal.
5. 2-1/2 Inch NPS (DN65) and Larger: 5-inch- (125-mm-) minimum water seal.

E. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

F. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

G. Vent Terminals: Commercially manufactured, shop-fabricated or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing, as indicated.

H. Downspout Boots: ASTM A 48, gray-iron casting, with 4-inch NPS (DN100) outlet; shop-applied bituminous coating; and inlet size indicated.

I. Downspout Boots: ASTM A 74, Service class, hub-and-spigot, cast-iron soil pipe.

2.4 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4 lb/sq. ft. or 0.0625-inch thickness.
2. Vent Pipe Flashing: 3 lb/sq. ft. or 0.0469-inch thickness.
3. Burning: 6 lb/sq. ft. or 0.0937-inch thickness.

B. Copper Sheet: ASTM B 152 (ASTM B 152M), of the following minimum

weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft..
2. Vent Pipe Flashing: 8 oz./sq. ft..

C. Zinc-Coated Steel Sheet: ASTM A 653 (ASTM A 653M), with 0.20 percent copper content and 0.04-inch (1.016-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 PLUMBING SPECIALTY INSTALLATION

A. General: Install plumbing specialty components, connections, and devices according to manufacturer's written instructions.

B. Install backflow preventers of type, size, and capacity indicated, at each water-supply connection to mechanical equipment and systems, and to other equipment and water systems as indicated. Comply with authorities having jurisdiction. Locate backflow preventers in same room as connected equipment. Install air-gap fitting on units with atmospheric-vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.

C. Install hose bibbs with integral or field-installed vacuum breaker.

D. Install wall hydrants with integral or field-installed vacuum breaker.

E. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of one percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

F. Install cleanouts in aboveground piping and building drain piping as indicated, and where not indicated, according to the following:

1. Size same as drainage piping up to 4-inch NPS (DN100). Use 4-inch NPS (DN100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping 4-inch NPS (DN100) and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

G. Install cleanout deck plates, of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.

H. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

I. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.

J. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.

K. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

L. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor or as indicated. Size outlets as indicated.

M. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

1. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
2. Radius, 30 to 60 Inches: Equivalent to one percent slope.
3. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

N. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

O. Position floor drains for easy access and maintenance.

P. Install roof drains at low points of roof areas according to roof membrane

manufacturer's written installation instructions. Size outlets as indicated.

Q. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.

R. Position roof drains for easy access and maintenance.

S. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

T. Fasten recessed, wall-mounting plumbing specialties to reinforcement built into walls.

U. Secure supplies to supports or substrate.

V. Install individual stop valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated.

W. Install water-supply stop valves in accessible locations.

X. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

Y. Locate drainage piping as close as possible to bottom of floor slab supporting fixtures and drains.

Z. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

AA. Include wood-blocking reinforcement for recessed and wall-mounting plumbing specialties.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing specialties and piping specified in other Division 15 Sections.
2. Install piping connections indicated between appliances and equipment specified in other Sections; connect directly to plumbing piping systems.

B. Arrange for electric-power connections to plumbing specialties and devices that require power. Electric power is specified in Division 16 Sections.

C. Supply Runouts to Plumbing Specialties: Install hot- and cold-water-supply piping of sizes indicated, but not smaller than required by authorities having jurisdiction.

D. Drainage Runouts to Plumbing Specialties: Install drainage and vent piping, with approved trap, of sizes indicated, but not smaller than required by authorities having jurisdiction.

E. Ground electric-powered plumbing specialties.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Arrange for electric-power connections to plumbing specialties and devices that require power. Electric power, wiring, and disconnect switches are specified in Division 16 Sections.

3.3 FLASHING INSTALLATION

A. Fabricate flashing manufactured from single piece unless large pans, sumps, or other drainage shapes are required.

B. Burn joints of lead sheets where required.

C. Solder joints of copper sheets where required.

D. Install sheet flashing on pipes, sleeves, and specialties passing through and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

E. Set flashing on roofs in solid coating of bituminous cement.

F. Secure flashing into sleeve and specialty clamping ring or device.

G. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."

H. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of factory-authorized service representative to supervise the field assembly of components and installation of grease recovery units, including piping and electrical connections, and to report results in writing.

1. Test and adjust plumbing specialty controls and safeties. Replace damaged and malfunctioning controls and components.

3.5 COMMISSIONING

A. Before startup, perform the following checks:

1. System tests are complete.
2. Damaged and defective specialties and accessories have been replaced or repaired.
3. Clear space is provided for servicing specialties.

B. Before operating systems, perform the following steps:

1. Close drain valves, hydrants, and hose bibbs.
2. Open general-duty valves to fully open position.
3. Verify that drainage and vent piping are clear of obstructions. Flush with water until clear.

C. Startup Procedures: Follow manufacturer's written instructions. If no procedures are prescribed by manufacturer, proceed as follows:

1. Energize circuits for electrically operated units. Start and run units through complete sequence of operations.

D. Adjust operation and correct deficiencies discovered during commissioning.

3.6 DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to perform startup services and train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on procedures and schedules related to startup of and servicing interceptors.
2. Train Owner's maintenance personnel on procedures and schedules related to startup of and servicing grease recovery units.

3. Review data in the maintenance manuals. Refer to Division 1 Section "Contract Closeout."
4. Review data in the maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
5. Schedule training with Owner with at least 7 days' advance notice.

3.7 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.8 CLEANOUT SCHEDULE

A. Cleanout CO-[1]: Where plumbing specialties of this designation are indicated, provide products complying with the following:

1. Applicable Standard: [ASME A112.36.2M.] [ASME A112.3.1.]
2. Available Products: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:

    a. Floor drains, roof drains and cleanouts; Josam Co.
    b. LSP-Specialty Products Co.
    c. Sioux Chief Manufacturing Co., Inc.
    d. Smith: Jay R. Smith Mfg. Co.
    e. Tyler Pipe, Wade Div.
    f. Watts Industries, Inc., Ancon Drain Div.
    g. Zurn Industries, Inc., Hydromechanics Div.

3. Application: Floor cleanout. For installation in exposed piping.
4. Body or Ferrule Material: Cast iron.
5. Clamping Device: Not required.
6. Outlet Connection: Threaded or inside calk.
7. Closure: Brass plug with straight threads and gasket or Brass plug with tapered threads. Plastic plug.
8. Adjustable Housing Material: Cast iron. Plastic with threads or set screws or other device.
9. Frame and Cover Material and Finish: Painted cast iron. Nickel-brass, copper alloy. Rough brass.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Heavy Duty.

3.9 FLOOR-DRAIN SCHEDULE

A. Floor Drain FD-[1]: Where plumbing specialties of this designation are indicated, provide products complying with the following:

1. Applicable Standard: ASME A112.21.1M. or ASME A112.21.1M floor drain

2. Available Products: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:

a. Floor drain; Enpoco, Inc.
b. Floor drain; Josam Co.
c. Floor drain; Sioux Chief Manufacturing Co., Inc.
d. Floor drain; Smith: Jay R. Smith Mfg. Co.
e. Floor drain; Tyler Pipe, Wade Div.
f. Floor drain; Watts Industries, Inc., Ancon Drain Div.
g. Floor drain; Zurn Industries, Inc., Hydromechanics Div.

3. Body Material: Cast iron.
4. Seepage Flange: Not required.
5. Clamping Device: Required.
6. Outlet: Bottom.
7. Sediment Bucket: Not required.
8. Top or Strainer Material: Brass.
9. Top of Body and Strainer Finish: Nickel brass.
10. Top Shape: Round.
11. Dimensions of Top or Strainer: 9-inch diameter.
12. Top Loading Classification: Heavy duty with vandal proof screws.
13. Trap Material: Cast iron.
15. Trap Pattern: Deep-seal P-trap.
16. Trap Features: Trap seal primer valve drain connection.

3.10 ROOF-DRAIN SCHEDULE

A. Roof Drain RD-[1]: Where plumbing specialties of this designation are indicated, provide products complying with the following:

1. Applicable Standard: ASME A112.21.2M. or ASME A112.3.1.
2. Available Products: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:

a. Roof drains; Enpoco, Inc.

b. Roof drains; Josam Co.
c. Roof drains; Marathon Roofing Products, Inc.
d. Roof drains; Portals Plus, Inc.
e. Roof drains; Sioux Chief Manufacturing Co., Inc.
f. Roof drains; Smith: Jay R. Smith Mfg. Co.
g. Roof drains;Thunderbird Products, Inc.
h. Roof drains;Tyler Pipe, Wade Div.
d. Roof drains; U-Flow Drain Systems, Inc.
e. Roof drains; Watts Industries, Inc., Ancon Drain Div.
f. Roof drains; Zurn Industries, Inc., Hydromechanics Div.

3. Body Material: Cast iron.
4. Dimensions of Body: 15 inches
5. Combination Flashing Ring and Gravel Stop: Required.
6. Outlet: Bottom.
7. Dome Material: Cast iron.
8. Extension Collars: Not required.
9. Underdeck Clamp: Required.
10. Sump Receiver: Not required.

END OF SECTION 15430

SECTION 15440-PLUMBING FIXTURES

PART 1 GENERAL

1.1 WORK INCLUDEDED

A. Water closets
B. Lavatories and Basins
C. Urinals
D. Drinking Fountains (Indoor and outdoor)
E. Service Sink
F. Showers
G. Showers

1.2 RELATED WORK

A. Section 07900-Joint Sealers.
B. Section 15410-Plumbing Piping.
C. Section 15430-Plumbing Specialists.
D. Section 15450-Plumbing Equipment

1.3 REFERENCES

A. ANSI A112181.1-Finished Rough Brass Plumbing Fixture Fittings.
B. ANSI A 112.19.2-Vitreous China Plumbing Fixtures
C. ANSI A 112.19.3-Stainless Steel Plumbing Fixtures (Designed for Residential Use).
D. ANSI A 112.19.5-Trim for Water Closet Bowls and Urinals.
E. ARI 1010-Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.

1.4 QUALITY ASSURANCES

A. Fixtures: By same manufacturer for each product specified throughout.

B. Trim: By same manufacturer for each product specified throughout.

1.5 SUBMITTALS

A. Submit product data. Include fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

PART 2 PRODUCTS

2.1 LAVATORY

A. Basin: ANSI A112.2; vitreous china ANS A 112.19.4; vitreous china lavatory 19x17 inch minimum with inch drilling on 4-inch centers, front overflow, and soap depression; Model as manufactured by American Standard or approved equal.

B. Trim: ANSI A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator, single lever type handle, chrome plated 17 gage, brass P-trap with clean-out plug and arm with escutcheon; as manufactured by American Standard or approved equal.

2.1 WATER CLOSET

A. Bowl: ANSI A112.19.2; floor mounted vitreous china, siphon jet, vitreous china closet with fittings and lever flush valve, bolt caps, white color.

B. Seat: Solid white plastic with open front and brass bolts.

C. Models as manufactured by American Standard to be as follows or approved equal:

1. Handicapped Type: 9468.018
2. Regular Type: 2221.018 with Sloan Model 110.3 flush valve.

2.3 DRINKING FOUNTAINS

A. Fountain: Halsey Taylor: Model #HAC8FS-!-(Design Basic).

B. Fountain: Peterson Pre-cased Model#DFH#3/DFH-T (Design Basic).

2.5 SINK

PART 3 -EXECUTION

3.1 INSPECTIONS

A. Review millworks shop drawings. Confirm location and size of fixtures and openings before rough in and installation.

B. Verify adjacent construction is read to receive rough-in work of this section.

3.2 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key screwdriver stops reducers, and escutcheons.

C. Install component level and plumb.

D. Install and secure fixtures in place with wall supports, wall carriers and bolts.

E. Seal fixtures to wall and floor surfaces with sealant.

3.3 ADJUSTING AND CLEANING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. At completion clean fixtures and equipment.

END OF SECTION 15440

SECTION 15450-PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 WORK INCLUDEDED

B. Water Heaters

1.2 RELATED WORK

A. Section 15440-Plumbing Fixtures.

1.3 REFERENCES

A. ANSI/ASME Section 8D-Pressure Vessels.

B. ANSI/NFPA 70- National Electrical Code.

1.4 QUALITY ASSURANCES

A. Provide pump with manufacturer's name, model number, and rating/capacity identified..

B. Ensure products and installation of specified products are in conformance with recommendation and requirements of the following organizations:

1. American Society of Mechanical Engineers (ASME).
2. National Electrical Manufacturer's Association (NEMA).
3. Underwriters Laboratories (UL).

1.5 REGULATORY REQUIREMENTS

A. Conform to ANSI/ASME Section 8D ANSI for tanks.

1.6 SUBMITTALS

A. Submit shop drawings and product data.

B. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery products to site.

B. Store and protect products.

C. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.9 WARRANTY

A. Provide five-(5) years manufacturer's warranty.

PART 2 GENERAL

2.1 WATER HEATER

A. Automatic, electrical heated, vertical storage type, with 100 degrees F temperature rise, 150 psig maximum working pressure

B. Glass lined welded steel tank; thermally insulated with glass fiber and encased in corrosion-resistant steel jacket; and baked-on enamel finish.

C. Automatic water thermostat temperature ranges adjustable from 120 to 170 degrees F.

D. Brass water connections and dip tube, drain valve, high-density magnesium anode and temperature and pressure relief valves.

PART 3 -EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heater in accordance with manufacturer's instructions and to UL requirements.

B. Coordinate with plumbing piping and related electrical work to achieve operating system.

C. Pipe relief valves and drains to floor.

END OF SECTION 15450

SECTION 15835-TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Unit Heaters.

B. Cabinet Unit Heaters.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 16180-Equipment Wiring Systems: Installation of room thermostats.

1.3 RELATED SECTIONS

A. Section 16180-Equipment Wiring Systems: Electrical supply to units.

B. ANSI/NEPA 70-National Electrical Code.

1.4 SUBMITTIALS

A. Submit product date indicating typical catalog of information including arrangements.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

B. Ensure products and installation of specified products are in conformance with recommendation and requirements of the following organizations:

1. American Society of Mechanical Engineers (ASME).
2. National Electrical Manufacturer's Association (NEMA).
3. Underwriters Laboratories (UL).

1.6 REGULATORY REQUIREMENTS

A. Conform to ANSI/NEPA 70 Code for internal wiring of factory wired equipment.

PART 2 –PRODUCT

2.1 ELECTIRCAL UNIT HEATERS

A. Assembly: UL listed and labeled assembly with terminal box and cover, and built-in controls on cabinet unit heaters.

B. Heating Elements: Exposed helical coil of nickel-chrome resistant wire with refractory ceramic support bushings.

C. Cabinet: 18-gage steel with easily removed front panel with integral air outlet and inlet grilles.

D. Fan: Direct drives propeller type, statically and dynamically balanced, with fan guard.

E. Motor: Horizontal models with permanently lubricated sleeve bearings.

F. Control: Separate fan speed switch and theromstat heat selectors switch, factory wired, and switches built-in behind cover for cabinet unit heater. Provide thermal overload.

PART 3 -EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Verify that required utilities are available, in proper location, and ready for use.

C. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Hang unit heaters from building structure, with pipe hangers anchored to building. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

C. Install cabinet unit heaters where indicated.

D. Protect units with protective covers during balance of construction.

E. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Verify that electrical wiring installation is in accordance with manufacturer's submittals and installation requirements of Division 16 Sections.

3.3 CLEANING

A. Clean Work.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

END OF SECTION 15835

SECTION 15865-FANS

PART 1 GENERAL

1.1 SECTION INCLUDED

A. Ceiling Fans.

1.2 RELATED WORK

A. Section 15890-Ductwork.

1.3 REFERENCES

A. AMCA 99-Standard Handbook.

B. AMCA 210- Laboratory Methods of Testing Fans for Rating Purposes.

C. SMACNA-Low Pressure Duct Construction Standards.

1.4 QUALITY ASSURANCES

A. Performance Ratings; Conform to ACMA 210 and bear the AMCA Certified Rating Seal.

1.5 SUBMITTIALS

A. Submit shop drawings and product data.

B. Provide fan curves or charts with operating point clearly noted.

1.6 MAINTENANCE AND OPERATION DATA

A. Submit operation and maintenance data.

1. Include instructions for lubrication, motor and drive replacement, and spare parts.

1.7 DELIVERY AND STORAGE

A. Deliver, protect and Store product at site..

PART 2 –PRODUCT

2.1 MOTOR AND DRIVES

A. Motors as indicated.

B. Bearings: ANSI/AFBMA 9, heavy-duty pillow block type, self-aligning, grease-lubricated ball bearings.

C. Shafts: Hot rolled steel ground and polished, protectively coated with lubricant.

D. V Belt Drive: Cast iron or steel sheaves, dynamically balanced..

2.2 CEILING EXHAUST FAN

A. Fan shall be UL listed.

B. Wheel: True steel centrifugal.

C. Housing: Galvanized steel incorporating and integral back-draft damper.

D. Motor: Speed shall not exceed the listed RPM.

E. Inlet Grille: Shall be white egg-crate shape design and comply with OSHA requirements and be 85% free open area.

PART 3 -EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

END OF SECTION 15865

SECTION 15891-DUCTWORK

PART 1 GENERAL

1.1 WORK INCLUDED

A. Low Pressure Ducts.

1.2 RELATED WORK

A. Section 15910-Ductwork Accessories.

1.3 REFERENCES

A. ASHRAE - Handbook.

B. ASTM A 90- Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

C. ASTM A527-Steel Sheet, Zinc Coated (Galvanized) by Dip Process, Lock Forming Quality.

D. NFPA 90A-Installation of Air Conditioning and Ventilating Systems.

E. SMACNA-Low Pressure Duct Construction Standards.

1.4 DEFINATIONS

A. Duct Sizes: Inside clear dimensions.

B. Low Pressure: As defined by SMACNA Standards.

1.5 REGULATORY REQUIRMENTS

A. Construct ductwork to NFPA 90A Standards.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver product to site, and store and protect products.

PART 2 –PRODUCT

2.1 DUCTWORK

A. Steel Ducts: ASTM A527 galvanized steel sheet, lock forming quality, having zinc coating of 1.25 oz per sq. ft. for each side.

B. Fasteners: Rivets, bolts or screws.

C. Sealant: Non-hardening, water resistant, fire resistant compatible with mastic materials; liquid used alone with tape or heavy mastic.

D. Hanger Rod: Steel, galvanized threaded both ends, threaded on or continuously.

2.2 LOW PRESSURE DUCTWORK

A. Fabricate and support in accordance with SMACNA Low Pressure Duction Standards. Provide duct materials, gages, reinforcing, and sealing for operating pressure indicated.

PART 3 -EXECUTION

3.1 INSTALLATION

A. During construction, provide temporary closures on open ductwork to prevent construction debris from entering ductwork.

3.2 ADJUSTING AND CLEANING

A. Clean ducts system to remove accumulated dust.

END OF SECTION 15891

SECTION 15910 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Volume control dampers.
3. Air turning devices.
4. Flexible ducts connectors.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 15 Section "Ductwork

C. References:

1. NEPA 90A-Installation of Air Conditioning and Ventilating Systems.
2. SMACNA- Low Pressure Duct Construction Standards.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including details for materials, dimensions of individual components, profiles, and finishes for the following items:

1. Backdraft dampers.
2. Volume control dampers.
3. Flexible ducts.

PART 2 - PRODUCTS

2.1 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards.

B. Fabricate splitter dampers of material same gage as duct.

C. Fabricate splitter dampers of single thickness sheet metal to streamline shape. Secure blade with continues hinge or rod. Operate with minimum ¼ inch diameter rod in self-aligning, universal joint action flanged bushing with setscrew.

D. Provide locking; indicate quadrant regulators on dampers.

2.2 AIR TUNING DEVICES

A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.3 FLEXIBLE DUT CONNECTIONS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards.

B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NEPA 90A, approximately 3 inches wide, crimped into metal edging strip.

2.4 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards.

B. Review locations prior to fabrication.

C. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices.

D. Access doors with sheet metal screw fasteners are not acceptable.

2.5 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to manufacturer's installation instructions and applicable portions of details of construction as shown in SMACNA standards.

B. Provide balancing dampers at points as required for air balancing.

C. Provide backdraft dampers on exhaust fans.

D. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.

E. Provide duct access doors for inspection and cleaning fans, and elsewhere as required. Provide minimum 8x8-inch size for hand access.

F. Provide duct test holes where indicated and required for testing and balancing purposes.

END OF SECTION 15910

SECTION 16010 – BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Omitted.

1.2 WORK BY OWNER

A. The Owner will award a contract to a General Contractor.

B. Future Work:

1. Provide for telephone system, which will be installed by the Owner.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Proposed Products List: Include Products specified.

C. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.

D. References:

1. ANSI/NFPA 70- National Electric Code.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable District of Columbia Electrical Code Requirements.

B. Electrical: Conform to NFPA 70.

C. Obtain permits and request inspection from authority having jurisdiction.

1.5 PROJECT/SITE CONDITIONS

A. Install work in locations shown on drawings.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including change to work specified in other sections. Obtain permission of Contracting Officer before proceeding.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 16010

SECTION 16111 - CONDUIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Rigid metal conduit and fittings.
   2. Intermediate metal conduit and fittings.
   3. Electrical metal tubing and fittings
   4. Liquid-tight flexible metal conduit and fittings.
   5. Non-Metallic conduit and fittings

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Cast-In-Place Concrete

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. References:
   1. ANSI C80.1-Rigid Steel Conduit Zinc-Coated.
   2. ANSI C80.3- Electrical Metallic Tubing Zinc-Coated.
   3. ANSI/NEMA FB 1 – Fittings and Supports for Conduit and Cable Assemblies.
   4. FS WW-C-563- Electrical Metallic Tubing.
   5. FS WW-C-566- Specification for Flexible Metal Conduit
   6. FS WW-C-581-Specification for Galvanized Rigid Conduit.
   7. NEMA TC2- Electrical Plastic Tubing (EPT) and conduit.
   8. NEMA TC3- PVC Fittings for use with rigid PVC Conduit and Tubing.

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT AND FITTINGS

A. Rigid Steel Conduit: ANSI C80.1 or FS WW-C-581.

B. Fittings and Conduits Bodies: ANSI/NEMA FB1: Threaded type, material to match conduit.

2.2 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

A. Conduit: Galvanized steel.

B. Fittings and Conduit Bodies: ANSI/NEMA FB1; use fittings and conduit bodies specified above for rigid steel conduit.

2.3 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. EMT: ANSI C80.3 OR FS WW-C-563 galvanized.

B. Fittings and Conduit Bodies: ANSI/NEMA FB1; steel or malleable iron, compression set screw type.

2.4 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Conduit: Flexible metal conduit with PVC jacket.

B. Fittings and Conduit Bodies: ANSI/ NEMA FB1.

2.5 PLASTIC CONDUIT AND FITTINGS

A. Conduit: NEMA TC2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC3.

2.6 CONDUIT SUPPORTS

A. Conduit Clamps, Straps and Supports: Steel or Malleable Iron.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT AND SUPPORT

A. Size conduit for conductors installed or for type THW conductors, whichever is larger: ¾-inch minimum size.

B. Arrange conduit to maintain headroom and present a neat appearance.

C. Route exposed conduit parallel and perpendicular to walls and adjacent piping.

D. Maintain minimum of 6-inches between conduit and piping.

E. Arrange conduit supports to prevent distortion of alignment by pulling operations.

Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers or bolted split stamped galvanized hangers.

F. Group conduit in parallel runs where practical and use conduit constructed of steel channel with conduit straps or clamps. Provide space for additional conduits.

G. Support conduit at a maximum of 7 feet on centers.

3.2 CONDUIT INSTALLATION

A. Cut conduit square using a saw or pipe cutters; deburr cut ends.

B. Bring conduit to should of fittings and couplings and fasten securely.

C. Use conduit hubs and sealing locknuts for fastening conduit to cast boxes and for fastening conduit to sheet metal boxes in damp or wet locations.

D. Install no more than four ninety-degree bends between boxes.

E. Use conduit bodies to make sharp changes in direction, as around beams.

F. Use hydraulic one-shot bender or factory elbows for bends in conduit larger than 2-inch size.

G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

I. Provide no. 12 AWG insulated conductor or suitable pull string in empty conduit.

J. Maximum size conduit in slabs above grade: ¾-inch. Do not route conduit to cross each other in slabs above grade.

K. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes.

L. Raceways embedded in Slabs: Install in middle third with minimum of 1" concrete cover. Per DCDGS (District of Columbia Design Guideline Specification.)

3.3 UNDERGROUND DUCTBANK INSTALLATION

A. Install top of ductbank 24 inches minimum below finished grade.

B. Install plastic conduits with a minimum grade od 4-inches per 100 feet.

C. Terminate plastic conduit in end bell at manhole entry.

D. Stagger plastic conduit joints in concrete encasement.

E. Use suitable separators and chairs installed not greater than 4 feet on centers. Band conduit together with suitable banding devices. Securely anchor to prevent movement during concrete placement.

F. Provide minimum 3-inch concrete cover at bottom, top and sides of ductbank.

3.4 CONDUIT INSTALLATION SCHEDULE

A. Underground Installation Outside of Building Foundation Wall: Schedule 40 PVC Plastic encased in concrete envelope.

B. Installation Under Slab: Schedule 40 PVC Plastic conduit encased in concrete envelope.

C. In Slab above Grade: Rigid Steel conduit or schedule 40 PVC Plastic Conduit.

D. Wet Interior Locations: Rigid steel conduit, Intermediate Metal Conduit or Electrical Metallic Tubing.

END OF SECTION 16111

SECTION 16120 - WIRES AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes building wires and cables and associated splices, connectors, and terminations for wiring systems rated 600 volts and less.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Firestopping."
2. Division 16 Section "Control/Signal Transmission Media" for telephone and communication wiring, including optical fiber cable.
3. Division 16 Section "Supporting Devices" for supports and anchors for fastening cable directly to building finishes.
4. Division 16 Section "Electrical Identification" for insulation color coding and wire and cable markers.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Field test reports indicating and interpreting test results relative to compliance with performance requirements of testing standard.

1.4 QUALITY ASSURANCE

A. Testing Firm Qualifications: In addition to the requirements specified in Division 1 Section "Quality Control Services," an independent testing firm shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or shall be a full member company of the International Electrical Testing Association (NETA).

1. Testing Firm's Field Supervisor Qualifications: A person currently certified by the NETA National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Comply with NFPA 70 "National Electrical Code" for components and installation.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in the "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.5 SEQUENCING AND SCHEDULING

A. Coordination: Coordinate layout and installation of cable with other installations.

1. Revise locations and elevations from those indicated as required to suit field conditions and as approved by the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver wire and cable according to NEMA WC-26.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Wires and Cables:
   a. American Insulated Wire Corporation, Leviton Manufacturing Co.
   b. Brand-Rex Cable Systems, Brintec Corp.
   c. Carol Cable Company, Inc.
   d. Senator Wire & Cable Co.
   e. Southwire Co.

2. Connectors for Wires and Cables:
   a. AFC, Monogram Co.
   b. AMP, Inc.
   c. Anderson, Square D Co.
   d. Electrical Products Division, 3M Co.
   e. O-Z/Gedney Unit, General Signal.

2.2 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable

construction, and rating as specified in Part 3 "Applications" Article.

B. Rubber Insulation: Conform to NEMA WC 3.

C. Thermoplastic Insulation: Conform to NEMA WC 5.

D. Cross-Linked Polyethylene Insulation: Conform to NEMA WC 7.

E. Ethylene Propylene Rubber Insulation: Conform to NEMA WC 8.

F. Solid conductor for 10 AWG and smaller; stranded conductor for larger than 10 AWG.

2.3 CONNECTORS AND SPLICES

A. UL-listed factory-fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated. Select to comply with Project's installation requirements and as specified in Part 3 "Applications" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with installation tolerances and other conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Service Entrance: Type USE, copper conductor.

B. Service Entrance: Type XHHW-2, copper conductor, in raceway.

C. Feeders: Type XHHW-2, copper conductor, in raceway.

D. Feeders: Type UF, copper conductor, 90C insulation.

E. Branch Circuits: Type XHHW-2, copper conductor, in raceway.

F. Branch Circuits: Type AC cable, copper conductor, 75C insulation.

3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and the NECA "Standard of Installation."

B. Pull conductors into raceway simultaneously where more than one is being installed in same raceway.

1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.
2. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

C. Conductor Splices: Keep to minimum.

3. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
4. Use splice and tap connectors that are compatible with conductor material.

D. Wiring at Outlets: Install with at least 12 inches (300 mm) of slack conductor at each outlet.

E. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.4 FIELD QUALITY CONTROL

A. Testing Firm: Owner will employ and pay an independent testing firm to perform specified field quality-control testing.

B. Testing Firm: Provide the services of a qualified independent testing firm to perform specified field quality-control testing.

C. Testing: Upon installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA Standard ATS, Section 7.3.1. Certify compliance with test parameters.

D. Correct malfunctioning products at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

END OF SECTION 16120

SECTION 16130 - BOXES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Outlet Boxes.

B. Pull and Junction Boxes.

1.2 RELATED WORK

A. Section: 16160-Cabinets and Enclosures.

1.3 REFERENCES

A. ANSI/NEMA OS 1 – Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.

B. NEMA 250 –Enclosures for Electrical Equipment.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel with ½-inch male fixture studs where required.

2.2 PULLED AND JUNCTION BOXES

A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.

B. Sheet Metal Boxes Larger Than 12-inches in any Dimension: Conform to Section 16160.

PART 3 - EXECUTION

3.1 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as required for splices, taps wire pulling, equipment connections and code compliance.

B. Locate and install boxes to allow access.

C. Locate and install to maintain headroom and to present a neat appearance.

3.2 OUTLET BOX INSTALLATION

A. Locate boxes in masonry walls to require cutting of masonry unit corner only.

B. Provide knockout closures for unused openings.

C. Support boxes independently of conduit.

D. Coordinate mounting heights and locations of outlets.

E. Provide cast outlet boxes in exterior locations exposed to the weather and wet locations.

END OF SECTION 16130

SECTION 16141 – WIRING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Wall Switches.

B. Receptacles.

C. Device Plates and Box Covers.

1.2 REFERENCES

A. FS W – S 896- Switch, Toggle.

B. NEMA WD 1- general-purpose Wiring Devices.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

A. Wall Switches for Lighting Circuits and Motors Loads Under ½ HP: NEMA WD 1 or FS W-S-896; AC General use snap switch with toggle rocker handle, rated 20 amperes and 120/277 volts. Handle: Ivory.

2.2 RECEPTACLES

A. Convenience and Straight-Blade Receptacles: NEMA WD 1 or FS W-C 596.

B. Convenience Receptacles Configuration: NEMA WD1; Type 20 R, Ivory.

2.3 WALL PLATES

A. Decorative Cover Plates: Smooth stainless steel.

B. Weatherproof Cover Plates: Gasketed cast metal with hinged gasketed device covers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wall switches 48-inches above floor, OFF position down.

B. Install convenience outlets at or near ceiling.

C. Install devices and wall plates flush and level.

END OF SECTION 16141

SECTION 16160 – CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Cabinets and large pull or junction boxes.

1.2 REFERENCES

A. NEMA 250 – Enclosures for Electrical Equipment.

PART 2 - PRODUCTS

2.1 HINGED COVER ENCLOSURES

A. Construction: NEMA 250; Type 1, Steel.

B. Finish: Manufacturer's Standard Enamel Finish

C. Covers: Continuous hinge, held closed by flush latch operable by screwdriver.

2.2 CABINETS

A. Cabinet Boxes: Galvanized Steel.

B. Cabinets Fronts: Steel, flush surface type with concealed trim clamos, screw cover front, concealed hinge and flush lock keyed to match branch circuit panel board; finish in baked gray enamel.

2.3 FABRICATION

A. Provide conduit hubs or knockouts on enclosures.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.

B. Install trim plumb.

END OF SECTION 16160

SECTION 16180 –EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electrical connections to equipment specified under other sections.

1.2 RELATED WORK

A. Section 15450-Plumbing Equipment: Hot Water Heaters.

B. Section 16111- Conduit.

C. Section 16120-Wire and Cable.

D. Section 16130-Boxes.

1.3 REFERENCES

A. FS-W-C-596-Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

B. NEMA WD 1- General Purpose Wiring Devices.

C. NEMA WD 5-Specific-Purpose Wiring Devices.

PART 2 - PRODUCTS

2.1 CORDS AND CAPS

A. Straight-blade Attachment Plug: NEMA WD 1.

B. Locking–blade Attachment Plug: NEMA WD 5.

C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

D. Cord Construction: Oil-resistant thermostat insulated Type SJO multiconductor flexible cord with identified equipment-grounding conductor, suitable for hard usage in damp location.

E. Cord Size: Suitable for connected load of equipment and rating of branch circuit over-current protection.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

B. Make conduit connections to equipment using flexible conduit. Use liquid tight flexible conduit in damp or wet location.

C. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.

D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

E. Make wiring connections in control panel or in writing compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

F. Installs disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

END OF SECTION 16180

SECTION 16190 –SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Fastening hardware.

1.2 RELATED WORK

A. Section 03300-Cast-in Place Concrete.

1.3 COORDINATION

A. Coordinate size, shape and location of concrete pads with Section 03000.

1.4 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Support Channel: Galvanized or painted steel.

B. Hardware: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps and outlet and junction boxes to building structure, using inserts, and expansion anchors.

B. Use toggle bolts or hollow wall fasteners in hollow masonry walls and self-drilling anchors or expansion anchor on concrete surfaces.

C. Do not fasten supports to piping, ductwork mechanical equipment or conduit.

D. Do not use powder actuated anchors.

E. Install surface-mounted cabinets and panel boards with minimum of four anchors. Provide steel channel to supports to stand cabinet one-inch off wall.

F. Fabricate supports from structural steel or steel channel rigidly welded or bolted to present a neat.

G. Install surface-mounted cabinets and panel boards with minimum of four anchors. Provide steel channel supports to stand cabinet one-inch off wall.

END OF SECTION 16190

SECTION 16440 –DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Disconnect Switches.

B. Fuses.

C. Enclosures.

1.2 REFERENCES

A. ANSI/UL 198C – High Intensity Capacity Fuses: Current Limiting Types.

B. ANSI/UL 198E-Class R Fuses.

C. FS W-F-870-Fuseholders (For plug and Enclosed Cartridge Fuses).

D. FS W-S-865-Switch, Box, (Enclosed), Surface-Mounted.

E. NEMA KS 1 – Enclosed Switches.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

A. Fusible and Non-Fusible Switches Assemblies: NEMA KS-1 or FS W-S-865; quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: FS W-F-870.

B. Enclosures: NEMA KS 1 Type 1 or 3R as required.

C. Fuses 600 Amperes and Less: ANSI/UL 198C or as required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installs disconnect switches where indicated or where required.

B. Install fuses in disconnect switches.

END OF SECTION 16440

SECTION 16450-SECONDARY GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Power system grounding.
2. Electrical equipment and raceway grounding and bonding.

1.3 SYSTEM DESCRIPTION

A. Ground the electrical services system neutral at service entrance equipment to metallic water service and to supplementary grounding electrodes.

B. Bonding together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway, systems, grounding conductor in raceways and cables, receptacle ground connectors and plumbing systems.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Ground Rods: Copper-encased steel, ¾ inch diameter, minimum length 10 feet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide a separate, insulated equipment-grounding conductor in feeder and branch circuits. Terminate each end on a grounding lug, bus or bushing.

B. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange.

C. Supplementary Grounding Electrode: Use driven ground rod on exterior of building.

3.2 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

D. Measure ground resistance from system neutral connection to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 10 ohms.

END OF SECTION 16450

SECTION 16470 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes services, lighting and distribution panelboards.

B. References:

1. NEMA AB 1-Molded Case Circuit Breakers.
2. NEMA PB 1-Panelboards.
3. NEMA PB 1.1-Instructions for Safe Installations, Operation and Maintenance of Panelboards rated 600 volts or less.

1.3 SUBMITTALS

A. Submit shops drawings for equipment and components devices.

B. Include outline and support point dimensions, voltage, main bus capacity, integrated short circuit ampere ratings, circuit breaker arrangement and sizes.

PART 2 - PRODUCTS

2.1 MAIN AND DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB.

B. Enclosures: NEMA PB1; Type 1.

C. Provide cabinet front with concealed trim clamps, screw cover and hinged door with flush lock. Finish in manufacturer's standard gray enamel.

D. Provide panelboards with copper bus ratings as indicated. Provide copper ground bus in all panelboards.

E. Molded Case Circuit Breakers: NEMA AB 1 provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole.

2.2 BRANCH PANELBOARDS

A. Branch Circuit Panelboards: NEMA PB1.

B. Enclosure: NEMA PB 1; type 1.

C. Provide flush surfaces cabinet front with concealed trim clamps, concealed hinge and flush lock. Finish in manufacturer's standard gray enamel.

D. Provide panelboards with copper bus and a copper ground bus.

E. Minimum integrated Short Circuit Rating: 10,000 amperes symmetrical.

F. Molded Case Circuit Breakers: NEMA AB 1 type thermal magnetic trip circuit breakers with common trip for all poles.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards plumb and level.

B. Provide filler plates for unused spaces in panelboards.

C. Provide typed circuit directory for each panelboards.

3.2 FIELD QUALITY CONTROL

A. Measure steady state loads currents at each panelboard feeder and should the difference between phases exceed twenty percent, rearrange circuits to balance loads.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION 16470

SECTION 16510 – LIGHTING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes

1. Interior luminaries and accessories.
2. Exterior luminaries and accessories.
3. Lamps.
4. Ballast's
5. Poles

B. Related Sections: The following sections contain requirements that relate to this section:

1. Section "Emergency Lighting Equipment."

C. References:

1. ANSI C82.1-Specifications for Fluorescent Lamp Ballast's.
2. FS W-F-414-Fixture, Lighting.
3. NEMA LE 2- HID Lighting System Noise Criterion Ratings.

1.3 SUBMITTALS

A. Submit product data.

B. Include outline drawings, lamp and ballast data, support points, weights and accessory information from each luminaries type.

C. Submit manufacturer's installation instructions.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site.

B. Store and protect products.

C. Handle metal poles carefully to prevent breakage and damage to finish.

1.5 EXTRA STOCK

A. Ballast's: Provide extra stock of 10% of quantity furnished.

PART 2 - PRODUCTS

2.1 INTERIOR LUMINAIRES AND ACCESSORIES

A. Fluorescent Luminaries: Provide hinged frames with latches, and 0.125 inch thick virgin acrylic lenses.

2.2 EXTERIOR LUMINAIRES AND ACCESSORIES

A. Enclosures: Complete with gaskets to form weatherproof assembly.

B. Provide low temperature ballast's with reliable starting to 0 degrees F.

2.3 LAMPS

A. General Use Incandescent Lamps: Inside Frosted type, rated 125 volts.

B. Fluorescent Lamps: Cool White.

C. High Pressure Sodium HID Lamps: Clear, suitable for all burning positions.

2.4 FLUORESCENT BALLAST

A. Fluorescent Ballast's: ANSI C82.1; electronic type.

2.5 HID BALLASTS

A. HID Ballast: ANSI C82.4; selected by luminaries manufacturer.

B. L-NC Rating: NEMA Led, equal to or less than ratings listed in Table C-1.

2.6 FLOODLIGHT POLES

A. Poles shall be 80 foot high complete with tapered base, anchor bolts, service platform, steps and pole climber designed to withstand 80 MPH winds plus a 1.3 gust factor per ASSHTO specifications for a maximum of 21 luminaries with EPA if 2.5 square feet each. Contractor shall utilize a computer model for the aiming of the floodlights.

B. POLES SHAFT AND BASE PLATE: The pole shaft shall be sixteen sided cross section an shall be fabricated of high strength steel with a minimum yield strength of 50,000 psi and conforming to the requirements of ASTM –572, galvanized pole of material greater than 50,000 psi may be used, but only 50,000 psi may be used for calculations.

All materials to be a single thickness American steel plate with no laminations. The steel plate shall be shot blasted clean of mill scale and other foreign matter before fabrication. The poles shall be cold formed with minimum dimensions of 8.4-inch tope diameter and 21 to 40-inch bottom diameter, and shall not be more than two longitudinal 60% penetration seam welds and no circumferential welds.

Each section shall be uniformly tapered and shall be joined to form the pole shaft assembly by telescoping over the next lower sections for a minimum of 1.5 times the outside diameter of the top of the lower section and shall be matched marked by the pole manufacturer for proper assembly.

The base plate shall be cold rolled formed ring of steel with a yield of 50,000 psi before forming and shall be designed to withstand the full bending moment of the pole shaft and shall be 1-1/2-inch thick by 2-1/2-inch wide and be drilled for the required anchor bolts. The surface around each hole shall be milled flat and smooth to receive the leveling nut. Flame cutting the base plate is not acceptable.

The top of each pole shall be fitted with a wire support "J" hook welded inside the top of each pole

Furnish each pole with a removable cap secured with stainless steel set screws.

C. TAPERED BASE: The pole shaft shall be fitted with a tapered style integral base fabricated of the same material as the bottom section of the poles and shall be formed panels assembled by means of longitudinal welds attached to the shaft with 100% penetration circumferential weld. This base section shall taper to the round bottom of the base plate and totally conceal the anchor bolts.

The internal base plate shall be attached to the tapered section by means of two circumferential fillet welds. A reinforced door opening shall be provided. A flush amount door cover shall be provided and secured into place with tamper-proof screws.

D. POLE STEPS: Each pole shall have step bolt lugs welded securely in place at the pole step locations. Pole steps shall begin approximately 12' above the pole base and extend to the bottom of the service platform(s). Steps shall alternate on 18" centers, with double sets of steps at each platform location. Pole steps shall be 5/8" diameter by 6" long galvanized carriage bolts with fastening nut.

D. ANCHOR BOLTS: Anchor bolts shall be manufactured from A576 cold drawn, stress relieved steel with a yield strength of 115,000 psi. The anchor bolt threads shall be rolled and the threaded ends galvanized. Each bolt shall include two galvanized nuts for leveling and fastening.

E. SERVICE PLATFORM: The service platform shall be manufactured of the same material grade as the pole shaft (ASTM 588 or 572). The platform shall be fabricated tubular style and complete with a steel mesh floor welded in place with an access door hinged at the rear. The 2" pipe mounting cross arms shall be drilled for the appropriate luminaries. Pipe rail on all sides shall be used for greater safety of the service person. Flexible wire, cable or rope will be considered inadequate.

The pole manufacturer and the luminaries' manufacturer shall coordinate the fastening method of the luminaries to the platform.

A 2" half coupling (wire outlet) shall be welded to the pole shaft approximately 3' from the top of the pole.

G. FINISH: The pole assembly sections and platform shall be thoroughly cleaned of weld splatter, dirt and other foreign matter. The pole shaft, base and service platform of A572 material shall be furnished either with one coat of red oxide prime paint inside and outside and coats of field applied finish coat outside, or hot dipped galvanized in accordance with ASTM 123, or shall receive a factory applied powder coat inside and outside of at least 4 mils thickness. See Specification: "Optional Finish Powder Coating".

H. INSTALLATION: The manufacturer shall furnish drawings and calculations for the approval. They also, shall furnish instructions for assembly and erection of the pole assemblies. The Contractor is responsible for following these directions. The Contractor shall thoroughly clean the poles of dirt, mud, grease and other foreign matter before erecting the pole.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lamps in luminaries and lampholders.

B. Support surface-mounted luminaries from building structure using bolts, screws, rivets, or approved framing member.

C. Luminaries Pole Bases: Size and constructed as required. Plumb for adjustment.

3.2 RELAMPING

A. Align luminaries and clean lenses at completion of work. Clean paint splatters, dirt and debris from installed luminaries.

B. Touch up luminaries finishes at completion of work.

END OF SECTION 16140

SECTION 16610

SECURITY SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security system

1.02 QUALITY ASSURANCE

A. NFPA - National Electrical Code

B. Underwriters Laboratory

1.03 SUBMITTALS

A. Product data is required.

PART 2 PRODUCTS

2.01 MATERIALS

A. Conduit rough-in only at exterior door contact switches, keypad location and at control panel location.

PART 3 EXECUTION

3.01 INSTALLATION

A. Open wiring installed above ceiling. Plenum rated as required.

B. Install all new security panel, passive infrared motion detectors, magnetic door switch detectors, wiring system, and power, to provide a complete, new operating security system.

C. All installations shall be in strict conformance with the manufacturer's recommendations.

D. Power supply to the system shall be as denoted on the Drawings, which must be from an individual circuit. Provide maintenance free, NICAD batteries to provide standby power to operate system for a minimum of 24 hours under normal quiescent supervision and 30 minutes of alarm. Provide battery chargers to maintain battery voltage. Batteries shall be stored in alarm control panels, an integral part of the systems.

E. All outlets shall be equipped with the appropriate security system devices.

F. All wiring (No. 16 AWG minimum size) for the security system shall be installed in conduit.

END OF SECTION

SECTION 16670 - LIGHTNING PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. OMITTED

1.2 SUMMARY

A. This Section includes lightning protection for buildings and associated structures and requirements for lightning protection system components.

1.3 SYSTEM DESCRIPTION

A. Protect entire building ie, Press Building, Maintenance Building and Locker Shower/Concession Building
B. Lightning Protection shall be provided for the following buildings:
   1. Press Building
   2. Concession/Locker Shower Building

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each component specified. Include the following:

   1. Roof adhesive data.
   2. Decorative air terminal illustrations.

C. Shop Drawings detailing lightning protection system. Include air terminal locations, conductor routing and connections, and bonding and grounding provisions. Include indications for use of raceway and data on how concealment requirements will be met.

D. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include data on listing or certification by nationally recognized testing laboratory (NRTL) or trade association. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Certification, signed by Contractor, that roof adhesive for air terminals is approved by manufacturers of both the terminal assembly and the single-ply membrane roofing material.

F. Field inspection reports indicating compliance with specified requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is NRTL listed or who is certified by the Lightning Protection Institute as a Master Installer/Designer.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

C. Provide UL Master Label.

D. Provide LPI certification of system.

E. Provide ETL Master Label indicating system complies with specified requirements.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

1. A-C Lightning Security, Inc.
2. Approved Lightning Protection Co., Inc.
3. Independent Protection Co., Inc.

2.2 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96.

B. System Materials: Copper, with solid air terminals, except as otherwise indicated.

C. Air Terminals for Single-Ply Membrane Roof Mounting: Units with bases especially designed for single-ply membrane roof materials.

D. Air Terminals for Main Stack: Stainless steel.

E. Ground Rods: Copper-clad steel with a minimum of 27 percent of rod weight in copper cladding.

1. Diameter: 3/4 inch (19 mm).
2. Length: 10 feet (3 m).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces, areas, and conditions, with Installer present, for compliance with installation tolerances and other conditions affecting performance of lightning protection. Do not proceed with installation until unsatisfactory conditions have been corrected. Test lightning protection for continuity and resistance to ground.

3.2 INSTALLATION

A. Install lightning protection as indicated, according to manufacturer's written instructions.

B. Comply with UL 96A, LPI-175, and NFPA 780.

C. Conform to the most stringent requirements when more than one standard is specified.

D. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends and narrow loops. Where indicated, run conductors in nonmetallic raceway, Schedule 40, minimum.

E. Conceal system conductors.

F. Conceal down conductors.

G. Conceal interior conductors.

H. Conceal conductors from normal view from exterior locations at grade within 200 feet (60 m) of building.

I. Provide notification at least 48 hours before concealing lightning protection components.

J. Cable Connections: Use approved exothermic-welded connections for all conductor splices and connections between conductors and other components, except those above single-ply membrane roofing.

K. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's installation instructions.

L. Bond extremities of vertical metal bodies exceeding 60 feet (18 m) in length to lightning protection components.

M. Bond ground terminals to counterpoise conductor.

N. Bond grounded metal bodies on building within 12 feet (4 m) of ground to counterpoise conductor.

O. Bond grounded metal bodies on building within 12 feet (4 m) of roof to counterpoise conductor.

P. Bond grounded metal bodies on building within 12 feet (4 m) of roof to interconnecting loop at eave level or above.

Q. Bond lightning protection components to grounded metal bodies on building at every 60 feet (18 m) with intermediate-level interconnection loop conductors.

3.3 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.

B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

A. Periodic Inspections: Provide the services of a qualified inspector to perform periodic inspections during construction and at its completion, according to LPI-177.

B. UL Inspection: Apply for inspection by UL as required for UL master labeling of system.

C. ETL Inspection: Provide the services of ETL to inspect completed system for conformance with specified requirements.

END OF SECTION 16670