

# Hampton National Historic Site Towson, MD

New Collection Storage Facility

HAMP – 150705

Volume 1 of 2

## PROJECT SPECIFICATIONS



NATIONAL PARK SERVICE  
DENVER SERVICE CENTER

December 4, 2009  
With Revised Sections



## **TABLE OF CONTENTS - PROJECT MANUAL**

### **VOLUME 1 OF 2**

#### **DIVISION 1 - GENERAL REQUIREMENTS**

01110	SUMMARY OF WORK
01270	DEFINITION OF CONTRACT LINE ITEMS
01310	PROJECT MEETINGS
01312	MECHANICAL AND ELECTRICAL COORDINATION
01323	PROJECT SCHEDULE AND MONTHLY INSPECTIONS
01330	SUBMITTALS
-----	ATTACHMENT: TRANSMITTAL FOR SCHEDULE OF SUBMITTALS, LIST OF MATERIAL SUBMITTALS
01350	ARCHEOLOGICAL PROTECTION
01360	ACCIDENT PREVENTION
01420	REFERENCE STANDARDS
01430	CONTRACTOR QUALITY CONTROL
-----	ATTACHMENTS: CONTRACTOR'S QUALITY CONTROL DAILY REPORT, DAILY TEST REPORT INFORMATION SHEET, and ACCESSIBILITY INSPECTION REPORT
01510	TEMPORARY SERVICES
01520	FIELD OFFICES AND SHEDS
01560	BARRIERS
01570	TEMPORARY CONTROLS
01571	STORM WATER POLLUTION PREVENTION
01600	MATERIAL AND EQUIPMENT
01720	FIELD ENGINEERING
01770	PROJECT CLOSEOUT
01785	OPERATION AND MAINTENANCE DATA
-----	CLOSEOUT AND OPERATION & MAINTENANCE REQUIREMENTS
01815	SYSTEM DEMONSTRATION AND TRAINING
-----	GEO TECH REPORT

#### **DIVISION 2 - SITEWORK**

02100	CLEARING AND GRUBBING
02210	SITE EXCAVATION AND PLACEMENT OF FILL MATERIAL
02221	TRENCHING, BACKFILLING AND COMPACTING
02270	SOIL EROSION AND SEDIMENTATION CONTROL
02485	FINISH GRADING, SEEDING, AND SODDING
02602	STORM INLETS, CATCH BASINS, ENDWALLS
02610	SANITARY SEWER PIPE
02615	WATER MAINS
02618	STORM DRAIN PIPE
02640	VALVES AND FIRE HYDRANTS
02653	TESTING AND DISINFECTING WATER MAINS

### **DIVISION 3 - CONCRETE**

03100 CONCRETE FORMS AND ACCESSORIES  
03200 CONCRETE REINFORCEMENT  
03300 CAST-IN-PLACE CONCRETE

### **DIVISION 4 - MASONRY - NOT USED**

### **DIVISION 5 - METALS - not used**

### **DIVISION 6 - WOOD AND PLASTICS**

06105 MISCELLANEOUS CARPENTRY  
06401 EXTERIOR ARCHITECTURAL WOODWORK  
06402 INTERIOR ARCHITECTURAL WOODWORK

### **DIVISION 7 - THERMAL AND MOISTURE PROTECTION**

07210 THERMAL INSULATION  
07260 VAPOR RETARDERS  
07411 METAL ROOF PANELS  
07620 SHEET METAL FLASHING AND TRIM  
07841 THROUGH-PENETRATION FIRESTOP SYSTEMS  
07920 JOINT SEALANTS

### **DIVISION 8 - DOORS AND WINDOWS**

08110 STEEL DOORS AND FRAMES  
08211 FLUSH WOOD DOORS  
08311 ACCESS DOORS AND FRAMES  
08550 WOOD WINDOWS  
08710 DOOR HARDWARE  
08800 GLAZING

### **DIVISION 9 - FINISHES**

09220 EXTERIOR PORTLAND CEMENT PLASTER (STUCCO)  
09260 GYPSUM BOARD ASSEMBLIES  
09310 CERAMIC TILE  
09511 ACOUSTICAL PANEL CEILINGS  
09650 RESILIENT FLOORING AND ACCESSORIES  
09671 RESINOUS FLOORING  
09681 CARPET TILE  
09910 PAINTING

### **DIVISION 10 - SPECIALTIES**

10200 LOUVERS AND VENTS  
10431 SIGNAGE  
10520 FIRE-PROTECTION SPECIALTIES  
10801 TOILET ACCESSORIES

**DIVISION 11 - EQUIPMENT - not used**

**DIVISION 12 - FURNISHINGS**

12494 ROLLER SHADES

**DIVISION 13 - SPECIAL CONSTRUCTION**

13701 ACCESS CONTROL ALARM MONITORING SYSTEMS  
13720 INTRUSION DETECTION  
13760 VIDEO SURVEILLANCE  
13851 DRY-PIPE FIRE-SUPPRESSION SPRINKLERS  
13935 FIRE-SUPPRESSION STANDPIPES

**DIVISION 14 - CONVEYING SYSTEMS - not used**

**VOLUME 2 OF 2**

**DIVISION 15 - MECHANICAL**

15030 ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT  
15050 BASIC MECHANICAL MATERIALS AND METHODS  
15052 COMMON WORK RESULTS FOR PLUMBING  
15057 COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT  
15061 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT  
15073 VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT  
15075 MECHANICAL IDENTIFICATION  
15076 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT  
15082 PLUMBING INSULATION  
15100 VALVES  
15111 GENERAL-DUTY VALVES FOR PLUMBING PIPING  
15123 EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING  
15126 METERS AND GAGES FOR PLUMBING PIPING  
15135 METERS AND GAGES  
15140 DOMESTIC WATER PIPING  
15145 DOMESTIC WATER PIPING SPECIALTIES  
15150 SANITARY WASTE AND VENT PIPING  
15155 SANITARY WASTE PIPING SPECIALTIES  
15195 FACILITY NATURAL-GAS PIPING  
15241 VIBRATION CONTROLS FOR HVAC COMPONENTS  
15250 MECHANICAL INSULATION  
15410 PLUMBING FIXTURES  
15485 ELECTRIC WATER HEATERS  
15510 HYDRONIC PIPING  
15513 CONDENSING BOILERS  
15530 REFRIGERANT PIPING  
15540 HVAC PUMPS

15545	CHEMICAL WATER TREATMENT
15672	CONDENSING UNITS
15725	MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS
15752	HUMIDIFIERS
15830	TERMINAL UNITS
15870	POWER VENTILATORS
15891	METAL DUCTWORK
15910	DUCTWORK ACCESSORIES
15970	HVAC CONTROLS
15990	TESTING, ADJUSTING, AND BALANCING

**DIVISION 16 - ELECTRICAL**

16050	BASIC ELECTRICAL MATERIALS AND METHODS
16060	GROUNDING AND BONDING
16120	CONDUCTORS AND CABLES
16130	RACEWAYS AND BOXES
16140	WIRING DEVICES
16410	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
16441	SWITCHBOARDS
16442	PANELBOARDS
16491	FUSES
16511	INTERIOR LIGHTING
16715	VOICE AND DATA COMMUNICATION CABLING

END OF TABLE OF CONTENTS

## SECTION 01110 - SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The work of this contract consists of the general construction of Hampton Collection Storage Facility. The building exterior envelope shall be wood-framed construction on concrete slab-on-grade, with shingle roof, fiber-cement siding, clad wood windows, and exterior metal doors and frames. Interior partitions shall be wood frame with gypsum board finish. Interior finishes shall include carpet tile, acoustical ceilings, resilient and ceramic tile flooring, and paint. The building shall house storage rooms, offices, research spaces, break room and support spaces.
- B. All work will be performed under a single contract.

#### 1.2 LOCATION

- A. Hampton National Historic Site, 535 Hampton Lane, Towson, MD 21286.

#### 1.3 CONTRACTOR'S USE OF PREMISES

- A. Construction Camp: Establishment of a camp [**or field**] office within the park will not be permitted.
- B. Construction Camp: Establishment of a camp will be permitted in **<Insert Note Here>** . Provide temporary water, sewer, and electric utilities as specified in Section 01510. Keep camp neat and clean and completely obliterate at completion of work. These requirements also apply to all Contractor's employees who may, with prior approval, establish their own camping facilities.
- C. The [**building**] [**road**] may be to the public during construction. Maintain access for National Park Service administrative and other official business throughout the construction phase.
- D. Contractor shall at all times conduct his operations to ensure the least inconvenience to the public. [**Building**] [**Road**] closures will be permitted, when required, upon specific approval of Contracting Officer.
- E. Confine storage of materials to [**areas indicated or as directed by Contracting Officer**] **<Insert Note Here>** .
- F. Preservation of Natural Features: Confine all operations to limits shown for the project. Prevent damage to natural surroundings. Restore damaged areas, repairing or replacing damaged trees and plants, at no additional expense to the Government.
  - 1. Provide temporary barriers to protect existing trees and plants and root zones.
  - 2. Do not remove, injure, or destroy trees or other plants without prior approval. Consult with Contracting Officer and remove agreed-on roots and branches that interfere with construction.
  - 3. Do not fasten ropes, cables, or guys to existing trees.
  - 4. Carefully supervise excavating, grading, filling, and other construction operations near trees to prevent damage.

- G. Existing Utilities: Notify Contracting Officer and utility companies of proposed locations and times for excavation.
1. Contractor shall be responsible for locating and preventing damage to known utilities. If damage occurs, repair utility at no additional expense to the Government.
  2. If damage occurs to an unknown utility, repair utility. An equitable adjustment will be made in accordance with the Changes clause of the contract.
  3. Interruption of Existing Utility Service
- H. Hauling Restrictions: Comply with all legal load restrictions in the hauling of materials. Load restrictions on park roads are identical to the state load restrictions with such additional regulations as may be imposed by the Park Superintendent. Information regarding rules and regulations for vehicular traffic on park roads may be obtained from the Office of the Park Superintendent. A special permit will not relieve Contractor of liability for damage which may result from moving of equipment.

#### 1.4 SPECIAL CONSTRUCTION REQUIREMENTS

- A. <Insert Note Here>

#### 1.5 AMERICAN RECOVERY AND REINVESTMENT ACT (ARRA) VISITOR INFORMATION RECOVERY ACT SIGNAGE REQUIREMENTS

- A. All ARRA projects must display a project sign that meets the ARRA Visitor Information Sign Requirements attached to the end of this specification.
1. The sign must be fabricated and installed in a prominent location on site within 10 days after Notice to Proceed is issued for this project.
  2. Maintain sign in like new condition throughout the contract period.
  3. Remove the sign within 10 days after substantial completion of the project

#### 1.6 FIELD VERIFICATION

- A. Field verify all new and existing dimensions affecting the work of this contract before ordering products.

#### 1.7 CONSTRUCTION MATERIALS

- A. The Government will furnish <Insert Note Here>
- B. All materials, including borrow and aggregates, shall be Contractor-furnished from outside the park.

#### 1.8 SALVAGED MATERIALS

- A. In addition to materials specified in other sections, the following will remain the property of the Government:

B. Stockpile material at <Insert Note Here>

1.9 SOILS INVESTIGATION REPORT

A. A soils investigation report entitled <Insert Note Here> has been prepared by <Insert Note Here>

B. A copy of the report is being sent to all plan holders along with this package.

C. If conflicts occur between the report and drawings or specifications, the drawings and specifications govern.

1.10 ADDITIONAL REPORTS

PART 2 - PRODUCTS -Not used.

PART 3 - EXECUTION - Not used.

END OF SECTION



## SECTION 01270 - DEFINITION OF CONTRACT LINE ITEMS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The intent of this section is to explain, in general, what is and what is not included in a contract line item, and the limits or cut off points where one item ends and another begins.
- B. If no contract line item exists for a portion of the work, include the costs in a related item

#### 1.2 CONTRACT LINE ITEM NO. \_\_\_\_\_ - \_\_\_\_\_.

- A. This item consists of \_\_\_\_\_.
- B. Measurement will be by the \_\_\_\_\_.
- C. Payment will be made at the contract \_\_\_\_\_.

#### 1.3 CONTRACT LINE ITEM NO. \_\_\_\_\_ OPTION \_\_\_\_ - \_\_\_\_\_.

- A. This item consists of \_\_\_\_\_.
- B. Measurement will be by the \_\_\_\_\_.
- C. Payment will be made at the contract \_\_\_\_\_.

#### 1.4 OPTION \_\_\_\_\_ - \_\_\_\_\_.

- A. CONTRACT LINE ITEM No. \_\_\_\_\_ - \_\_\_\_\_.
  - 1. This item consists of \_\_\_\_\_
  - 2. Measurement will be by the \_\_\_\_\_
  - 3. Payment will be made at the contract \_\_\_\_\_
- B. CONTRACT LINE ITEM No. \_\_\_\_\_ - \_\_\_\_\_.
  - 1. This item consists of \_\_\_\_\_
  - 2. Measurement will be by the \_\_\_\_\_
  - 3. Payment will be made at the contract \_\_\_\_\_
- C. CONTRACT LINE ITEM No. \_\_\_\_\_ - \_\_\_\_\_.
  - 1. This item consists of \_\_\_\_\_
  - 2. Measurement will be by the \_\_\_\_\_
  - 3. Payment will be made at the contract \_\_\_\_\_

PART 2 - PRODUCTS NOT USED.

PART 3 - EXECUTION NOT USED.

END OF SECTION 01270

## SECTION 01310 - PROJECT MEETINGS

### PART 1 - GENERAL

#### 1.1 PRECONSTRUCTION CONFERENCE

- A. Before start of construction, Contracting Officer will arrange an on-site meeting with Contractor. The meeting agenda will include the following as a minimum:

1. Park rules and regulations
2. Authorized Representatives
3. Correspondence procedures
4. Labor standards provisions
5. Payroll reports
6. Modifications
7. Payments to Contractor
8. Acceptance/rejection
9. Construction progress
10. Subcontractors
11. Cultural resource studies
12. Documents required under the contract
13. Submittal of shop drawings, project data, samples, and approved equals
14. As-constructed drawings/operation and maintenance (O&M) manuals
15. Saturday, Sunday, holiday and night work
16. Reference materials
17. Contractor quality control
18. Value engineering
19. Liquidated damages
20. Notice to proceed
21. Construction schedule

- B. Submittals required prior to Pre-Construction Conference – The following items shall be submitted a minimum of one week prior to the Preconstruction Conference. Contracting Officer will notify Contractor of tentative date for the Pre-Construction Conference.

1. Letter designating your Project Superintendent
2. Proposed Construction Progress Schedule
3. A comprehensive breakdown of the Schedule of Values
4. Accident Prevention Plan
5. A list of subcontractors for this project (must be same as in your proposal)
6. Written statements from your subcontractors certifying compliance with applicable labor standard clauses
7. Satisfactory evidence of liability insurance coverage and workman's compensation for the Contractor and all subcontractors
8. Waste and Recycling Plan
9. Quality Control Plan
10. Location of source for borrow material (if applicable)
11. Storm and Waste Water Pollution Prevention Plan

- C. All items listed must be provided to the Contracting Officer before the Pre-Construction Conference is held. If all of these documents have not been received one week prior to the scheduled Pre-Construction Conference date, the conference will be cancelled, Notice to Proceed will not be issued, and the Contracting Officer will consider other contractual remedies. Work shall not commence until written Notice to Proceed has been issued.

## 1.2 PROGRESS MEETINGS

- A. The Contracting Officer will schedule weekly meetings with the Contractor
- B. The meeting agenda will include the following as a minimum:
  - 1. Approval of minutes of previous meetings
  - 2. Submittal status
  - 3. Review of off-site fabrication and delivery schedules
  - 4. Requests for information (RFI) and other issues
  - 5. Modifications
  - 6. Work in progress and projected
  - 7. Schedule update (provide updated CPM)
  - 8. Status of Project Record Drawings and O&M manuals
  - 9. Other business relating to work

PART 2 - PRODUCTS - Not used.

PART 3 - EXECUTION - Not used.

END OF SECTION

**SECTION 01312 - MECHANICAL AND ELECTRICAL COORDINATION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The following schedule clarifies the division of labor and materials between Division 15, Mechanical, and Division 16, Electrical. Contractor shall have overall control for assignment of work and responsibility for completeness and proper operation of work as specified and shown on drawings. MD indicates Mechanical Division and ED indicates Electrical Division.

Items	Products Under	Execution Under	Power Wiring Under	Control Wiring Under
Equipment Motors	MD	MD	ED	ED
Motor Starters and Overload Relays Not Included with Equipment	ED	ED	ED	ED
Disconnect Switches Not Included with Equipment	ED	ED	ED	
Time Clocks and Switches	ED	ED	ED	
Thermostats, Control Relays, Control Transformers, Damper Motors	MD	MD	ED	MD
Fan Speed Controls	MD	ED	ED	ED
Duct Smoke Detectors	ED	MD	ED	ED
Electric Heaters	MD	MD	ED	MD
Fire Protection Alarm and Tamper Switches	MD	MD	ED	ED

PART 2 - PRODUCTS - Not used.

PART 3 - EXECUTION - Not used.

END OF SECTION



## SECTION 01323 - PROJECT SCHEDULE AND MONTHLY INSPECTIONS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Summary: The work of this section consists of project schedule requirements including preparation of a project schedule, schedule updates, schedule revisions and time impact analysis. The project schedule shall be based upon the Critical Path Method (CPM) for planning, scheduling and reporting progress of the Work.
- B. Purpose: The purpose of the project schedule is to ensure adequate planning, coordination, scheduling, and reporting during execution of the work by the Contractor. The project schedule will assist the Contractor and Contracting Officer in monitoring the progress of the work, evaluating proposed changes, and processing the Contractor's monthly progress payment.
- C. Software: The software shall be the latest version of Primavera Project Planner (P3), SureTrak Project Scheduler, Microsoft Project, or approved equal. The Contractor shall provide to the Contracting Officer a licensed copy of the software used for the project schedule and a software reference manual. The software and reference manual will be returned to the Contractor at completion of the Contract.

#### 1.2 SUBMITTALS:

- A. Project Schedule: After Contract Award and before the Preconstruction Conferences, submit one electronic copy on PC compatible CD-ROM and 2 paper copies of the proposed project schedule, and accompanying CPM Schedule Reports.
- B. Project Schedule Updates: On or before the 7th day preceding the progress payment request date, submit estimates of the percent completion of each schedule activity and necessary supporting data. Provide two paper copies and one electronic copy.
- C. Project Schedule Revisions and Time Impact Analysis: Submit one electronic copy and two paper copies of a Time Impact Analysis. Each Time Impact Analysis shall include a Fragmentary Network (Fragnet) demonstrating how the Contractor proposes to incorporate a modification, change, delay, or Contractor request into the project schedule.
- D. Schedule of Values
  - 1. After Contract Award and before the Preconstruction Conferences, submit a schedule of dollar values based on the Contract Bid Schedule. Breakdown each lump-sum bid item into component parts of work for which progress payments may be requested. The total costs for the component parts of work shall equal the bid amount for that lump-sum item. The Contracting Officer may request data to verify accuracy of dollar values. Include mobilization, general condition costs, overhead and profit in the total dollar value of unit price items and in the component parts of work for each lump-sum item, as described below. Do not include mobilization, general condition costs, overhead or profit as a separate item.
  - 2. Do not break down unit price bid items. Use only the bid amount for unit price items.

3. The total cost of all items shall equal the contract sum. The Schedule of Values will form the basis for progress payments.
4. An acceptable Schedule of Values shall be agreed upon by the Contractor and Contracting Officer before the first progress payment is processed.

### 1.3 PRELIMINARY REQUIREMENTS

- A. Meeting: The Contractor shall meet with the Contracting Officer on the day of the preconstruction conference to go over any questions or issues relating to the initial schedule review comments, and check on the progress of incorporating the review comments.
- B. Contractor's Schedule Representative: Before or at the preconstruction conference, designate in writing and provide the qualifications of an authorized representative in the Contractor's organization who shall be responsible for coordinating with the Contracting Officer during the preparation and maintenance of the project schedule.

### 1.4 PROJECT SCHEDULE

- A. Schedule Development:
  1. The late finish date shown on the schedule shall be the same date as the last day of the contract period.
  2. The Contractor shall use the Precedence Diagram Method (PDM) with limited use of lead or lag duration's between schedule activities. The Contractor's project schedule shall consist of procurement activities (including mobilization, submittal, and the fabrication and delivery of key and long-lead procurement items) and construction activities.
  3. The Contractor's project schedule shall consist of, but not be limited to, the following for each activity:
    - a. Identify each and every activity number with numerical designations (maximum 5-digit). Numbering of activities shall be in increments of 10 digits.
    - b. Concise description of the work represented by the activity (maximum 48 characters). Avoid the use of non-standard abbreviations. The work related to each activity shall be limited to one work trade.
    - c. Activity duration in whole working days with a maximum duration of 15 work days each, unless otherwise approved by the Contracting Officer, except for non-construction activities including mobilization, shop drawing and sample submittals, fabrication of materials, delivery of materials and equipment, and concrete curing.
  4. In developing the project schedule, ensure that subcontractor work at all tiers, as well as the prime contractor's work, is included and coordinated in the project schedule.
  5. The project schedule as developed shall show the sequence and interdependence of activities required for complete performance of the work. Ensure all work sequences are logical and the project schedule shows a coordinated plan of the work.
  6. Proposed duration assigned to each activity shall be the Contractor's best estimate of time required to complete the activity considering the scope and resources planned for the activity.
  7. Resource loading of each activity shall list all personnel by labor category and equipment type and capacity proposed to complete the activity in the duration shown.
  8. Consider seasonal weather conditions in planning and scheduling all work influenced by high or low ambient temperatures, wind and/or precipitation to ensure completion of all work within the contract time. Show anticipated weather conditions on project calendar.

B. Joint Review, Revision, and Acceptance:

1. Within seven calendar days of receipt of the Contractor's proposed project schedule, the Contracting Officer and Contractor shall meet for joint review, correction, or adjustment of the proposed project schedule. Any areas which, in the opinion of the Contracting Officer, conflict with timely completion of the project shall be subject to revision by the Contractor.
2. In the event the Contractor fails to define any element of work, activity, or logic, and the Contracting Officer review does not detect this omission or error, such omission or error, when discovered by the Contractor or Contracting Officer, shall be corrected by the Contractor at the next monthly project schedule update and shall not affect the contract time.
3. Within seven calendar days after the joint review between the Contractor and Contracting Officer, the Contractor shall revise and resubmit the project schedule in accordance with agreements reached during the joint review.
4. Upon acceptance of the project schedule by the Contracting Officer, the project schedule will be used to evaluate the Contractor's monthly applications for payment based upon information developed at the monthly project schedule update meeting.

1.5 PROJECT SCHEDULE UPDATES

- A. General: Update the project schedule on a monthly basis throughout the entire contract time and until project substantial completion. The status date of each schedule update shall be the 7th day preceding the progress payment request date.
- B. Procedure: The Contractor shall meet with the Contracting Officer each month at a project schedule update meeting to review actual progress made through the status date of the project schedule update, including dates activities were started and/or completed and the percentage of work completed on each activity started and/or completed.
- C. Progress Payments: The monthly updating of the project schedule shall be an integral part of the process upon which progress payments will be made under this contract. If the contractor fails to provide schedule updates or revisions, then a portion of his monthly payment may be retained until such corrections have been made.

1.6 PROJECT SCHEDULE REVISIONS

- A. Required Revisions: If, as a result of the monthly schedule update, it appears the project schedule no longer represents the actual prosecution and progress of the work, the Contracting Officer will request, and the Contractor shall submit, a revision to the project schedule. The Contractor may also request reasonable revisions to the project schedule in the event the Contractor's planning for the work is revised. If the Contractor desires to make changes in the project schedule, the Contractor shall notify the Contracting Officer in writing, stating the reason for the proposed revision. Accepted revisions will be incorporated into the project schedule at the next monthly schedule update.
- B. Procedure: If revision to the project schedule is contemplated, the Contractor or Contracting Officer shall so advise the other in writing at least seven calendar days prior to the next schedule update meeting, describing the revision and setting forth the reasons therefore. Government-requested revisions to the project schedule will be presented in writing to the Contractor, who shall respond in writing within seven calendar days.

1.7 TIME IMPACT ANALYSIS FOR CONTRACT MODIFICATIONS, CHANGES, DELAYS, AND CONTRACTOR REQUESTS

- A. Requirements: When contract modifications or changes are initiated, delays are experienced, or the Contractor desires to revise the project schedule, the Contractor shall submit to the Contracting Officer a written time impact analysis illustrating the influence of each modification, change, delay, or Contractor request on the contract time.
- B. Time Extensions: Activity delays shall not automatically mean that an extension of the contract time is warranted or due the Contractor. It is possible that a modification, change, or delay will not affect existing critical path activities or cause non-critical activities to become critical. A modification, change, or delay may result in only absorbing a part of the available total float that may exist within an activity chain of the project schedule, thereby not causing any effect on the contract time. Time extensions will be granted in accordance with the terms of the contract.
- C. Float: Float is not for the exclusive use or benefit of either the Government or the Contractor. Extension of the contract time will be granted only to the extent the equitable time adjustments to the activity or activities affected by the modification, change, or delay exceeds the total (positive or zero) float available on a particular activity.
- D. Procedure: Each time impact analysis shall be submitted within the time period stated in a request for proposal, or the time period designated under the clauses entitled Changes or Default. In cases where the Contractor does not submit a written request for extension of time and a time impact analysis within the designated time, it is mutually agreed that the particular modification, change, delay, or Contractor request does not require an extension of the contract time. Upon acceptance, the time impact analysis shall be incorporated into the project schedule at the next monthly schedule update.

1.8 MONTHLY INSPECTIONS

- A. Project record drawings as specified in Section 01770.
- B. Operation and maintenance data binders as specified in Section 01785.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION Not used.

END OF SECTION

## SECTION 01330 - SUBMITTALS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The work of this section consists of submittal requirements before and during construction.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01770 – Project Closeout

#### 1.3 SUBMITTAL AND APPROVAL PROCEDURES

- A. All material submittals shall be transmitted using National Park Service form CM-16, dated 4/00. (A copy of the form is included at the end of this section.) No action will be taken on a submittal item unless accompanied by the transmittal form.
- B. A submittal list has been attached to the end of this specification section for your convenience. The intent is to provide an overall summary of submittal requirements and not a comprehensive list. The terms and conditions of the contract still require you to satisfy the requirements of the individual specification sections regardless of what is shown on the submittal list. Forward submittals to Contracting Officer at least 30 days before need for approval. Unless a different number is specified, submit four copies of each shop drawing, four copies of manufacturer's catalog sheets (cut sheets), four specimens of each sample, and four copies of all other submittals requested.
- C. As specified in the individual sections, forward submittals to Contracting Officer at least 30 days before need for approval. Unless a different number is specified, submit one reproducible original and three copies of each shop drawing, four copies of manufacturer's catalog sheets (cut sheets), four specimens of each sample, and four copies of all other submittals requested.
  - 1. Shop Drawings: Include the following information with each copy of shop drawings:
    - a. Date.
    - b. Date of revisions (when applicable).
    - c. Contractor's certification that shop drawing has been checked for compliance with contract documents.
    - d. Details of fabrication, assembly and erection including connections and engagement to contiguous work.
    - e. Materials used.
    - f. All required dimensions.
    - g. The term "by others" shall not be used. All work to be performed by others shall be identified by Contractor or subcontractor name, discipline, or trade.
  - 2. Samples: Samples shall be large enough to illustrate clearly the functional characteristics and full range of color, texture, or pattern.
  - 3. Manufacturers' Catalog Sheets: Submit only pertinent pages; mark each copy of standard printed data to identify specific products proposed for use.

4. Manufacturer's Installation Instructions: When contract documents require compliance with manufacturer's printed instructions, provide one complete set of instructions for Contracting Officer and keep another complete set of instructions at the project site until substantial completion.
- D. Contracting Officer reserves the right to require submittals in addition to those called for in individual sections. If the contractor intends on supplying materials that differ from the salient characteristics specified in the individual sections, than a submittal will be required.
- E. Approved Equals:
1. For each item proposed as an "approved equal," submit supporting data, including:
    - a. Drawings and samples as appropriate.
    - b. Comparison of the characteristics of the proposed item with that specified.
    - c. Changes required in other elements of the work because of the substitution.
    - d. Name, address, and telephone number of vendor.
    - e. Manufacturer's literature regarding installation, operation, and maintenance, including schematics for electrical and hydraulic systems, lubrication requirements, and parts lists. Describe availability of maintenance service, and state source of replacement materials.
  2. A request for approval constitutes a representation that Contractor:
    - a. Has investigated the proposed item and determined that it is equal or superior in all respects to that specified.
    - b. Will provide the same warranties for the proposed item as for the item specified.
    - c. Has determined that the proposed item is compatible with interfacing items.
    - d. Will coordinate the installation of an approved item and make all changes required in other elements of the work because of the substitution.
    - e. Waives all claims for additional expenses that may be incurred as a result of the substitution.
  3. Construction Materials: The Contractor is encouraged to submit for approval products made out of recycled or environmentally responsible material. Every effort will be made by the National Park Service to approve these materials.
- F. Coordinate all submittals and review them for legibility, accuracy, completeness, and compliance with contract requirements. Forward submittals that are related to or affect one another as a package to facilitate coordinated review. Each transmittal shall contain only data specific to that individual submittal.
- G. Documents required in division 1 are to be delivered under separate cover letter. Do not use the CM-16 Transmittal form for these documents.
- H. Submittal Identification:
1. Contracting Officer will provide a project identification stamp which shall be applied by the Contractor. Identification shall include the park name-package number, project title, contract number, and transmittal number.

2. All sets of shop drawings, manufacturer's catalog sheets, samples, and other documents submitted to the Contracting Officer must have the identification information stamped on the submittal. If the material is bound it will not be necessary to stamp every page, but clearly stamp the cover page with the identification stamp.
3. Identification information shall be applied to the bottom right margin on each page. Identification information on samples shall be applied to the most readily visible area on the sample or on tags attached to sample.

I. Submittal Numbering:

1. Number each submittal consecutively.
2. For re-submittals use the original submittal number, plus a letter suffix beginning with A.
3. Additional re-submittals of the same item shall contain the original number with the next consecutive letter.

J. Contracting Officer's Review:

1. Submittals will be returned disapproved without technical review if identification information is missing, not filled in, or if placed on the back of the submittal; an incorrect number or format of submittals is provided; the transmittal form is incorrectly filled out; submittals are not coordinated; or submittals do not show evidence of Contractor's approval.
2. Any work done or orders for materials or services placed before approval shall be at the Contractor's own risk.
3. After reviewing submittals, the Contracting Officer will return one copy of form CM-16 and one copy of applicable (marked up) submittal sheets to the Contractor. Shop drawing review notations will be returned on the reproducible original shop drawing. All other submitted items will be retained. The Contractor is responsible for producing additional copies for his/her own use.
4. The returned submittal will be marked in one of three ways as defined below:
  - a. APPROVED: Acceptable with no corrections.
  - b. APPROVED WITH NOTATIONS: Minor corrections or clarifications required. All comments are clear and no further review is required. The Contractor shall address all review comments when proceeding with the work.
  - c. DISAPPROVED - RESUBMIT: Rejected as not in accordance with the contract or as requiring major corrections or clarifications. The Contracting Officer will identify the reasons for disapproval. The Contractor shall revise and resubmit with changes clearly identified.

PART 2 - PRODUCTS - Not used.

PART 3 - EXECUTION Not used.

END OF SECTION



# TRANSMITTAL - NATIONAL PARK SERVICE

Transmittal No.:  
Sheet: 1 of:

Park: \_\_\_\_\_ Project: \_\_\_\_\_ Contract No.: \_\_\_\_\_

PMIS No.: \_\_\_\_\_ Date: \_\_\_\_\_

Contractor: \_\_\_\_\_ Subcontractor/Supplier: \_\_\_\_\_

### NPS ACTION

Item No.	Specification Section No.	Paragraph No.	Description of Item (Size, Type, Name, Manufacturer, Use, Etc.)	No. of Copies Submitted	No. of Copies Returned	Approved	Approved with Notations	Disapproved - Resubmit

Contractor Signature \_\_\_\_\_ Recommended by \_\_\_\_\_

Title, Date \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_

I hereby certify that this submittal has been reviewed for accuracy, completeness, and compliance with contract requirements (FAR 52.236-21)

Review Comments \_\_\_\_\_ Action By \_\_\_\_\_ Date \_\_\_\_\_

Contracting Officer's Representative

Approval of this submittal is subject to the provisions of the contract drawings and specifications. This action is for general concurrence only and the Government is not responsible for errors or omission.

SUBMITTAL LOG DATES: From contractor [\_\_\_\_], To reviewer [\_\_\_\_], From reviewer [\_\_\_\_], To Contractor [\_\_\_\_]  
 Distribution: ( ) Contractor ( ) DSC File ( ) COR ( ) A/E ( ) DSC Interim ( ) COR Interim ( ) Contractor Interim CM-16Rev. 4/00

# TRANSMITTAL CONTINUATION - NATIONAL PARK SERVICE

Transmittal No.:  
Sheet: 1 of:

Park: \_\_\_\_\_ Project: \_\_\_\_\_ Contract No.: \_\_\_\_\_

PMIS No.: \_\_\_\_\_ Date: \_\_\_\_\_

Contractor: \_\_\_\_\_ Subcontractor/Supplier: \_\_\_\_\_

## NPS ACTION

Item No.	Specification Section No.	Paragraph No.	Description of Item (Size, Type, Name, Manufacturer, Use, Etc.)	No. of Copies Submitted	No. of Copies Returned	Approved	Approved with Notations	Disapproved - Resubmit

Review Comments

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**"MATERIAL SUBMITTAL LIST AND REVIEW ESTIMATE"  
INSTRUCTIONS**

PHASE OF WORK	RESPONSIBLE PARTY	DESCRIPTION OF TASKS
<p align="center"><b>DESIGN SERVICES (CONSTRUCTION DOCUMENTS PHASE)</b></p>	<p align="center"><b>Design A/E</b></p>	1. Fill out Park/PMIS/Project title cell with project reference information.
		2. Use this form to record construction submittal requirements for the project. Fill out the Specification Section, Paragraph number, Description columns on the left side of the form. Insert additional rows, as required, for sections containing multiple submittals.
		3. In the columns designated "REQUIREMENTS (indicate with an 'X')", indicate the submittal requirement(s) by placing an "X" in the appropriate box(s).
		4. Copy the "List Of Material Submittals" side of the form (Yellow portion), and attach a black and white version to the end of specification section 01330 in the project manual. Delete instructional notes on the top and bottom of the page.
<p align="center"><b>CONSTRUCTION SERVICES (CONSTRUCTION PHASE)</b></p>	<p align="center"><b>Construction COR</b></p>	1. Utilize the "List Of Material Submittals" form submitted with the Final Construction Documents. If amendments have been issued make adjustments to the submittal requirements if necessary.
		2. Indicate which submittals will be reviewed by the Construction Management Representative (CMR) in the field by placing an "X" in the far right column. If more than one submittal item is indicated on the same row and the review duties will be split between the A/E and CMR, then add another row and copy/paste the CMR items to that new row and indicate CMR field review. The objective is to clearly indicate who is responsible for the submittal review, CMR or A/E.
		3. Attach this form to the "A/E Construction Services" Scope of Services.
		4. Utilize this form to generate the estimated time required for the AE to accomplish the submittal reviews by inserting your estimated number of hours per discipline under corresponding column headings.
		5. Add discipline headings columns, as required.
		6. Use the total number of hours per discipline at the bottom of the form and apply the hourly rates listed in the IDIQ base contract to formulate the government estimate for submittal reviews.
		7. Use the information contained within this form to negotiate the submittal review portion of the AE Construction Services task order.
		8. Provide this form to the CMR so they have an understanding of which submittals they are responsible for and which are to be forwarded to the AE.
	<p align="center"><b>AE</b></p>	1. Indicate level of effort required for each submittal review by inserting the number of hours for each discipline under the "A/E Review Time (Indicate number of hours)" column.
		2. Submittals shown with an "X" in the far right column under "CMR Field Review" will not be the A/E's responsibility and these rows are to be left blank.
3. Use the total number of hours indicated for each discipline and apply the appropriate rates from the IDIQ base contract to formulate your estimate.		
4. Use this estimate to negotiate the submittal review portion of the AE Construction Services portion of the task order.		



## SECTION 01350 - ARCHEOLOGICAL PROTECTION

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The work of this section consists of protecting archeological resources contained in soil deposits.

#### 1.2 DEFINITIONS

- A. Archeological Resources: Archeological resources are the physical evidences of past human activity, including evidences of the effects of that activity on the environment. Archeological resources represent both prehistoric and historic time periods. They are found above and below ground and under water.
- B. Archeologically Sensitive Areas: Areas that have the potential to contain significant (National Register eligible) archeological resources. If National Register eligible or listed archeological resources could not be avoided, an appropriate mitigation strategy would be developed in consultation with the state historic preservation officer and, if necessary, associated American Indian tribes.
- C. Non-sensitive Areas: Areas with little, if any, potential of containing significant (National Register eligible) archeological resources.
- D. Archeological Monitor: Representative of the Government designated to oversee construction activities that could disturb archeological resources.
- E. Archeological Resources Protection Act (ARPA) of 1979 (P.L. 96-95; 93 Stat. 712): defines archeological resources as any material remains of past human life or activities that are of archeological interest and at least 100 years old; Section 4 of the statute describes the requirements that must be met before Federal authorities can issue a permit to excavate or remove any archeological resource on Federal or Indian lands; the curatorial requirements of artifacts, and other materials excavated or removed.

#### 1.3 SUBMITTALS

- A. 30 days before start of ground-disturbing site work, submit a Daily Work Schedule, detailing construction work in archeologically sensitive areas. Key schedule to drawings and include the following information.
  - 1. Starting and ending dates of ground-disturbing construction.
  - 2. Locations of temporary facilities, such as barriers, field offices, staging areas, sanitary facilities, borrow pits, and haul and access roads.
  - 3. Types of construction, such as clearing, topsoil stripping, structure or trench excavation, landscaping, and post construction clean-up.
  - 4. Methods and equipment used for each type of construction.

5. Plan for relocating work in the event of temporary work stoppages at each archeologically sensitive area.

B. For archeological investigation carried out by non-NPS personnel, the following applies:

1. A permit is required for any archeological investigations (e.g. excavation, shovel testing, coring, pedestrian survey, underwater archeology, rock art documentation, or other types of reconnaissance including the archaeological monitoring of construction) carried out on parklands by non-NPS personnel, unless carried out under a contract or a cooperative agreement specifically written for archeological investigations. Permits are issued under the Archaeological Resources Protection Act of 1979 (ARPA). The NPS does not issue a permit for archeological investigations carried out by NPS archeologists, or to archeologists working on NPS archeological projects under a contract or cooperative agreement provided that the requirements of ARPA have otherwise been met.
2. Applicants should submit a Permit Application (DI Form 1926 (Rev Sept 2004) OMB No. 1024-0037, approved through 1/31/2008 – the Permit Application form is available in pdf format) to the manager of the park in which they propose to work; or to the regional director, with a copy to the park manager.

#### 1.4 QUALITY ASSURANCE

- A. At least one week before on-site work begins, Contractor shall meet with Contracting Officer and Archeological Monitor to discuss Daily Work Schedule and equipment and special methods to be used in archeologically sensitive areas. Contractor shall ensure that approved Daily Work Schedule is followed throughout construction.

### PART 2 - PRODUCTS

#### 2.1 BARRICADES

- A. Section 01560.

### PART 3 - EXECUTION

#### 3.1 BARRICADES

- A. Construct as specified in Section 01560. Locate as directed by Contracting Officer.

#### 3.2 OBSERVATION

- A. Archeological Monitor will observe all ground-disturbing site work, including construction of temporary facilities, at all archeologically sensitive areas, from a safe location mutually agreed on by Contractor and Monitor. As new ground is broken, Monitor will examine excavated materials, using construction layout centerline and perimeter staking as a reference point to record locations of findings.

#### 3.3 DISCOVERY OF RESOURCES

- A. If Archeological Monitor discovers resources, immediate relocation of the work to a nonsensitive area may be required to allow Monitor to take soil samples and record resources. While Archeological Monitor is documenting resources in sensitive areas, Contractor shall relocate work to nonsensitive areas where monitoring is not normally required.
- B. If resources are discovered while Archeological Monitor is absent, stop work immediately and report the discovery to the Contracting Officer.

#### 3.4 WORK STOPPAGE

- A. The Contractor shall plan, schedule, and execute the work to prevent stoppages at one area from stopping all work at the construction site.

END OF SECTION



## SECTION 01360 - ACCIDENT PREVENTION

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The work of this section consists of establishing an effective accident prevention program and providing a safe environment for all personnel and visitors.

#### 1.2 SUBMITTALS

- A. Accident Prevention Program: After contract award and before the Pre-construction conference, submit for approval an accident prevention program. The Contracting Officer will review the proposed program for compliance with OSHA and project requirements. If the program requires any revisions or corrections, the Contractor shall resubmit the program within 10 days. No progress payments will be made until the program is approved. The program shall include:
  - 1. Name of responsible supervisor to carry out the program.
  - 2. Weekly and monthly safety meetings.
  - 3. First aid procedures.
  - 4. Outline of each phase of the work, the hazards associated with each major phase, and the methods proposed to ensure property protection and safety of the public, National Park Service personnel, and Contractor's employees. Identify the work included under each phase by reference to specification section or division numbers.
  - 5. Training, both initial and continuing.
  - 6. Planning for possible emergency situations, such as floods, fires, cave-ins, slides, explosions, power outages, and wind storms. Such planning shall take into consideration the nature of construction, site conditions, and degree of exposure of persons and property.
  - 7. Housekeeping: Section 01570.
  - 8. Fire Protection: Section 01510.
  - 9. Blasting Plan: Section 02305.
- B. Certificates: Provide certificates from a mechanic that all mechanical equipment has been inspected and meets OSHA requirements.
- C. Submit a copy of test reports, as required by OSHA, for personnel working with hazardous materials.
- D. Submit a report of safety meetings and of inspections.
- E. Upon request, submit proof of employees' qualifications to perform assigned duties in a safe manner

#### 1.3 QUALITY ASSURANCE

- A. Comply with the clauses entitled "Accident Prevention" and "Permits and Responsibilities" of the contract. In case of conflicts between Federal, state, and local safety and health requirements, the most stringent shall apply. Equipment or tools not meeting OSHA requirements will not be allowed on the project sites. Failure to comply with the requirements of this section and related sections may result in suspension of work.
- B. Qualifications of Employees:

1. Ensure that employees are physically qualified to perform their assigned duties in a safe manner.
2. Do not allow employees to work whose ability or alertness is impaired because of drugs, fatigue, illness, intoxication, or other conditions that may expose themselves or others to injury.
3. Operators of vehicles, mobile equipment, hoisting equipment, and hazardous plant equipment shall be able to understand signs, signals, and operating instructions, and be capable of operating such equipment. Provide operating instructions for all equipment. Newly hired operators shall be individually tested by an experienced operator or supervisor to determine if they are capable of safely operating equipment.

#### 1.4 ACCIDENT REPORTING

- A. Reportable Accidents: A reportable accident is defined as death, occupational disease, traumatic injury to employees or the public, property damage by accident in excess of \$100, and fires. Notify Contracting Officer immediately in the event of a reportable accident. Within 7 days of a reportable accident, fill out and forward to Contracting Officer an Accident/Property Damage Report (Form CM-22). Form may be obtained from the Contracting Officer.
- B. All Other Accidents: The Contractor shall report all other accidents to the Contracting Officer as soon as possible and assist the Contracting Officer and other officials as required in the investigation of the accident.

### PART 2 -

#### 2.1 FIRST AID FACILITIES

- A. Provide adequate facilities for the number of employees and the type of construction at the site.

#### 2.2 PERSONNEL PROTECTIVE EQUIPMENT

- A. Meet requirements of NIOSH and MSHA.

#### 2.3 BARRIERS

- A. Section 01560.

### PART 3 - EXECUTION

#### 3.1 EMERGENCY INSTRUCTIONS

- A. Post telephone numbers and reporting instructions for ambulance, physician, hospital, fire department, and police in conspicuous locations at the work site.

#### 3.2 FIRE AND LIFE SAFETY

- A. Provide and maintain the fire and life safety requirements in NFPA 241 (Standard for Safeguarding Construction, Alteration, and Demolition Operations).

- B. Contractor shall have a Hazard Communications Plan; store hazardous materials in accordance with manufacturer's and OSHA recommendations; immediately report all spills of hazardous materials to the park; and maintain a spill emergency response kit.

### 3.3 PROTECTIVE EQUIPMENT

- A. Inspect personal protective equipment daily and maintain in a serviceable condition. Clean, sanitize, and repair, as appropriate, personal items before issuing them to another individual.
- B. Inspect and maintain other protective equipment and devices before use and on a periodic basis to ensure safe operation.

### 3.4 SAFETY MEETINGS

- A. As a minimum, conduct weekly 15-minute "toolbox" safety meetings. These meetings shall be conducted by a foreman and attended by all construction personnel at the worksite.
- B. Conduct monthly safety meetings for all levels of supervision. Notify the Contracting Officer of meeting dates and times. These meetings shall be used to review the effectiveness of the Contractor's safety effort, to resolve current health and safety problems, to provide a forum for planning safe construction activities, and for updating the accident prevention program. The Contracting Officer will attend the meeting and enter the results of the meetings into the daily log.

### 3.5 HARD HATS AND PROTECTIVE EQUIPMENT AREAS

- A. A hard hat area will be designated by the Contracting Officer. The hard hat area shall be posted by the Contractor in a manner satisfactory to the Contracting Officer.
- B. It is the Contractor's responsibility to require all those working on or visiting the site to wear hard hats and other necessary protective equipment at all times. As a minimum, provide six hard hats for use by visitors. Change liners before reissuing hats.

### 3.6 TRAINING

- A. First Aid: Provide adequate training to ensure prompt and efficient first aid.
- B. Hazardous Material: Train and instruct each employee exposed to hazardous material in safe and approved methods of handling and storage. Hazardous materials are defined as explosive, flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful substances that could cause death or injury.

END OF SECTION



## SECTION 01420 - REFERENCE STANDARDS

### PART 1 - GENERAL

1.1 The following abbreviations, which may be used in the construction specifications, refer to the organizations and specifications of the organizations listed below:

AA	Aluminum Association 900 19th Street, NW, Suite 300 Washington, D.C. 20006-2168
AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503 Washington, D.C. 20005
AAMA	American Architectural Manufacturers Association 1827 Walden Office Square, Suite 104 Schaumburg, Illinois 60173-4268
AAN	see ANLA
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, NW, Suite 249 Washington, D.C. 20001
ABMA	American Boiler Manufacturers Association 950 N. Glebe Road, Suite 160 Arlington, Virginia 22203-1824
ACI	American Concrete Institute P.O. Box 9094 Farmington Hills, Michigan 48333-9094
ACPA	American Concrete Pipe Association 222 West Las Colinas Boulevard, Suite 641 Irving, Texas 75039-5423
ADAAG	Americans with Disabilities Act Accessibility Guidelines The Access Board 1331 F Street, NW, Suite 1000 Washington, DC 20004-1111 <a href="http://www.access-board.gov">http://www.access-board.gov</a>

ADC Air Diffusion Council  
11 South LaSalle Street, Suite 1400  
Chicago, Illinois 60603

AFPA American Forest and Paper Association  
1111 19th Street, NW, Suite 800  
Washington, D.C. 20036

AGA American Gas Association  
1515 Wilson Boulevard  
Arlington, Virginia 22209

AHA American Hardboard Association  
1210 W. Northwest Highway  
Palatine, Illinois 60067-1897

AHAM Association of Home Appliance Manufacturers  
20 N. Wacker Drive, Suite 1500  
Chicago, Illinois 60606

AI Asphalt Institute  
Research Park Drive  
P.O. Box 14052  
Lexington, Kentucky 40512-4052

AISC American Institute of Steel Construction  
1 East Wacker Drive, Suite 3100  
Chicago, Illinois 60601-2001

AISI American Iron and Steel Institute  
1101 17th Street, NW  
Washington, D.C. 20036-4700

AITC American Institute of Timber Construction  
7012 S. Revere Parkway, Suite 140  
Englewood, Colorado 80112

ALSC American Lumber Standards Committee  
P.O. Box 210  
Germantown, Maryland 20875

AMCA Air Movement and Control Association International, Inc.  
30 W. University Drive  
Arlington Heights, Illinois 60004-1893

ANLA American Nursery and Landscape Association  
1250 I Street, NW, Suite 500  
Washington, D.C. 20005

ANSI American National Standards Institute  
11 West 42nd Street, 13th Floor  
New York, New York 10036

APA American Plywood Association (See EWA)

APWA American Public Works Association  
106 West 11th Street, Suite 1800  
Kansas City, Missouri 64105-1806

ARI Air-Conditioning and Refrigeration Institute  
4301 Fairfax Drive, Suite 425  
Arlington, Virginia 22203

ARMA Asphalt Roofing Manufacturers Association  
Center Park, 4041 Powder Mill Road, Suite 404  
Calverton, Maryland 20705

ASC Adhesive and Sealant Council  
1627 K Street, NW, Suite 1000  
Washington, D.C. 20006-1707

ASHRAE American Society of Heating, Refrigerating, and Air-Conditioning Engineers  
1791 Tullie Circle, NE  
Atlanta, Georgia 30329-2305

ASLA American Society of Landscape Architects  
4401 Connecticut Avenue, NW  
Fifth Floor  
Washington, D.C. 20008-2369

ASME American Society of Mechanical Engineers  
345 East 47th Street  
New York, New York 10017

ASPE American Society of Plumbing Engineers  
3617 Thousand Oaks Boulevard, Suite 210  
Westlake, California 91362-3649

ASSE American Society of Sanitary Engineering  
28901 Clemens Road, Suite 100  
Westlake, Ohio 44145

ASTM American Society for Testing and Materials  
100 Barr Harbor Drive  
West Conshohocken, Pennsylvania 19428-2959

AWI Architectural Woodwork Institute  
1952 Isaac Newton Square  
Reston, Virginia 20190

AWPA American Wood-Preservers' Association  
3246 Fall Creek Highway, Suite 1900  
Granbury, Texas 76049-7979

AWPI American Wood Preservers Institute  
1945 Old Gallows Road, Suite 550  
Vienna, Virginia 22182

AWS American Welding Society, Inc.  
550 NW LeJeune Road  
Miami, Florida 33126

AWWA American Water Works Association  
6666 W. Quincy Avenue  
Denver, Colorado 80235

BHMA Builders Hardware Manufacturers Association, Inc.  
355 Lexington Avenue, 17th Floor  
New York, New York 10017-6603

BIA Brick Institute of America  
11490 Commerce Park Drive  
Reston, Virginia 22091-1525

BOCA Building Officials Code Administrators  
4051 W. Flossmoor Road  
Country Club Hills, Illinois 60478-5795

CBM Certified Ballast Manufacturers  
1422 Euclid Avenue, Suite 402  
Cleveland, Ohio 44115-2851

CDA Copper Development Association, Inc.  
260 Madison Avenue, 16th Floor  
New York, New York 10016-2401

CE	Corps of Engineers 20 Massachusetts Avenue, NW Washington, D.C. 20314
CID	Commercial Item Description See contract clauses
CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Road, Suite 419 Chattanooga, Tennessee 37421
CLFMI	Chain Link Fence Manufacturers Institute 9891 Broken Land Parkway, Suite 300 Columbia, Maryland 21046
CRA	California Redwood Association 405 Enfrente Drive, Suite 200 Novato, California 94949
CRI	Carpet and Rug Institute 310 S. Holiday Avenue Dalton, Georgia 30722-2048
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, Illinois 60173-4758
CS	Commercial Standard of NBS (U.S. Department of Commerce) Government Printing Office Washington, D.C. 20402
CSSB	Cedar Shingle and Shake Bureau 515 116th Avenue, NE, Suite 275 Bellevue, Washington 98004-5294
DHI	Door and Hardware Institute 14170 Newbrook Drive Chantilly, Virginia 22021-2223
EPA	Environmental Protection Agency 401 M Street, SW Washington, D.C. 20460

EWA APA- The Engineered Wood Association  
P.O. Box 11700  
Tacoma, Washington 98411-0700

FHA Federal Housing Administration  
(U.S. Department of Housing and Urban Development)  
451 7th Street, SW  
Washington, D.C. 20410

FHVA Fine Hardwood Veneer Association  
260 S. First Street, Suite 2  
Zionsville, Indiana 46077

FM Factory Mutual System  
1151 Boston-Providence Turnpike  
P.O. Box 9102  
Norwood, Massachusetts 02062-9102

FS Federal Specifications  
See contract clauses

GA Gypsum Association  
810 First Street, NE, Suite 510  
Washington, D.C. 20002

GANA Glass Association of North America  
3310 SW Harrison Street  
Topeka, Kansas 66611-2279

HI Hydronics Institute  
35 Russo Place  
P.O. Box 218  
Berkeley Heights, New Jersey 07922

HMA Hardwood Manufacturers Association  
400 Penn Center Boulevard, Suite 530  
Pittsburgh, Pennsylvania 15235-5605

HPMA Hardwood Plywood Manufacturers Association  
P.O. Box 2789  
Reston, Virginia 22090-2789

IA Irrigation Association  
1911 N. Fort Myer Drive, Suite 1009  
Arlington, Virginia 22209-1630

IBC International Building Code (by International Code Council formerly ICBO)

ICBO International Conference of Building Officials  
5360 S. Workman Mill Road  
Whittier, California 90601

ICEA Insulated Cable Engineers Association, Inc.  
P.O. Box 440  
South Yarmouth, Massachusetts 02664

IEEE The Institute of Electrical and Electronics Engineers  
345 E. 47th Street  
New York, New York 10017-2394

IES Illuminating Engineering Society of North America  
120 Wall Street, 17th Floor  
New York, New York 10005-4001

IGCC See ITS

ILIA Indiana Limestone Institute of America, Inc.  
Stone City Bank Building, Suite 400  
Bedford, Indiana 47421

ITS Internek Testing Services  
3393 Route 11  
P.O. Box 2040  
Cortland, New York 13045-7902

KCMA Kitchen Cabinet Manufacturers Association  
1899 Preston White Drive  
Reston, Virginia 22091-4326

LIA Lead Industries Association, Inc.  
295 Madison Avenue  
New York, New York 10017

MBMA Metal Building Manufacturer's Association  
c/o Thomas Associates, Inc.  
1300 Sumner Avenue  
Cleveland, Ohio 44115-2851

MFMA Maple Flooring Manufacturers Association  
60 Revere Drive, Suite 500  
Northbrook, Illinois 60062

MIA Marble Institute of America  
30 Eden Alley, Suite 201  
Columbus, Ohio 43215

MIMA Mineral Insulation Manufacturers Association  
1420 King Street  
Alexandria, Virginia 22314

MLSFA Metal Lath/Steel Framing Association - A Division of NAAMM  
8 South Michigan Avenue, Suite 1000  
Chicago, Illinois 60603

MS Military Standardization Documents  
See contract clauses

MSHA Mine Safety and Health Administration  
4015 Wilson Boulevard, Room 601  
Arlington, Virginia 22203

MSS Manufacturers Standardization Society of the Valve and Fittings Industry  
127 Park Street, NE  
Vienna, Virginia 22180-4602

NAAMM The National Association of Architectural Metal Manufacturers  
8 South Michigan Avenue, Suite 1000  
Chicago, Illinois 60603

NACE National Association of Corrosion Engineers  
1440 South Creek Drive  
P.O. Box 218340  
Houston, Texas 77218-8340

NAIMA North American Insulation Manufacturers Association  
44 Canal Center Plaza, Suite 310  
Alexandria, Virginia 22314

NAPA National Asphalt Pavement Association  
NAPA Building  
5100 Forbes Boulevard  
Lanham, Maryland 20706-4413

NAPCA National Association of Pipe Coating Applicators  
8th Floor, Commercial National Bank Building  
333 Texas Street, Suite 800  
Shreveport, Louisiana 71101-3673

NBS National Bureau of Standards  
(U.S. Department of Commerce)(See NIST)

NCMA National Concrete Masonry Association  
2302 Horse Pen Road  
Herndon, Virginia 20171-3499

NEC National Electrical Code (by NFPA)

NECA National Electrical Contractors Association  
3 Bethesda Metro Center, Suite 1100  
Bethesda, Maryland 20814

NELM Northeastern Lumber Manufacturers' Association  
272 Tuttle Road  
P.O. Box 87A  
Cumberland Center, Maine 04021-0687

NEII National Elevator Industry, Inc.  
185 Bridge Plaza North, Suite 310  
Fort Lee, New Jersey 07024

NEMA National Electrical Manufacturers Association  
1300 N. 17th Street, Suite 1847  
Rosslyn, Virginia 22209

NFPA National Fire Protection Association  
1 Batterymarch Park  
P.O. Box 9101  
Quincy, Massachusetts 02269-9101

NHLA National Hardwood Lumber Association  
P.O. Box 34518  
Memphis, Tennessee 38184-0518

NHPMA Northern Hardwood and Pine Manufacturers Association, Inc.,  
c/o Northern Softwood Lumber Bureau  
Box 217  
Dear River, Minnesota 56636

NIOSH National Institute for Occupational Safety and Health  
NIOSH Building 1, Room 3007  
1600 Clifton Road, NE  
Atlanta, Georgia 30333

NIST National Institute of Standards and Technology  
(US Department of Commerce)  
Building 101, #A1134  
Route I-270 and Quince Orchard Road  
Gaithersburg, Maryland 20899

Send requests for publications to:  
Superintendent of Documents  
Government Printing Office  
Washington, D.C. 20402

NOFMA National Oak Flooring Manufacturers Association  
P.O. Box 3009  
Memphis, Tennessee 38173-0009

NPA National Particleboard Association  
18928 Premiere Court  
Gaithersburg, Maryland 20879-1569

NRCA National Roofing Contractors Association  
O'Hare International Center  
10255 W. Higgins Road, Suite 600  
Rosemont, Illinois 60018-5607

NSF NSF International  
(Formerly National Sanitation Foundation)  
3475 Plymouth Road  
P.O. Box 130140  
Ann Arbor, Michigan 48113-0140

NTMA The National Terrazzo and Mosaic Association  
3166 Des Plaines Avenue, Suite 121  
Des Plaines, Illinois 60018

NWWDA National Wood Window and Door Association  
1400 East Touhy Avenue, Suite G-54  
Des Plaines, Illinois 60018

OSHA Occupational Safety and Health Administration  
U.S. Department of Labor  
200 Constitution Avenue, NW  
Washington, D.C. 20210

PCA Portland Cement Association  
5420 Old Orchard Road  
Skokie, Illinois 60077-1083

PCI        Precast/Prestressed Concrete Institute  
            175 W. Jackson Boulevard  
            Chicago, Illinois 60604

PDI        Plumbing and Drainage Institute  
            45 Briston Drive, Suite 101  
            South Euston, Massachusetts 02375

PEI        Porcelain Enamel Institute, Inc.  
            4004 Hillsboro Pike, Suite 224-B  
            Nashville, Tennessee 37215

PI         Perlite Institute, Inc.  
            88 New Dorp Plaza  
            Staten Island, New York 10306

PS         Product Standard of NBS (U.S. Department of Commerce)  
            Government Printing Office  
            Washington, D.C. 20402

RFCI      Resilient Floor Covering Institute  
            966 Hungerford Drive, Suite 12-B  
            Rockville, Maryland 20850-1714

RIS        Redwood Inspection Service (Grading Rules)  
            405 Enfrente Drive, Suite 200  
            Novato, California 94949

RMMI      Rocky Mountain Masonry Institute  
            1780 South Bellaire Street, No. 602  
            Denver, Colorado 80222

SCMA      Southern Cypress Manufacturers Association  
            400 Penn Center Blvd., Suite 530  
            Pittsburgh, Pennsylvania 15235

SDI        Steel Deck Institute  
            P.O. Box 25  
            Fox River Grove, Illinois 60021

SDI        Steel Door Institute  
            30200 Detroit Road  
            Cleveland, Ohio 44145-1967

SFPA Southern Forest Products Association  
P.O. Box 52468  
New Orleans, Louisiana 70152

SGCC See ITS

SIGMA Sealed Insulating Glass Manufacturers Association  
401 N. Michigan Avenue  
Chicago, Illinois 60611-4267

SJI Steel Joist Institute  
3127 10th Avenue, North Ext.  
Myrtle Beach, South Carolina 29577-6760

SMACNA Sheet Metal and Air-Conditioning Contractors' National Association, Inc.  
4201 Lafayette Center Drive  
P.O. Box 221230  
Chantilly, Virginia 20151-1209

SPIB Southern Pine Inspection Bureau (Grading Rules)  
4709 Scenic Highway  
Pensacola, Florida 32504-9094

SSPC Steel Structures Painting Council  
40 24th Street, 6th Floor  
Pittsburgh, Pennsylvania 15222-4643

SWI Steel Window Institute  
c/o Thomas Associates, Inc.  
1300 Sumner Avenue  
Cleveland, Ohio 44115-2851

TCA Tile Council of America  
100 Clemson Research Boulevard  
Anderson, South Carolina 29625

TIMA Thermal Insulation Manufacturers Association (See NAIMA)

TPI Truss Plate Institute  
583 D'Onofrio Drive, Suite 200  
Madison, Wisconsin 53719

UBC Uniform Building Code (by ICBO)

UL Underwriters Laboratories, Inc.  
333 Pfingsten Road  
Northbrook, Illinois 60062

USDA U.S. Department of Agriculture  
14th Street and Independence Avenue, SW  
Washington, D.C. 20250

WCLB West Coast Lumber Inspection Bureau (Grading Rules)  
P.O. Box 23145  
Portland, Oregon 97281-3145

WIC Woodwork Institute of California  
P.O. Box 980247  
West Sacramento, California 95798-0247

WMMPA Wood Moulding and Millwork Producers Association  
507 First Street  
Woodland, California 95695

WRI Wire Reinforcement Institute, Inc.  
203 Loudoun Street, SW  
Leesburg, Virginia 20175-2718

WSFI Wood and Synthetic Flooring Institute (See MFMA)

WWPA Western Wood Products Association (Grading Rules)  
Yeon Building  
522 SW 5th Avenue  
Portland, Oregon 97204-2122

WWPA Woven Wire Products Association  
2515 Nordica Avenue  
Chicago, Illinois 60635

WWPI Western Wood Preservers Institute  
7017 NE Highway 99 #108  
Vancouver, Washington 98665

PART 2 - PRODUCTS - Not used.

PART 3 - EXECUTION - Not used.

END OF SECTION

## SECTION 01430 - CONTRACTOR QUALITY CONTROL

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The work of this section consists of preparing and executing a Quality Control Program.

#### 1.2 RELATED REQUIREMENTS

- A. "Inspection of Construction" clause of the contract.

#### 1.3 SUBMITTALS

- A. Quality Control Plan:

1. After contract award and before the Pre-Construction conference, submit for approval a written Contractor Quality Control (CQC) plan.
2. If the plan requires any revisions or corrections, the Contractor shall resubmit the plan within 10 days.
3. The Government reserves the right to require changes in the plan during the contract period as necessary to obtain the quality specified.
4. No change in the approved plan may be made without written concurrence by the Contracting Officer.
5. The plan shall include:
  - a. A list of personnel responsible for quality control and assigned duties. Include each person's qualifications.
  - b. A copy of a letter of direction to the Contractor's Quality Control Supervisor outlining assigned duties.
  - c. Names, qualifications, and descriptions of laboratories to perform sampling and testing, and samples of proposed report forms.
  - d. Methods of performing, documenting, and enforcing quality control of all work.
  - e. Methods of monitoring and controlling environmental pollution and contamination as required by regulations and laws.

- B. Contractor's Quality Control Daily Reports: Submit showing all inspections and tests on the first workday following the date covered by the report. Utilize the forms attached at the end of this section.

- C. Test Reports:

1. Submit Daily Test Information Sheets with Quality Control Daily Reports.
2. Submit failing test results and proposed remedial actions within four hours of noted deficiency.
3. Submit three copies of complete test results not later than one calendar days after the test was performed.

- D. CQC Accessibility Inspection Report: Submit report not later than three calendar days after the inspection was performed.
- E. Off-Site Inspection Reports: Submit prior to shipment.
- F. If the CQC plan and Quality Control Daily Reports are not submitted as specified, the Contracting Officer may retain all payments until such time a plan is accepted and implemented, or may retain payments for work completed on days there are no Quality Control daily reports.

#### 1.4 QUALITY ASSURANCE

##### A. General:

1. The quality of all work shall be the responsibility of the Contractor. Testing shall be the responsibility of an independent testing laboratory.
2. Inspect and test all work as needed to ensure that the quality of materials, workmanship, construction, finish, and functional performance is in compliance with applicable specifications and drawings.
3. Utilize the attached CQC Accessibility Inspection form to document compliance with the Architectural Barriers Act Accessibility Standards (ABAAS). Inspect at various stages of construction as needed to insure the finished product meets the guidelines. Fill out the applicable sections of the CQC Accessibility Inspection Report and attach to the Quality Control Daily Report.
4. Quality Control Daily Reports shall be completed by the Quality Control Supervisor.
5. Test reports shall be completed by person performing the test.
6. The Contracting Officer may designate locations of tests.

##### B. Quality Control Staff:

1. The Contractor's Quality Control Supervisor may also perform the duties of Project Superintendent.
2. The Contractor's Quality Control Supervisor shall be assigned no other duties.
3. The Contractor's Quality Control Supervisor shall be assigned no other duties.
4. The Contractor's designated Quality Control Supervisor shall be on the project site whenever contract work is in progress.
5. The Contractor's job supervisory staff may be used to assist the Quality Control Supervisor, supplemented as necessary by additional certified testing technicians.

##### C. Testing Laboratory and Equipment:

1. Employ certified independent laboratories to perform sampling and testing. The testing laboratory organization shall be certified for the type of testing work to be done.
2. All measuring devices, laboratory equipment, and instruments shall be calibrated at established intervals against certified standards in accordance with NBS requirements. Upon request, measuring and testing devices shall be made available for use by the Government for verification tests.
3. Accessibility Measuring Equipment
  - a. Electronic Level: Electronic level with digital display accurate within 0.1 degrees.

Level identifies any angle in 3 different modes: degrees, % slope and pitch. SmartTool™ 24 Inch Smart Level by M-D Building Products or approved equal.

- b. Door Pressure Gauges: Door pressure gauge as supplied by HMC INT'L. DIV., INC., 5996 South Crocker Street, Littleton, Colorado 80120-2054, Phone (303) 794-2510 or approved equal.

PART 2 - PRODUCTS            Not used.

PART 3 - EXECUTION

3.1        OFF-SITE CONTROL

- A. Items that are fabricated or assembled off-site shall be inspected for quality control at the place of fabrication.

3.2        ON-SITE CONTROL

A. Notification:

- 1. Notify the Contracting Officer at least 48 hours in advance of the preparatory phase meeting.
- 2. Notify the Contracting Officer at least 24 hours in advance of the initial and follow-up phases.

B. Preparatory Phase: Perform before beginning each feature of work.

- 1. Review control submittal requirements with personnel directly responsible for the quality control work. As a minimum, the Contractor's Quality Control Supervisor and the foreman responsible for the feature of work shall be in attendance.
- 2. Review all applicable specifications sections and drawings related to the feature of work.
- 3. Ensure that copies of all referenced standards related to sampling, testing, and execution for the feature of work are available on site.
- 4. Ensure that provisions have been made for field control testing.
- 5. Examine the work area to ensure that all preliminary work has been completed.
- 6. Verify all field dimensions and advise the Contracting Officer of discrepancies with contract documents.
- 7. Ensure that necessary equipment and materials are at the project site and that they comply with approved shop drawings and submittals.
- 8. Document all preparatory phase activities and discussions on the Contractor's Quality Control Daily Report.

C. Initial Phase:

- 1. As soon as work begins, inspect and test a representative portion of a particular feature of work for quality of workmanship.
- 2. Review control testing procedures to ensure compliance with contract requirements.
- 3. Document all initial phase activities and discussions on the Contractor's Quality Control Daily Report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

- D. Follow-Up Phase: Inspect and test as work progresses to ensure compliance with contract requirements until completion of work.
- E. Additional Preparatory and Initial Phases: Additional preparatory and initial phases may be required on the same feature of work for the following reasons:
  - 1. Quality of on-going work is unacceptable.
  - 2. Changes occur in the applicable quality control staff, on-site production supervision, or work crew.
  - 3. Work on a particular feature of work is resumed after a substantial period of inactivity.

### 3.3 DOCUMENTATION

- A. Maintain Quality Control Daily Reports, Daily Test Report Information Sheets, and CQC Accessibility Inspection Reports (attached) of quality control activities and tests.
- B. Quality Control Daily Reports may not be substituted for other written reports required under clauses of the contract, such as Disputes, Differing Site Conditions, or Changes.

### 3.4 ENFORCEMENT

- A. The Contractor shall stop work on any item or feature pending satisfactory correction of any deficiency noted by the quality control staff or the Contracting Officer.

END OF SECTION

**CONTRACTOR'S QUALITY CONTROL DAILY REPORT**

REPORT NO. \_\_\_\_\_ SHEET 1 OF \_\_\_\_\_

PROJECT			CONTRACT NO.		DATE	
PARK			CONTRACTOR'S REPRESENTATIVE ON THE JOB			
WEATHER (Rain, Snow, Cloudy, Windy, etc.)	RAINFALL Inches	TEMPERATURE MAX.   MIN.		GROUND CONDITIONS (Dry, Damp, Wet, Frozen, etc.)		
<b>1. PRIME CONTRACTOR</b>						
NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments
WORK PERFORMED BY PRIME CONTRACTOR:						
MATERIALS DELIVERED			OFFICIAL VISITORS TO SITE			
2A. SUBCONTRACTOR, _____: (If more than one subcontractor use copies of following page.)						
NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments
WORK PERFORMED BY SUBCONTRACTOR:						
3. SPECIFIC INSPECTIONS: (Inspections performed, results, and corrective actions)						
4. TESTING: <input type="checkbox"/> Check if any testing was performed today. (Complete and attach Test Report Information Sheets.)						
Type and Location of Testing: _____						
5. VERBAL INSTRUCTION RECEIVED FROM GOVERNMENT ON CONSTRUCTION DEFICIENCIES OR RE-TESTING REQUIRED:						
6. REMARKS:						
7. CERTIFICATION:						
I certify that the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the prime contractor and each subcontractor and determined that all materials, equipment, and workmanship are in strict compliance with the plans and specifications except as may be noted above.						
						Contractor's Quality Control Representative

SUBCONTRACTOR WORK CONTINUED:

CONTRACT NO.

REPORT NO. \_\_\_\_\_  
SHEET \_\_\_\_ OF \_\_\_\_

2 SUBCONTRACTOR,						
NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments
WORK PERFORMED BY SUBCONTRACTOR:						
2 SUBCONTRACTOR,						
NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments
WORK PERFORMED BY SUBCONTRACTOR:						
2 SUBCONTRACTOR,						
NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments
WORK PERFORMED BY SUBCONTRACTOR:						
2 SUBCONTRACTOR,						
NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	COMMENTS
WORK PERFORMED BY SUBCONTRACTOR:						

**DAILY TEST REPORT INFORMATION SHEET**

CONTRACT NO. \_\_\_\_\_ REPORT NO. \_\_\_\_\_

SHEET \_\_\_\_ OF \_\_\_\_

1. Individual Making Inspection or Test:	
2. Testing Laboratory; Name:	Phone #:
Address: _____	
3. Description of Work and Test Method: _____	
4. Location of Samples and Tests or Inspections: _____	
5. Specification Section:	
6. Inspection or Test Data: _____	
7. Test Results and Interpretations of Test Results: _____	
8. Comments or Professional Opinion About Compliance of Inspected Work or Tested Work with contract Document Requirements:	
9. Recommendations: _____	
10. Corrective Actions Taken: _____	

**CERTIFICATION:**

I certify that the above testing report is complete and correct and that all testing performed this day for this contract is in strict compliance with the plans and specifications except as noted above.

\_\_\_\_\_  
Signature of Inspector

# CQC ACCESSIBILITY INSPECTION REPORT

CONTRACT NO. \_\_\_\_\_ REPORT NO. \_\_\_\_\_

SHEET \_\_\_\_ OF \_\_\_\_

Note: This report covers only the most common accessibility requirements. This form can be expanded as needed for elements not shown. Inspect for compliance with all requirements of the ABAAS.

CQC Inspector: \_\_\_\_\_

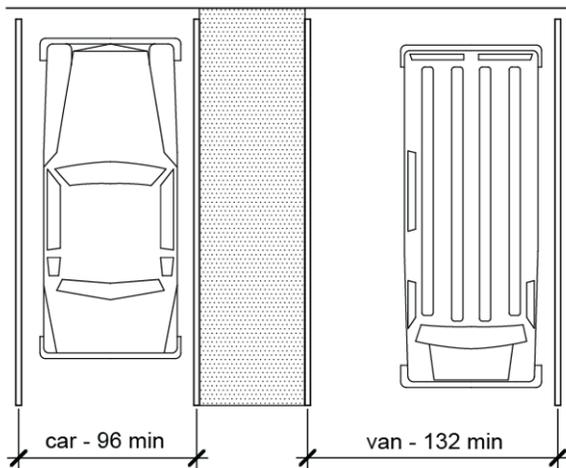
Date: \_\_\_\_\_

1. Parking and Passenger Loading Zones: Attach grading plan with running and cross slope readings noted.

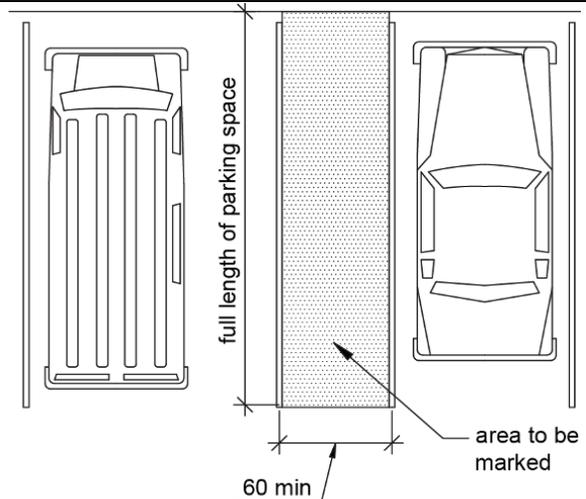
- a) Yes  No  Accessible parking spaces and access aisles running slope and cross slope is 1:48 (2%) or less.
- b) Yes  No  Car spaces are at least 96 inches wide and van spaces 132 inches wide, and have an adjacent access aisle.
- c) Yes  No  Access aisles are 60 inches wide min. and adjoin an accessible route.
- d) Yes  No  Curb ramps meet slope requirements for ramps and have 36 inch minimum landing length at top of ramp.
- e) Yes  No  Curb ramp flared side slopes are 1:10 (10%) or less.

Inspection Results: \_\_\_\_\_

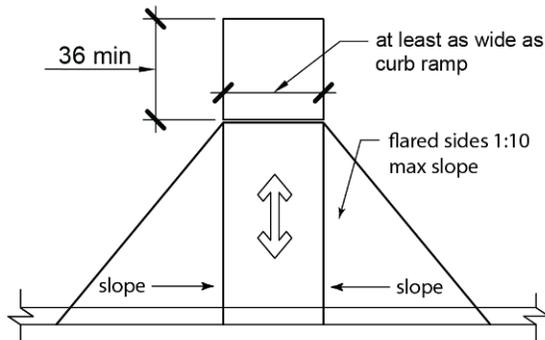
Corrective Actions Needed/Taken: \_\_\_\_\_



1.b) Parking Space Widths



1.c) Access Aisle



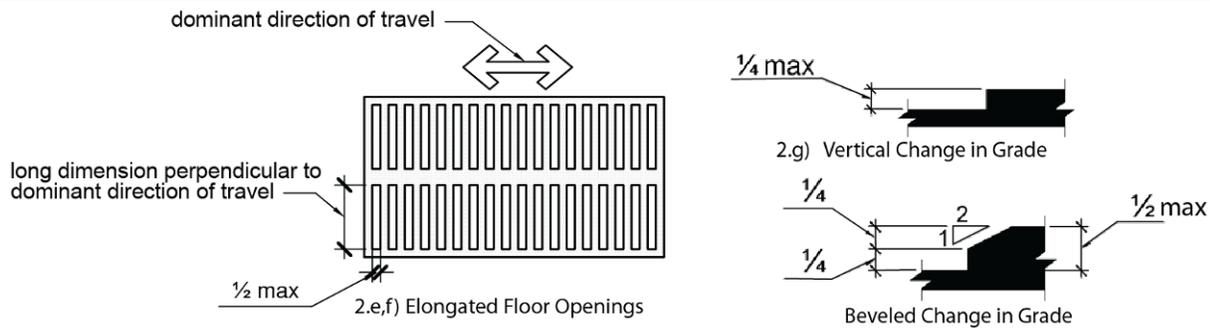
1.d,e) Curb Ramp Sides and Landings

2. Walking surfaces and Accessible Route: The accessible route is defined as the pedestrian route from the accessible parking and passenger loading zones to all accessible facilities and features. Attach grading plan with accessible route highlighted and running and cross slope readings noted.

- a) Yes  No  Floor and ground surfaces are stable, firm, and slip resistant as defined by ADAABAAG Advisory 302.1
- b) Yes  No  Running slope of all walking surfaces on the accessible route is 1:20 (5%) or less.
- c) Yes  No  Cross slope of walking surfaces is 1:48 (2%) or less.
- d) Yes  No  Clear widths of walking surfaces are 36 inches minimum.
- e) Yes  No  Elongated openings in floor or ground surfaces are 1/2 inch wide or less.
- f) Yes  No  Elongated openings are perpendicular to direction of travel.
- g) Yes  No  Accessible route surface changes are 1/2 inch or less with 1/4 inch maximum vertical change.
- h) Yes  No  Floor drains and grates on accessible route meet all above requirements

Inspection Results: \_\_\_\_\_

Corrective Actions Needed/Taken: \_\_\_\_\_

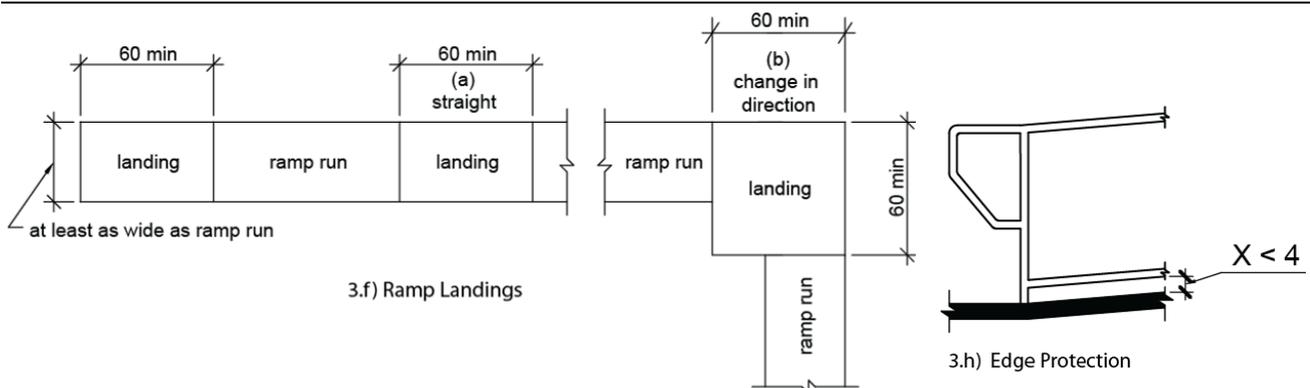


3. Ramps: Ramps are defined as walking surfaces on the accessible route that are steeper than 1:20 (5%) but less than 1:12 (8.33%). Attach grading plan with running and cross slope readings noted.

- a) Yes  No  Running slope is 1:12 (8.33%) or less. Measured at 2-foot intervals.
- b) Yes  No  Cross slope is 1:48 (2%) or less. Measured at 2-foot intervals.
- c) Yes  No  Clear width is 36 inches minimum, clear width between handrails is 36 inches minimum.
- d) Yes  No  Rise for any ramp run is 30 inches maximum.
- e) Yes  No  Ramps have landings at the top and the bottom of each ramp run.
- f) Yes  No  Landing clear length is 60 inches minimum, running slope and cross slope of landing is 1:48 (2%) or less.
- g) Yes  No  Ramps with a rise greater than 6 inches have handrails.
- h) Yes  No  Ramps and landings have edge protection on both sides that prevents passage of a 4 inch diameter sphere.

Inspection Results: \_\_\_\_\_

Corrective Actions Needed/Taken: \_\_\_\_\_

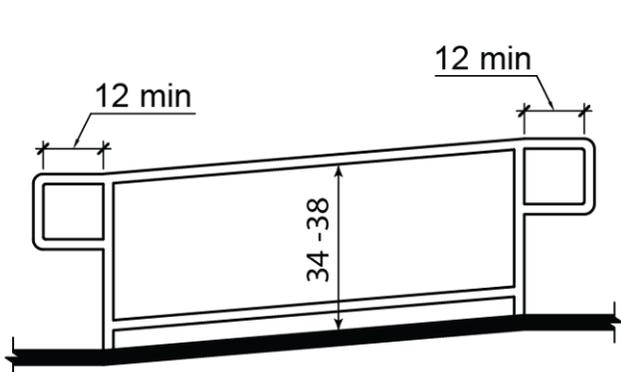


4. Handrails:

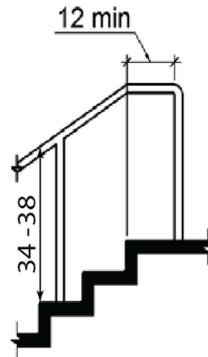
- a) Yes  No  Top of handrail is 34 inches minimum and 38 inches maximum vertically above walking surfaces.
- b) Yes  No  Handrails extend 12 inches minimum beyond the top and bottom of ramp runs.
- c) Yes  No  Handrails extend horizontally 12 inches minimum at top of stairs.
- d) Yes  No  Handrails extend at slope of the stair flight at bottom of stairs minimum one tread depth beyond last riser.
- e) Yes  No  Handrail clearance is 1 1/2 inches clear minimum to walls and above horizontal attachments.

Inspection Results: \_\_\_\_\_

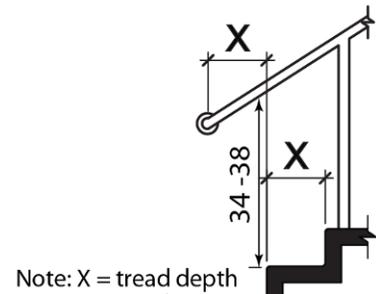
Corrective Actions Needed/Taken: \_\_\_\_\_



4.a,b) Handrail Extension at Top and Bottom of Ramp

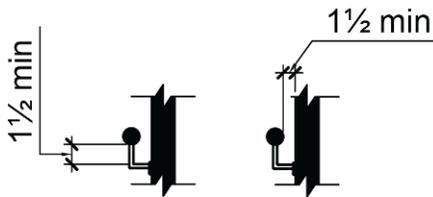


4.c) Handrail Extension at Top of Stair



Note: X = tread depth

4.d) Handrail Extension at Bottom of Stair



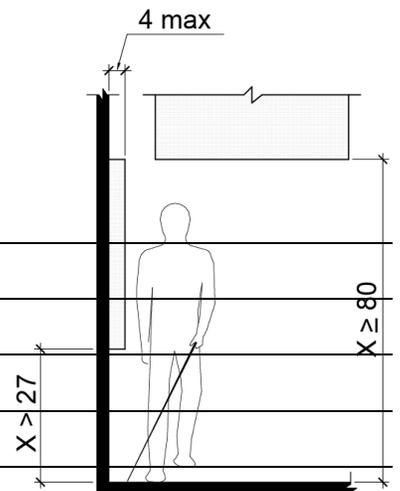
4.e) Handrail Clearance

5. Drinking fountains (Two spout heights required for each drinking fountain):

- a) Yes  No  Spout outlet is 36 inches maximum above the finish floor or ground for wheelchair accessible spout.
- b) Yes  No  Spout outlet for standing persons is 38 inches minimum and 43 inches maximum above the finish floor.
- c) Yes  No  Drinking fountain is recessed or has 27 inches maximum space from floor to bottom of fountain.

Inspection Results: \_\_\_\_\_

Corrective Actions Needed/Taken: \_\_\_\_\_



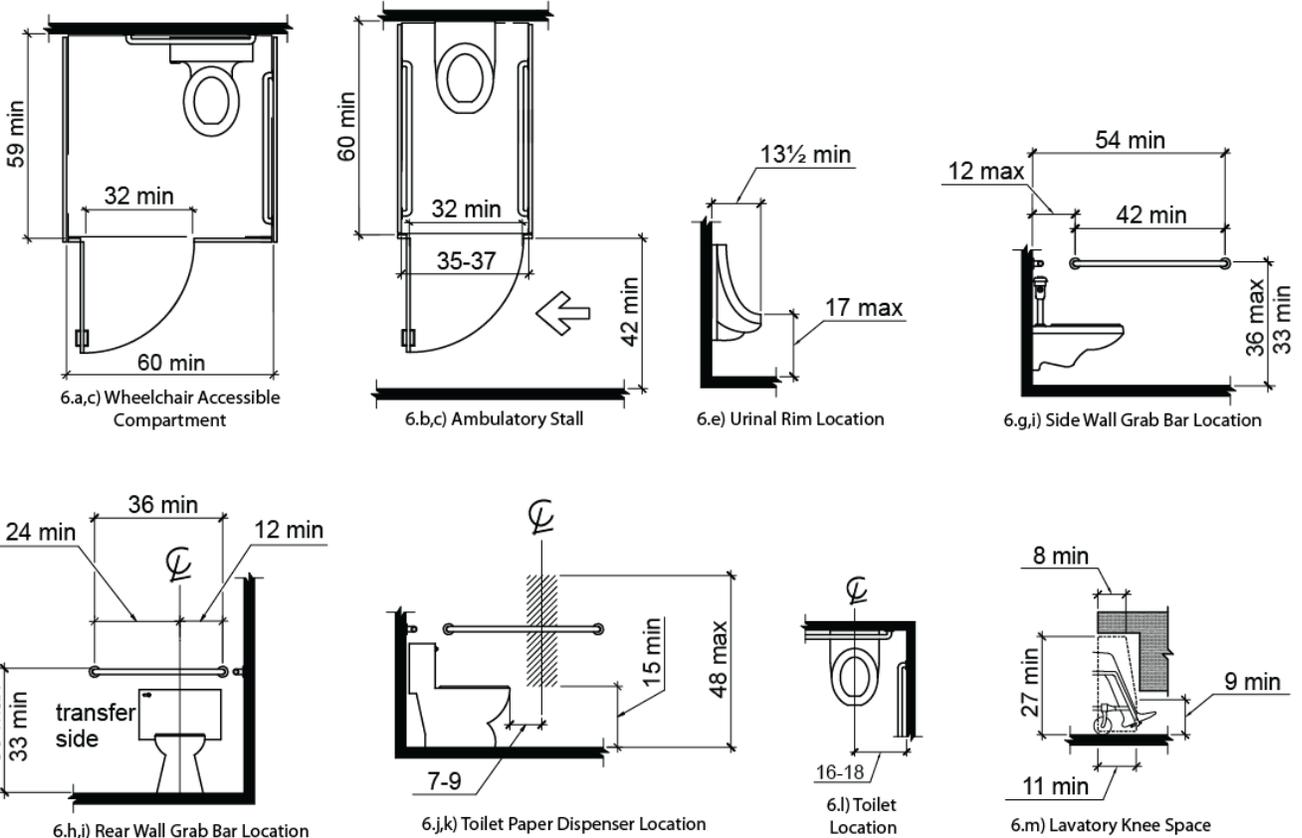
5.c) Limits of Protruding Objects

6. Toilet Compartments: Attach floor plan with as-constructed dimensions noted.

- a) Yes  No  Wheelchair accessible compartment is 60 inches wide min., and 59 inches deep minimum.
- b) Yes  No  Ambulatory stall is 60 inches deep min. width of 35 inches min. and 37 inches max, toilet is centered in stall.
- c) Yes  No  Accessible compartment has 32 inch wide door opening minimum with door opening outward, or adequate clear space for door opening inward.
- d) Yes  No  Seat height is 17 inches minimum and 19 inches maximum measured to the top of the seat.
- e) Yes  No  Urinal rim is 17 inches maximum above the finish floor and 13 1/2 inches deep minimum.
- f) Yes  No  Urinal has a clear floor space of 30 inches wide by 48 inches long minimum.
- g) Yes  No  Side wall grab bar is 42 inches long minimum, located 12 inches maximum from the rear wall.
- h) Yes  No  Rear wall grab bar is 36" long min. extends from toilet centerline 12" min. one side, 24" min. other side.
- i) Yes  No  Grab bar height is 33 inches minimum and 36 inches maximum.
- j) Yes  No  Toilet paper dispensers are 7 inches min. and 9 inches max. in front of the toilet to centerline of the dispenser.
- k) Yes  No  Toilet paper dispenser outlet is 15 inches minimum and 48 inches maximum above the finish floor.
- l) Yes  No  Centerline of the wheelchair stall toilet is 16 inches min. to 18 inches max. from the side wall.
- m) Yes  No  Sinks and counters are 34 inches max. above the finish floor with 27 inches min. knee space. Sink drain pipes are insulated, or concealed.

Inspection Results: \_\_\_\_\_

Corrective Actions Needed/Taken: \_\_\_\_\_



7. Service Counters, Dining and Work Surfaces: (Service counters are parallel or forward approach)

- a) Yes  No  Parallel Approach. Counter is 36 inches long min. and 36 inches high max.
- b) Yes  No  Forward Approach. Counter surface is 30 inches long min. and 36 inches high max, knee space under counter.
- c) Yes  No  Tops of dining and work surfaces are 28 inches minimum and 34 inches maximum above the finish floor.

Inspection Results: \_\_\_\_\_

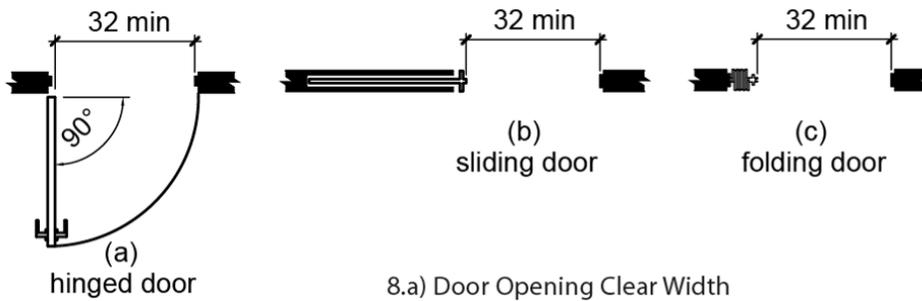
Corrective Actions Needed/Taken: \_\_\_\_\_

8. Doors:

- a) Yes  No  Door openings on accessible routes provide a clear width of 32 inches minimum.
- b) Yes  No  Door closers move door from open position of 90 degrees to 12 degrees from the latch is 5 seconds min.
- c) Yes  No  Spring hinge doors close from open position of 70 degrees to closed position in 1.5 seconds minimum.
- d) Yes  No  Fire doors have the minimum opening force allowable by the appropriate administrative authority.
- e) Yes  No  Interior hinged doors have an opening force of 5 pounds maximum.

Inspection Results: \_\_\_\_\_

Corrective Actions Needed/Taken: \_\_\_\_\_

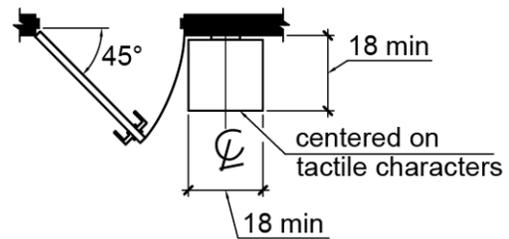
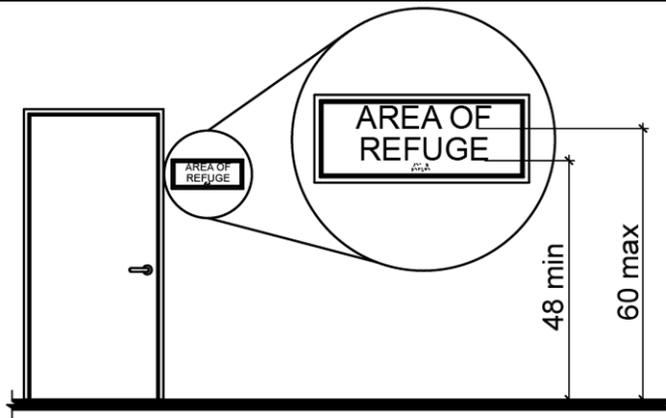


9. Signs:

- a) Yes  No  Parking space signs are 60 inches minimum above finish ground surface measured to the bottom of the sign.
- b) Yes  No  Van parking space sign includes the designation "van accessible".
- c) Yes  No  Tactile characters on signs are 48 inches minimum and 60 inches maximum above the finish floor.
- d) Yes  No  Sign is located alongside the door at the latch side.
- e) Yes  No  Sign is located with a clear floor space of 18 inches by 18 inches minimum.

Inspection Results: \_\_\_\_\_

Corrective Actions Needed/Taken: \_\_\_\_\_



CERTIFICATION:

I certify that the above inspection report is complete and correct and that this inspection is in compliance with the contract documents.

\_\_\_\_\_  
Signature of Inspector

## **SECTION 01510 - TEMPORARY SERVICES**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

- A. The work of this section consists of providing temporary services required for Contractor's performance of the work of this contract.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 01520 - Field Offices and Sheds.
- B. Section 01570 - Temporary Controls.

### **PART 2 - PRODUCTS**

#### **2.1 GENERAL**

- A. Temporary materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

#### **2.2 SANITARY FACILITIES**

- A. Provide and maintain temporary toilet facilities in accordance with State Health Department and National Park Service requirements.
- B. Sufficiently lighted and ventilated toilet facilities in weatherproof, sightproof, handicap accessible, sturdy enclosures with privacy locks.
- C. Provide separate facilities for men and women.

#### **2.3 FIRE PROTECTION EQUIPMENT**

- A. Extinguisher shall have a minimum UL rating of 2-A:10-B:C.

### **PART 3 - EXECUTION**

#### **3.1 ELECTRICITY AND LIGHTING**

- A. Make arrangements with utility company for metered connection to existing utility and pay all costs.
- B. There is no electrical service available at the project site. Contractor shall provide source for power and lighting.

- C. Provide connections to existing facilities. The Government will pay the costs of power used.
- D. Temporary Electrical: Temporary electrical work shall meet requirements of NFPA 70 (NEC), Article 305.
- E. When temporary connections are removed, restore existing utility services to their original condition.

### 3.2 HEATING, VENTILATING, AND COOLING

- A. Provide and maintain adequate approved facilities, as required for safety and construction requirements, during the progress of the work. Provide ample clearance around stoves and heaters and all chimney and vent connections to prevent ignition of combustible material.
- B. Furnish temporary heating and cooling. Use of permanent heating and cooling system will not be allowed without written authorization from Contracting Officer. When the permanent heating and cooling system is approved for use as temporary heating and cooling, pay all costs until final acceptance. Permanent heating and cooling system must be sufficiently complete, including controls, to permit safe operation.
- C. Install and maintain temporary filters when air handling equipment is used for temporary heating and cooling. Install new filters before final acceptance in addition to any extra sets of filters required. Clean coils as determined by Contracting Officer.
- D. Equipment warranties for equipment used for temporary heating and cooling shall start on date of Final Acceptance.

### 3.3 TELEPHONE

- A. No telephone service is available on site for Contractor's use. Make arrangements with Telephone company and pay all costs.
- B. Make arrangements with the telephone company to install <Insert Number> lines for the Contracting Officer's use and pay installation costs.

### 3.4 WATER

- A. Nonpotable water is available from <Insert Note Here>
- B. Arrange with utility company for potable water and pay all costs.
- C. Make connections to existing facilities for potable water. Government will pay costs for water used.
- D. Water for construction is not available within the park boundaries. The Contractor shall furnish water from a source outside the park boundary.

- E. Furnish cool, potable water for construction personnel in locations convenient to work stations.

### 3.5 SANITARY FACILITIES

- A. Place in approved locations secluded from public observation and convenient to work stations. Relocate as work progress requires.
- B. Maintain and clean toilet facilities at least weekly.
- C. Completely remove sanitary facilities on completion of work.

### 3.6 FIRE PREVENTION AND PROTECTION

- A. Responsible Person: A capable and qualified person shall be placed in charge of fire protection. The responsibilities shall include locating and maintaining fire protective equipment and establishing and maintaining safe torch cutting and welding procedures.
- B. Hazard Control: Take all necessary precautions to prevent fire during construction. Do not store flammable or combustible liquids in [**historic**] [**existing**] buildings. Provide adequate ventilation during use of volatile or noxious substances.
- C. Spark Arresters:
  - 1. Written determinations of periods and areas of potential fire hazard will be issued by Contracting Officer.
  - 2. Equip all gasoline or diesel powered equipment used during periods of potential fire hazards or in potential forest and grass fire locations with spark arresters approved by the USDA Forest Service.
- D. Service and Refueling Areas: Locate areas a minimum of 50 feet from buildings. Shut down equipment before refueling.
- E. Smoking: Smoking within buildings or temporary storage sheds is prohibited.
- F. Welding: Cutting by torch or welding shall be performed only when adequate fire protection is provided.

### 3.7 PROTECTION EQUIPMENT REQUIRED

- A. Buildings:
  - 1. Furnish a minimum of one extinguisher for each 1,500 square feet of area or major fraction thereof.
  - 2. Travel distance from any work station to the nearest extinguisher shall not exceed 75 feet.

- B. Vehicles and Equipment: Provide one extinguisher on each vehicle or piece of equipment. Check with park; many require “burn permits” for welding.

END OF SECTION

## SECTION 01520 - FIELD OFFICES AND SHEDS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The requirements of this section consist of furnishing, locating, and removing temporary structures, equipment, and furnishings.

#### 1.2 RELATED REQUIREMENTS

- A. Temporary services - Section 01510.

### PART 2 - PRODUCTS

#### 2.1 CONTRACTING OFFICER'S FIELD OFFICE

- A. The field office shall be a separate structure from the Contractor's office.
- B. Office Structure: Like-new condition.
  - 1. Prefabricated, job built, or a mobile unit; structurally sound, nonflammable exterior construction, weather tight, minimum [**300 square feet**].
  - 2. Operable windows and security screens, adjustable ventilation.
  - 3. Rest room (minimum of lavatory and toilet, with exhaust fan if room is windowless).
  - 4. Air conditioner and heater.
  - 5. Interior partition with lockable door to divide office
  - 6. Paneling or freshly painted walls, acoustical tile or painted ceilings, and resilient flooring.
  - 7. Two exterior doors with dead bolts keyed from outside,
  - 8. Minimum 20-square-foot landing and steps at each exterior door.
- C. Furnishings:
  - 1. Two desks with five drawers each and two chairs with casters; two drafting tables (minimum 40 inches wide by 5 feet long) and two stools; drawing rack; two 2-drawer and one 4-drawer legal size locking filing cabinets with keys; 8 feet of 12-inch deep shelving; coat rack; two additional guest chairs; two desk lamps; two drafting table lamps; and a maximum/minimum thermometer.
  - 2. Manufactured computer work station, capable of containing CPU, monitor, keyboard, printer; work station chair.
  - 3. Additional tables necessary for FAX machine and copier.
  - 4. Two 5-gallon trash cans and one 30-gallon trash can with lid.
  - 5. Outlets: Two four-outlet surge protectors.
  - 6. Refrigerator: Under counter, 3.2-cubic-foot volume with 0.8-cubic-foot freezer.

7. Fire Extinguisher: UL listed and FM approved, minimum rating of 2-A:10-B:C, dry chemical.
8. First-Aid Kit: General office/light industrial kit which includes antiseptic wipes, bandages, disposable gloves, tape, instant cold pack, dressing pads, eye pads, scissors, and Tylenol tablets. Provide small size, such as manufactured by Johnson & Johnson, New Brunswick, New Jersey, or approved equal.

D. Services: Provide heat, lights, power, air conditioning, and temporary water pressure and sewage holding tanks

## 2.2 CONTRACTOR'S FIELD OFFICE

A. Contractor may provide one office for his own use. Size, location, and construction shall be subject to approval.

## 2.3 STORAGE SHEDS

A. Temporary weathertight sheds or other covered facilities for storage of materials subject to weather damage. Number and size of structures shall be subject to Contracting Officer's approval.

## PART 3 - EXECUTION

### 3.1 CONTRACTING OFFICER'S FIELD OFFICE

A. Provide office, furnishings, and utility connections no later than 7 days after date of Notice to Proceed. Exact location will be determined by Contracting Officer.

B. Maintain furnishings, and structures. Provide weekly cleaning services and trash disposal. Maintain and service water and sewer holding tanks as required.

### 3.2 OTHER STRUCTURES

A. Locate where directed by Contracting Officer, a minimum of 50 feet from permanent structures.

### 3.3 REMOVAL

A. Remove structures, furnishings, and terminate services after punch list is 100 percent completed or when directed by Contracting Officer.

END OF SECTION

## **SECTION 01560 - BARRIERS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

- A. The work of this section consists of furnishing, installing, and maintaining barriers to protect existing facilities and the public from construction operations.

### **PART 2 - PRODUCTS**

#### **2.1 GENERAL**

- A. Material may be new or used, but shall be suitable for intended purpose. Fences and barriers shall be structurally adequate and neat in appearance.

#### **2.2 FENCING**

- A. Security Fence: Chain link, 2-inch mesh, minimum height, 6 feet.
- B. Safety Barrier Fence: Orange plastic fence, minimum height, 4 feet.

#### **2.3 BARRICADES AND SIGNS**

- A. Manual on Uniform Traffic Control Devices (MUTCD), Part VI, 2003 edition.

#### **2.4 LUMBER**

- A. Free of nails, large knot holes and splinters.

#### **2.5 BARRIER TAPE**

- A. Banner Guard, imprinted with "CAUTION: CONSTRUCTION AREA", manufactured by Reef Industries, Inc., Houston, Texas, or approved equal.

### **PART 3 - EXECUTION**

#### **3.1 PROTECTION OF PUBLIC**

- A. Fence, barricade, or otherwise block off the immediate work area to prevent unauthorized entry.
- B. Erect and maintain barricades, lights, danger signals, and warning signs in accordance with MUTCD-2003.

- C. Illuminate barricades and obstructions at night; keep safety lights burning from sunset to sunrise.
- D. Adequately barricade and post open cuts in or adjacent to thoroughfares.
- E. Protect pedestrian traffic by guardrails or fences.
- F. When pedestrian traffic is detoured onto a roadway, provide temporary walkways with protection as required at ends and overhead. For walkways, use lumber running parallel to direction of traffic movement and provide ramps at changes of elevation.
- G. Cover pipes, hoses, and power lines crossing sidewalks and walkways with troughs using beveled edge boards.
- H. Erect and maintain sufficient detour signs at road closures and along detour routes.

### 3.2 SECURITY FENCES

- A. Before starting work, install security fence with locked entrance gates as shown on the drawings.
- B. Enclose the entire area of construction.
- C. Locate vehicular gates to avoid interference with traffic on public thoroughfares.
- D. Locate pedestrian entrance gates as required to provide controlled personnel entry.

### 3.3 BARRIER TAPE

- A. Install where directed by Contracting Officer. Keep a minimum of two rolls on site at all times.

### 3.4 REMOVAL

- A. Completely remove barriers no longer needed when approved by Contracting Officer.

END OF SECTION

## SECTION 01570 - TEMPORARY CONTROLS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The work of this section consists of providing temporary controls.

#### 1.2 SUBMITTALS

- A. Recycling is strictly voluntary, but highly encouraged. If you chose to recycle, submit a plan that includes a list of materials to be recycled, proposed method, and location for disposal.

### PART 2 - PRODUCTS - Not used.

### PART 3 - EXECUTION

#### 3.1 HOUSEKEEPING

- A. Keep project neat, orderly, and in a safe condition at all times.
- B. Provide enough containers for collecting construction debris and construction materials to be recycled.
- C. Provide individually marked containers for recycling personal items, such as aluminum cans, newspapers, glass, plastic, corrugated cardboard. These items may be recycled by the Contractor or turned over to the Park recycling committee.
- D. Wet down dry materials and rubbish to prevent blowing dust.
- E. Keep volatile wastes in covered containers.
- F. Utilize excavated material as soon as possible.

#### 3.2 DISPOSAL

- A. Dispose of excess excavated material (including rocks and boulders) that cannot be used in construction outside the park.
- B. Unless otherwise specified, all removed material becomes the property of the Contractor and shall be disposed of outside the park.

1. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Roll off type dumpsters will be permitted at locations approved by the Contracting Officer, see Drawings for potential locations.
  
- C. Immediately remove hazardous rubbish from project site. Place other construction debris in refuse containers at least daily. Dispose of refuse at least weekly, in a legal manner, at public or private dumping areas outside the park. Do not burn or bury refuse inside the park.

### 3.3 AIR AND WATER POLLUTION CONTROL

- A. Take all necessary reasonable measures to reduce air and water pollution by any material or equipment used during construction.
- B. Do not dispose of volatile wastes or oils in storm or sanitary drains.
- C. Do not allow waste materials to be washed into streams or bodies of water.
- D. Sod or seed slopes, as specified in Section , as soon as possible to prevent erosion. If it is impossible to prevent erosion, the Contracting Officer may require construction of sedimentation basins to prevent water pollution.

END OF SECTION

## **SECTION 01571 - STORM WATER POLLUTION PREVENTION**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

- A. The work of this section consists of implementing measures to prevent Storm Water Pollution during construction activities, in accordance with Federal, State, and local regulations, and in accordance with the Storm Water Pollution Prevention Plan (SWPPP) to be prepared for this project.

#### **1.2 SUBMITTALS**

- A. Submit Storm Water Pollution Prevention Plan after contract award and before the pre-construction conference.
- B. Plans showing proposed arrangements and methods for control of erosion, sedimentation, and pollutant conveyance in storm water resulting from construction activities. Show that the Storm water Pollution Prevention Plan satisfies all Federal and State NPDES permit requirements.
- C. Provide sufficient information for evaluation of:
  - 1. Erosion protection measures and products;
  - 2. Drainage management strategies; and
  - 3. Surface restoration.
- D. Submit schedules for inspection and monitoring of all storm water pollution prevention measures.
- E. Submit manufacturer's product information and installation recommendations for silt fence, filter fabric and erosion control blanket, straw bales, and any other materials proposed for use on this project.

#### **1.3 QUALITY ASSURANCE**

- A. Before commencing construction activities, such as grading, excavation or filling in any part of the site, Contractor shall plan for temporary structures to guide runoff away from the work area and to capture eroded material before it reaches natural water courses. The measures shall be in accordance with reviewed and approved storm water pollution prevention plans.
- B. Arrange construction activities to minimize erosion to the maximum practical extent. Clearing, excavation, and grading shall be limited to those areas of the project site necessary for construction. Minimize the area exposed and unprotected.
- C. Clearly mark and delineate the limits of work activities. Equipment shall not be allowed to operate outside the limits of work or to disturb existing vegetation. Excavation and grading shall be completed during the dry season to the maximum extent possible.
  - 1. Contractor vehicles shall be parked in visitor's parking lot. Equipment and vehicles required for construction shall park in designated areas outside the tree safety zone (outside drip line).

#### 1.4 REGULATORY REQUIREMENTS

- A. Apply and obtain all required permits in a timely fashion, as there may be significant lead time in obtaining permits from the local NPDES Permitting Agency.
- B. Implement the requirements of the National Pollutant Discharge Elimination System (NPDES) for erosion control due to storm water runoff during construction.
- C. Notice of Intent (NOI)
  - 1. The Contractor shall file a Notice of Intent (NOI), implement the accepted SWPPP during construction and, upon completion of the construction, file a Notice of Termination (NOT), all as described in the following requirements. Implement all good housekeeping practices, inspections and record keeping.
  - 2. Provide a Draft SWPPP for the project which includes the following information and forms:
    - a. Site description.
    - b. Expected sequencing of operations and construction schedule.
    - c. Weather monitoring procedure.
    - d. Descriptions and details of erosion controls, including dust control.
    - e. Erosion control plans.
    - f. Controls for other potential onsite storm water pollutants.
    - g. Applicable specifications.
    - h. Maintenance and inspection procedures and forms.
    - i. Description of potential non-storm water discharges at site.
    - j. Notice of Intent (NOI) form. (Completed)
    - k. Notice of Termination (NOT) form. (Template)
    - l. Contractor and Sub-contractor Certification forms.
    - m. Other record keeping forms and procedures.
    - n. Good housekeeping practices and procedures, including vehicle wash-down areas, protection of equipment storage and maintenance areas, and sweeping of roadways related to hauling activities.
  - 3. The Contractor and the Contracting Officer (CO) will jointly review the draft SWPPP and agree to any needed revisions. The Contractor and the CO will then accept and sign the revised SWPPP. When the SWPPP is accepted, it will be the document in force on the project. The accepted SWPPP will describe and ensure implementation of the practices which will be used to reduce the pollutants in storm water discharges to assure compliance with the terms and conditions of the EPA permit. Place the SWPPP and all updates in a three-ring binder so that completed inspection forms and other records may be inserted. The Contractor shall maintain a current copy of the SWPPP and all associated records and forms at the jobsite throughout the duration of the project. The SWPPP shall be available for public inspection and for the inspection and use of the CO.
  - 4. Implement the SWPPP as required throughout the construction period and maintain all erosion control elements in proper working order. Do not perform clearing and grubbing or earthwork until the SWPPP has been implemented. Prior to construction, the Contractor and all subcontractors shall sign certifications (included in the SWPPP) that they understand the requirements of the NPDES permit. All subcontractors shall comply with the requirements of the NPDES under the supervision of the Contractor. The contractor shall designate the erosion control supervisor who will be responsible for implementing the SWPPP. The erosion control supervisor shall be familiar with the

SWPPP procedures and practices and shall ensure that emergency procedures and the SWPPP are updated as needed and available for inspection. The SWPPP (including inspection forms) and all data used to complete the NOI shall be provided to the CO at the completion of the project.

5. Inspections and Revisions to Plan:

- a. The Contractor and the CO will perform a weekly inspection of the site. The inspection shall include disturbed areas that have not been finally stabilized, areas used for storage of materials, locations where vehicles enter or exit the site, and all erosion and sediment controls that are included in the Plan. Inspections shall be documented on forms provided in the Plan. The inspection forms shall be retained onsite in the Plan notebook throughout the construction period.
- b. It may be necessary to revise the Plan during construction to make necessary improvements or revisions or to respond to unforeseen conditions noted during construction or site inspections. For that purpose, the Plan shall specify the mechanism whereby revisions may be proposed by the Contractor or the CO and incorporated into the Plan, including review and acceptance of minor changes. The Contractor and the CO will jointly accept and sign each revision to the Plan before implementation. Accepted modifications will be implemented within 7 calendar days following the date of the inspection when deficiencies or necessary corrections are first noted.
- c. Temporary erosion and pollution control measures shall be used to correct conditions that develop during construction that were not foreseen during design, that are needed prior to installation of permanent control features, or that are needed temporarily to control erosion that developed during normal construction practices but are not associated with permanent control features on the project.
- d. Provide additional temporary erosion and pollution controls made necessary by Contractor's errors or negligence at no additional cost to the Government.
- e. Maintain erosion and sediment control features until final acceptance of project.

D. Notice of Termination (NOT)

1. Upon final acceptance, the Contractor shall file a NOT.

1.5 JOB CONDITIONS

- A. The Contractor shall maintain records of work performed on the sediment control structures.
- B. The Contractor shall not remove any erosion or sediment control measure without prior permission from the Contracting Officer.
- C. The Contractor shall obtain approval from the Contracting Officer prior to making changes to erosion control plans.

1.6 SEQUENCE OF CONSTRUCTION

- A. The Contractor shall be responsible for arranging and conducting an Erosion and Sediment Control meeting/briefing to inform all parties scheduled to be on-site during the project of the measures to be implemented for proper erosion and sediment control (may be included as part of the Pre-Construction Meeting).

1. Installation of silt fences, storm drain protection, and all other forms of erosion and sediment control shall not begin until after this meeting has occurred.
- B. The Contractor shall notify the Contracting Officer in writing and by telephone of the following events:
1. The required erosion and sediment control meeting/briefing.
  2. Following installation of required sediment control structures.
  3. Prior to removal of or modification to sediment control structures.
  4. Prior to removal of all sediment control structures.
- C. Silt fences, storm drain protection, and all other forms of erosion and sediment control shall be installed, inspected, and accepted by the Contracting Officer before beginning any utility excavation.
- D. Temporary silt fences shall be installed around any stockpiles and/or excavated material that cannot be backfilled during the same day in which it was excavated. Temporary silt fences shall also be placed immediately downstream of any utility trench that has not been backfilled at the end of the working day. Temporary silt fences shall be installed prior to leaving the work site for the day.
- E. Silt fences and storm drain protection shall be inspected by the Contractor weekly. Repairs to these devices shall be completed prior to leaving the work site for the day.
- F. The Contractor shall prevent the deposition of materials onto paved areas. The Contractor shall inspect the paved areas for deposited materials weekly and remove the materials immediately.
- G. Failure to maintain silt fences and storm drain protection shall be cause for an immediate stop-work order.
- H. Silt fences shall be removed with permission of the Contracting Officer within 20 working days after final acceptance of the project and/or after the establishment of permanent stabilization of all excavations and fill areas.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT

- A. Before the work begins, sufficient equipment shall be available on the site to assure that the operation and adequacy of the erosion control plans can be continuously maintained.

### 2.2 EROSION CONTROL PRODUCTS

### 2.3 EROSION CONTROL MEASURES

- A. Erosion control measures shall consist of silt fencing, barrier protectors, straw bales, temporary soil retention blankets, excelsior drainage filters, sediment traps and berms.
- B. Berms and excelsior drainage filters shall be used to form sediment traps and to control run-on and run-off into other areas, including creeks, streams, marshes, access roads, well areas, and the staging areas.

- C. Erosion control measures shall be used to contain only direct precipitation in the construction zone. The contained water shall be allowed to percolate into the ground or drain slowly through the drainage filter sediment traps.
- D. Earthen sediment traps or holding ponds shall not be used unless accepted by the Contracting Officer.

## PART 3 - EXECUTION

### 3.1 GENERAL DESCRIPTION

- A. Furnish, install, maintain, and operate necessary control measures and other equipment necessary to prevent erosion. Temporary measures shall be to Contractor's own design and Contractor shall be solely responsible for risks related to the management of erosion control during construction.

### 3.2 METHODS

- A. Construct berms to reduce runoff velocity as well as direct surface runoff around and away from all fuel containment, storage, and borrow areas.
- B. Divert surface runoff around and away from cut and fill slopes by constructing berms or ditches at the base of disturbed slopes. Provide conveyance for the runoff in temporary pipes or protected channels to temporary sediment traps.
- C. Place drainage filters around all catch basins to create sediment traps to control run-off from the construction area.
- D. Excess water used for dust control shall be contained within the demolition areas by the erosion control measures.

### 3.3 MAINTENANCE OF TEMPORARY FACILITIES

- A. Inspect erosion and sediment control structures weekly. Ensure erosion and sediment control structures remain effective throughout excavation and grading operations. Relocate structures as necessary.
- B. Inspect control structures after each significant rainfall. Promptly repair breaches which occur.
- C. The Contractor shall remove entrapped sediment from behind excelsior drainage filter after each storm.

### 3.4 DISPOSAL OF SEDIMENT FROM STORM WATER POLLUTION CONTROL STRUCTURES

- A. Sediment excavated from temporary sediment control structures shall be disposed on the site with general fill, or with topsoil. Sediment shall be allowed to dry out as required before reuse.
- B. Contractor shall place the sediment removed from traps and other structures where it will not enter a storm drain or watercourse and where it will not immediately reenter the basin.

3.5 REMOVAL OF TEMPORARY STORM WATER POLLUTION CONTROL MEASURES

- A. All temporary control measures shall be removed with permission of the Contracting Officer within 20 working days after final acceptance of the project, and/or once grading is completed and slopes have stabilized.

END OF SECTION 01571

## SECTION 01600 - MATERIAL AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The work of this section consists of the general procedures for handling, storing, and protecting material and equipment.

#### 1.2 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of materials in accordance with construction schedules; coordinate to avoid conflict with work and conditions at the site. Deliver materials in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible. Contractor is encouraged to obtain materials in biodegradable or recyclable/reusable packaging which uses the minimum amount of packaging possible.

#### 1.3 STORAGE AND PROTECTION

- A. Store materials in accordance with manufacturer's instructions, with seals and labels accessible for inspection.
- B. Interior Storage: Maintain temperature and humidity within the ranges required by manufacturer's instructions.
- C. Exterior Storage:
  - 1. Store products subject to damage by the elements in weathertight enclosures.
  - 2. Store fabricated products above the ground, on blocking or skids; prevent soiling or staining. Cover products subject to damage or deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.
  - 3. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- D. Protection after Installation: Provide adequate coverings as necessary to protect installed materials from damage resulting from natural elements, traffic, and subsequent construction. Remove when no longer needed.

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION - NOT USED.

END OF SECTION



## SECTION 01720 - FIELD ENGINEERING

### PART 1 - GENERAL

#### 1.1 LAYOUT OF WORK

- A. Contractor will set initial construction stakes establishing lines, slopes, grades, reference points, base lines and bench marks as required. Contractor shall execute the work in accordance with these stakes, and perform all additional staking necessary to execute the work.
- B. Contractor shall preserve controls thus established. Controls that are destroyed by Contractor will be replaced by the Contractor at their expense.
- C. Existing Monuments: All bench marks, land corners, and triangulation points, established by other surveys, existing within the construction area shall be preserved. If existing monuments interfere with the work, secure written permission before removing them.
- D. Locations and elevations shown on the drawings may be subject to minor field adjustment by Contracting Officer before construction. Contractor shall immediately notify the Contracting Officer of apparent errors discovered on the drawings or in the initial stakeout. If changes in stakeout are required, Contractor shall cooperate with Contracting Officer in prompt establishment of the field control for altered or adjusted work.

#### 1.2 QUANTITY SURVEYS

- A. Quantity surveys shall be conducted, and the data derived from these surveys shall be used in computing the quantities of work performed and the actual construction completed and in place.
- B. The Contractor shall conduct the original and final surveys and surveys for any periods for which progress payments are requested. All these surveys shall be conducted under the direction of a representative of the Contracting Officer, unless the Contracting Officer waives this requirement in a specific instance. The Government shall make such computations as are necessary to determine the quantities of work performed or finally in place. The Contractor shall make the computations based on the surveys for any periods for which progress payments are requested.
- C. Promptly upon completing a survey, the Contractor shall furnish the originals of all field notes and all other records relating to the survey or to the layout of the work to the Contracting Officer, who shall use them as necessary to determine the amount of progress payments. The Contractor shall retain copies of all such material furnished to the Contracting Officer.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

## SECTION 01770 - PROJECT CLOSEOUT

### PART 1 - GENERAL

- 1.1 The work of this section consists of final cleanup, closeout submittals, and final inspection procedures.

### PART 2 - PRODUCTS

#### 2.1 CLEANING MATERIALS

- A. As recommended by the manufacturer of surface to be cleaned.

#### 2.2 POSTED OPERATING INSTRUCTIONS

- A. Frame instructions under nonglare glass or approved laminated plastic. In areas where operating instructions are subject to sunlight or moisture, provide weather-resisting materials.

### PART 3 - EXECUTION

#### 3.1 POSTED OPERATING INSTRUCTIONS

- A. As specified in the individual sections. Furnish operating instructions attached to or posted adjacent to equipment. Include wiring diagrams, control diagrams, control sequence, start-up, adjustment, operation, lubrication, shut-down, safety precautions, procedures in the event of equipment failure, and other items of instruction recommended by the manufacturer.

#### 3.2 CLEANING

- A. Before scheduling the final inspection, remove all tools, equipment, surplus materials, and rubbish. Restore or refinish surfaces that are damaged due to work of this contract to original condition. Remove grease, dirt, stains, foreign materials, and labels from finished surfaces. Thoroughly clean building interiors. Pick up all construction debris from the site. At time of final inspection, project shall be thoroughly clean and ready for use.

#### 3.3 PROJECT RECORD DRAWINGS

- A. Maintain one complete full-size set of contract drawings and one full-size set of vendor-supplied drawings. Clearly mark changes, deletions, and additions using National Park Service drafting standards to show actual construction conditions. Show additions in red, deletions in green, and special instructions in blue.
- B. Keep record drawings current. Make record drawings available to the Contracting Officer for inspection at the time of monthly progress payment requests. If project record drawings are not current, the Contracting Officer may retain an appropriate amount of the progress payment.

- C. On completion of the total project, submit complete record drawings. Include all shop drawings, sketches, and additional drawings that are to be included in the final set, with clear instructions showing the location of these drawings.

### 3.4 CLOSEOUT SUBMITTALS

- A. A list of closeout requirements has been attached at the end of the division 1 specifications for your convenience. The intent is to provide an overall summary of requirements and not a comprehensive list. The terms and conditions of the contract still require you to satisfy the requirements of the individual specification sections regardless of what is shown on the list. Submit the following before requesting final inspection.

1. Project Record Drawings: As specified above.
2. Guarantees and Bonds: As specified in individual sections.
3. Spare Parts and Materials: As specified in individual sections.
4. Operation and Maintenance Data: As specified in individual sections and Section 01785.
5. Keys and Keying Schedule: Submit all keys including duplicates. Wire all keys for each lock securely together. Tag and plainly mark with lock number, equipment identification, or panel or switch number, and indicate location, such as building and room name or number.
6. Operating Tools: As specified in the individual sections.
7. Special Tools: One set of special tools required to operate, adjust, dismantle, or repair equipment. Special tools are those not normally found in possession of mechanics or maintenance personnel.
8. System Demonstration and Training: As specified in individual sections and Section 01815.
9. Mechanical and Electrical Systems: Verify the following in writing:
  - a. All systems are complete.
  - b. All systems have been properly started and are operational.
  - c. All controls are complete and operational, and sequences have been checked and are functioning properly.
10. Testing and Balancing Report: As specified in Section 15952.

### 3.5 SUBSTANTIAL COMPLETION AND FINAL INSPECTION

- A. When project, or designated portion of project, is substantially complete, request in writing a final inspection. Upon receipt of written request that project is substantially complete, the Contracting Officer will proceed with inspection within 10 days of receipt of request or will advise the Contractor of items that prevent the project from being designated as substantially complete.
- B. If, following final inspection, the work is determined to be substantially complete, Contracting Officer will prepare a list of deficiencies to be corrected before final acceptance and issue a Letter of Substantial Completion. Contractor shall complete the work described on the list of deficiencies within 30 calendar days, as weather permits. If the Contractor fails to complete the work within this time frame, the Contracting Officer may either replace or correct the work with an appropriate

reduction in the contract price or charge for reinspection costs in accordance with the Inspection of Construction clause of the contract..

- C. If, following final inspection, the work is not determined to be substantially complete, Contracting Officer will notify Contractor in writing. After completing work, Contractor shall request a new final inspection. All reinspection costs may be charged against the Contractor in accordance with the Inspection of Construction clause of the contract.

### 3.6 FINAL ACCEPTANCE OF THE WORK

- A. After all deficiencies have been corrected, a Letter of Final Acceptance will be issued.

END OF SECTION



## **SECTION 01785 - OPERATION AND MAINTENANCE DATA**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

- A. The work of this section consists of furnishing operation and maintenance data manuals.

#### **1.2 RELATED WORK**

- A. Project Record Drawings - Section 01770.

#### **1.3 SCHEDULING**

- A. At start of project, begin accumulating operation and maintenance data and initiate an index. Install and index all data in binders within 30 days after delivery of items. As custom written data and test results are produced, add them to the operation and maintenance data file.
- B. A list of Operation and Maintenance requirements has been attached at the end of the division 1 specifications for your convenience. The intent is to provide an overall summary of requirements and not a comprehensive list. The terms and conditions of the contract still require you to satisfy the requirements of the individual specification sections regardless of what is shown on the list.
- C. Keep operation and maintenance data current. Make operation and maintenance binders available to the Contracting Officer for inspection at the time of monthly progress payment requests. If operation and maintenance binders are not current the Contracting Officer may retain an appropriate amount of the progress payment.
- D. Before scheduling a final inspection, furnish two complete sets of operation and maintenance data to Contracting Officer for review. Should Contracting Officer find manual to be substantially incomplete, the final inspection will be delayed.
- E. Within 30 days following receipt of review comments, deliver four completed sets of Operation and Maintenance data.

### **PART 2 - PRODUCTS**

#### **2.1 BINDERS**

- A. White, commercial quality, hard back, three-ring, 2-inch maximum ring size, lever-locking type slant ring, with clear window pockets on front and side. Cardinal Slant-D Ring, manufactured by Atapco Office Products Group, St. Louis, Missouri; View SlantRing, manufactured by E-Z-D Premiere View Binder, Torrance, California; or approved equal.

#### **2.2 INDEX SYSTEM**

- A. Index sheet with mylar reinforced edges at binder holes and tabbed divider sheets with mylar reinforced edges and pre-printed numbered tabs aligned with numbers and title lines on index sheet. Cardinal One-Step, manufactured by Atapco Office Products Group, St. Louis, Missouri; Avery Ready Index, manufactured by Avery Dennison, Covina, California; or approved equal.

## PART 3 - EXECUTION

### 3.1 FORM

- A. Provide four complete sets of data.
- B. Number multiple binder volumes consecutively.
- C. Cover Sheet: Identify the project title, location, park, contract number, prime contractor's name and address, date of substantial completion, and binder volume number. Insert cover sheet into clear plastic view pocket on front of binder. Insert sheet with project title and "Operation and Maintenance" into side clear plastic view pocket.
- D. Index System: Organize data into sections by common subjects and subsystems. Place a consecutively numbered tabbed divider sheet in front of each section. Place index sheet at the beginning of each binder, listing sections by subject name. If multiple binders are used, place a table of contents of all data provided behind the index sheet in each binder.
- E. Data: Fill binders to no more than 75 percent of capacity. Punch holes shall not obscure any data. Normal sheet size shall be 8-1/2 inches by 11 inches. Fold oversize sheets and insert them in 8-1/2 by 11-inch clear pocket sheet protectors placed in binders. When the contents of a single tabbed section covers more than one item, provide colored paper sheets to separate the data for each item.
  - 1. Manufacturers' Data: Provide originals for color or copyrighted data. Black and white data may be originals or clean, good quality reproductions. Where originals are printed on both sides of the page, reproductions shall also be printed on both sides of the page. Copies produced by facsimile transmission and sheets with stamps, such as submittal approval stamps, will not be acceptable. Include only sheets that apply to items installed; cross out inapplicable data.
  - 2. Vendor Furnished As-Built Drawings: Maximum 24-inch by 36-inch sheets with minimum character or lettering size of 1/8 inch. Reduced-size reproductions may be provided instead of full-size drawings if the reproductions are clear and legible. If reduced-size drawings are used, identify as "REDUCED SIZE" and provide graphic scales, if applicable.
  - 3. Custom Written Data: Typewritten text, supplemented by drawings and schematics necessary to describe systems adequately.
  - 4. Equipment Data Sheet: Typewritten data, using form at the end of this section.
  - 5. Schedules: Clean, typewritten schedules reflecting final, as-installed conditions. Hand-written mark-ups of schedules submitted earlier are not acceptable.
  - 6. Data that is poorly reproduced or in any way illegible will be rejected.

### 3.2 CONTENT

- A. Manufacturers' Published Data: Provide all available data, including installation and operating instructions, parts lists, electrical and mechanical schematics, control circuit documentation, performance data, safety instructions, cleaning and care instructions, and illustrations and

instructions for maintenance, including lubrication, disassembly and repair, cleaning, and service. Indicate catalog numbers, sizes, colors, options, and other information pertaining to the products furnished which would be required when ordering replacements. For equipment assemblies, provide data for each separate item of equipment furnished as part of the assembly.

- B. Custom Written Data: For data not in manufacturer's standard literature, provide text, drawings, and schematics specifically applicable to installed systems. Include step-by-step descriptions of operating procedures; identification of individual components and their functions; descriptions of how system components relate to one another and operate together to accomplish a common process or function; and sequence of operation for system control circuits. For seasonally operated systems, provide start-up and shutdown instructions.
- C. Equipment Data Sheets: For each item of equipment included in the operation and maintenance data, provide an Equipment Data Sheet using the form at the end of this section. For equipment consisting of a driven machine and a driver (for example, a pump and a motor), the equipment data shall cover both the driven machine and the driver. For similar type equipment (for example, multiple exhaust fans of the same model and type), provide a single equipment data sheet with an attached schedule listing the individual equipment items.
- D. Vendor Furnished As-Built Drawings: Provide for each electrical and each mechanical control system.
  - 1. For each control system, provide control circuit schematic drawings. Identify each wire and terminal block number. Show terminal numbers on all control devices. Show control wires and devices remote from the control panel.
  - 2. For each control panel, provide a general arrangement drawing showing location of each control component and terminal block on the panel front and interior. Include a materials list of all panel-mounted control components as well as field-installed control components remote from the panel, identifying components, manufacturer, model number, and initial set points or sensing ranges of devices where applicable.
  - 3. For packaged equipment systems, provide general arrangement drawings showing interrelationships of the various items of equipment and components.
  - 4. In addition to the control wiring schematic, provide a power wiring schematic drawing showing the power flow to each motor. Identify each power conductor. Show all overcurrent protection and motor starting devices.
- E. Schedules: Provide one copy of material and equipment schedules, as listed in the individual sections, in the appropriate sections of the manual.
- F. Warranties: Place a copy of each manufacturer, supplier, and installer warranty extending for a period greater than one year in a single separately identified tabbed section of the manual.
- G. Test Results: Include in the operation and maintenance data copies of test results for mechanical and electrical equipment and systems as listed in the individual specification sections.
- H. Subcontractor and Supplier List: List all subcontractors and major suppliers who worked on the project. Include each subcontractor's or supplier's address and telephone number and identify work performed.

END OF SECTION

## EQUIPMENT DATA SHEET

Equipment Item: \_\_\_\_\_ Designation: \_\_\_\_\_

Function: \_\_\_\_\_

Location: \_\_\_\_\_

Project: \_\_\_\_\_

Model No.: \_\_\_\_\_ Serial No.: \_\_\_\_\_

Manufacturer Address and Phone:

Supplier Address and Phone:

Preventive Maintenance Tasks:

\$

\$

\$

\$

Nameplate Data:

Spare Parts Furnished and Other Information:



**CLOSEOUT AND OPERATION & MAINTENANCE REQUIREMENTS**

<b>Topic</b>	<b>Specification Section</b>	<b>Requirement</b>	<b>Submittal Date</b>	<b>Completed</b>	<b>Received by Park</b>
Project Record Drawings	01770	Final Project Record Drawings			
System Demonstration and Training					
Tools Spare Parts Equipment					
Extra Stock	09931	Furnish an additional 5 percent, but not less than 2 gal. (7.6 L) of each material and color applied.			
Reports					
Keys and keying schedule	10125	Directory keys			
O&M Data Warranties Guarantees	07317	Maintenance Data: For wood shingles and shakes to include in maintenance manuals			
	08411	Maintenance data.			



## SECTION 01815 - SYSTEM DEMONSTRATION AND TRAINING

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The work of this section consists of demonstrating systems and equipment to operating personnel. It also includes training of personnel.

#### 1.2 COORDINATION

- A. Schedule demonstrations and training periods with Contracting Officer. Conduct training sessions after the equipment or system has been accepted and turned over to the Government.

#### 1.3 GENERAL REQUIREMENTS

- A. A list of System Demonstration and Training requirements has been attached at the end of the division 1 specifications for your convenience. The intent is to provide an overall summary of requirements and not a comprehensive list. The terms and conditions of the contract still require you to satisfy the requirements of the individual specification sections regardless of what is shown on the list.
- B. For each training session, the Contractor shall submit for approval a proposed outline of the subjects to be covered. The training shall not be conducted until the outline is approved.
- C. Videotapes of demonstrations and training sessions:
  - 1. Provide original and one copy of each disc.
  - 2. Label each video disc with the date of demonstration or training, the instructor's name, and provide an index of the contents. The index shall list the start and end time of each subject covered during the training session. The sequence of the training subjects shall follow the sequence listed in the approved training outline or as actually conducted.
  - 3. Provide a separate video disc for each separate training session.

### PART 2 - PRODUCTS

#### 2.1 VIDEO DISCS

- A. Compact Discs (CD) or Digital Video Discs (DVD)

### PART 3 - EXECUTION

#### 3.1 TRAINING

- A. As specified herein and in individual sections, furnish the services of instructors to train designated personnel in adjustment, operation, including seasonal and emergency operations, if applicable, maintenance, and safety requirements of equipment and systems. Instructors shall be thoroughly

trained in operating theory as well as practical operation and maintenance work for each type of equipment or system. The sequence of the training shall follow the approved training outline.

- B. Individual sections specify the duration of training required. If no duration is listed, provide training of sufficient duration to adequately cover the subjects. When more than four days of instruction are specified, use approximately one-half of the time for classroom and the other half for hands-on instruction with the equipment or system.
- C. Use Operating and Maintenance Data as a training guide.

### 3.2 VIDEO RECORDING

- A. Record all of the above sessions with high restoration equipment. The instructor's voice shall be clearly audible and understandable on the disc. Utilize a supplemental microphone worn by the instructor.
- B. Video discs with poor video or audio quality will be rejected and the training re-recorded.

END OF SECTION

# GEOTECHNICAL ENGINEERING SOLUTIONS, LLC

207 West Conestoga Street - New Holland, PA 17557  
(717) 468-6986 (717) 355-5398 fax  
tmartin207@frontiernet.net

August 12, 2009

GES9020

Mr. Philip M. Donmoyer, P.G.  
Alternative Environmental Solutions, Inc.  
480 New Holland Avenue  
Suite 8203  
Lancaster, PA 17602

Reference: Geotechnical Engineering Services  
New Storage Building  
Hampton National Historical Site  
Baltimore, Maryland

Dear Mr. Donmoyer:

Geotechnical Engineering Solutions, LLC is pleased to present our Geotechnical Engineering Report for the above referenced project. These services were provided in accordance with our agreement dated June 25, 2009.

The Geotechnical Engineering Study included the evaluation of test boring, geological, soil test and related structural data to develop the following:

- Estimated subsurface conditions and groundwater levels within the area explored.
- Foundation requirements for support of the proposed building, including a recommended allowable soil bearing pressure, bearing grades and estimated total and differential settlements for shallow spread footings.
- Recommendations for floor slab support, including a modulus of subgrade reaction for design.
- Discussion of pertinent design and construction considerations, including requirements for foundation installation, the need for and the methods of rock removal, seismic site coefficient, parameters for earthwork and compaction, and the scope of geotechnical engineering services necessary during construction.

Services with respect to horizontal or vertical lines and grades, quantity or cost estimates, or detailed plans and specifications were not included in this agreement.

## **PROPOSED CONSTRUCTION AND SITE DESCRIPTION**

The proposed construction will consist of a one story wood frame structure with a floor slab supported on-grade at EL 365.5. The anticipated maximum wall and column loads are estimated to be less than two kips/LF and 25 kips, respectively. The site is presently open and grass-covered with the ground surface sloping downward to the south from about EL365 to EL 358. Numerous utilities are present beneath the site based on our observations of markings provided by utility locators. The majority of these markings are for communication lines with one electrical line also possibly present beneath the proposed building area.

## **SUBSURFACE EXPLORATION**

### **1. Stratification**

Five test borings were performed by Connelly & Associates, Inc., York, Pennsylvania under our observation on July 28, 2008. Test Boring Logs are included in the Enclosure along with the Location Plan. Based on the test boring data, the following generalized subsurface strata underlie the site to the depths explored:

STRATUM A (RESIDUAL)	From the ground surface to a depth of 9.5 to 14 feet	Brown, SILTY SAND (SM) to SILT WITH SAND (ML) contains rock fragments; generally firm density and medium stiff consistency (N= 4 to 24)
STRATUM B (RESIDUAL)	Below Stratum A to the maximum depth of penetration, 15.2 feet	Brown, DISINTEGRATED ROCK; very compact density (N= 100+)

Samples have been classified in accordance with ASTM D2488. The ASTM D2488, group symbols (e.g. SM), indicated above and on the test boring logs, are based on visual observations of recovered samples.

The above N values indicate the low and high Standard Penetration Test resistances encountered in a particular layer as determined from the number of blows required to drive a two inch O.D., 13/8 inch I.D. sampling spoon one foot using a 140 pound hammer falling 30 inches. This test is conducted after seating the sampler six inches in the bottom of the hole according to ASTM D1586.

Disintegrated rock is defined as residual material with N values in excess of 60 blows per foot and less than 100 blows for two inches of penetration. Penetration resistance of 100 blows or more per two inches is designated as refusal.

## 2. Groundwater

Groundwater was encountered during drilling at the locations of Borings B-1, B-3, B-4 and B-5 at depths of two to 13.5 feet below the ground surface. All test borings were left open following completion of drilling to obtain longer term water level readings. The results of these observations are shown on the respective boring logs. Based on this data it appears that groundwater is present at a depth of about 6.5 to 8.5 feet below the ground surface at all boring locations except at the location of Boring B-2 which caved dry at a depth of about 8.5 feet below the existing ground surface. No long term water level readings were obtained as the test borings were backfilled following completion for safety. Based on the boring data and the anticipated excavation grades, groundwater is not anticipated to be encountered during construction of the proposed building, although fluctuations in the water table and the development of perched water conditions should be expected with variations in precipitation, flooding, surface runoff, pumping, and evaporation occurring throughout the year.

## 3. Geology

Seven to eight inches of topsoil were encountered at each of the boring locations except boring B-1 where 5 inches of gravel was present. Stratum A represents the residual soils that were derived from the in-place weathering of the underlying calcareous schist of the Cockeyville Formation. Stratum B is designated as disintegrated rock. The disintegrated rock has undergone far less weathering than the overlying residual soils and has maintained some of the characteristics of the underlying bedrock. This formation does have carbonate characteristics (ie sinkhole prone) which appear to be a minor component of the residual soils overlying the parent bedrock. Based on our review of geological data and the previously discussed subsurface data the risk of sinkhole occurrence is low.

## GEOTECHNICAL ENGINEERING RECOMMENDATIONS

### 1. Foundations

Based on our analysis of the aforementioned data, footings may be supported on suitable natural soils and new compacted structural fill following removal of any loose or disturbed soils from beneath the footings as described below. Suitable natural soils consist of the firm density sands and the stiff consistency silts of Stratum A and the very compact density disintegrated rock of Stratum B. Footings supported on suitable natural soils and compacted structural fill as described below may be designed for an allowable soil bearing pressure of 2000 psf.

Interior footing grades may be set at nominal depths below the floor slab. Perimeter footings exposed to climactic variations should be founded at least three feet below the final exterior grades for frost protection. Wall and column footings should be a minimum of 16 and 30 inches wide, respectively for shear consideration. All footing subgrades should be evaluated by the Geotechnical Engineer prior to the placement of any concrete.

The total foundation settlements are expected to be less than 3/4 inch with differential settlements between adjacent new foundation elements of up to half the total settlement.

## **2. Floor Support**

Slabs on-grade may be supported on suitable natural soils and new compacted structural fill following subgrade preparation as described below. Concrete floor slabs may be designed using a subgrade modulus value of 125 pci based on a one foot, square steel plate. A four inch washed gravel or crushed stone moisture barrier corresponding to AASHTO Size No. 57 Aggregate should underlie all floor slabs on-grade.

## **3. Compacted Structural Fill**

Areas to receive compacted fill should be stripped of organic material, vegetation, topsoil and otherwise unsuitable or soft subgrade materials. The stripping should extend at least five feet beyond the areas to receive compacted fill. Following stripping, the subgrades should be proofrolled with a loaded tandem axle dump-truck or ten-ton roller under the observation of the Geotechnical Engineer. Areas which exhibit excessive pumping or weaving as determined by the Geotechnical Engineer should be removed and replaced with new compacted structural fill, as described below.

Compacted fill for building support should consist of ML or better material according to ASTM D2487 with a maximum particle size of three inches. The on-site soils meeting this minimum soil classification may be reused as compacted structural fill provided that adequate compaction can be attained.

The compacted fill should be placed on the approved subgrade in lifts not exceeding eight inches in loose thickness and should be compacted to at least 95 percent of maximum dry density according to ASTM D698, Standard Proctor.

## **SEISMIC ACTIVITY**

The soil encountered at the test boring locations represents a Site Class C, according to the 2006 International Building Code.

## **CONSTRUCTION CONSIDERATIONS**

### **1. Earthwork**

The on-site soils are moderately to highly susceptible to moisture changes. Reworking of the on-site soils to be used as compacted fill should be anticipated considering their moisture susceptibility and the likelihood that they will not be within the range of optimum moisture content at the time earthwork proceeds.

No excavations should be allowed to pond water during construction. Any subgrade soils which have been weakened due to saturation or disturbance should be removed. Over-excavated areas should be replaced with compacted structural fill. We recommend that the earthwork portions of this project be completed during warmer and drier weather to avoid wet and freezing conditions.

The subgrades to receive compacted fill to achieve proposed grades should be proofrolled under the observation of the Geotechnical Engineer to verify that suitable non-organic soils are present following subgrade preparation as previously described. Where proofrolling reveals weak and unsuitable material, these soils should be undercut and replaced with compacted fill. As detailed previously, full-time observation and testing of compacted fill and backfill by the Geotechnical Engineer are also essential.

The contractor should schedule his work so that the construction traffic is controlled in an efficient manner such that compacted fill and subgrade work previously approved is not subsequently disturbed. Failure to control construction traffic may result in costly reworking of previously approved areas, especially when wetted by surface water. The specifications should delegate this responsibility to the contractor.

## **2. Spread Footings**

Care should be exercised during excavation for spread footings to ensure that as little disturbance as possible occurs at the foundation level. Any footing subgrades that are considered unsuitable for footing support should be undercut to suitable natural soils under the observation of the Geotechnical Engineer. Observation of actual footing grades by the Geotechnical Engineer is considered essential to verify that subgrade soils meet the requirements given herein.

## **3. Rock Excavation**

Based on the anticipated building grade, boring data and our visual observations, rock excavation will not be required to achieve the planned footing grade of the proposed building.

## **4. Observation and Testing**

Regardless of the thoroughness of a geotechnical engineering exploration, there is always a possibility that conditions between borings will be different from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the subsurface conditions. Therefore, geotechnical engineering construction observation should be performed under the supervision of a Geotechnical Engineer from our office who is familiar with the intent of the recommendations presented herein. This observation is recommended to evaluate whether the conditions anticipated in the design actually exist or whether the recommendations presented herein should be modified where necessary.

**LIMITATIONS**

The conclusions and recommendations of this report are based on the information revealed by this exploration. An attempt has been made to provide for normal contingencies, but the possibility remains that unexpected conditions may be encountered during construction. An allowance should be established to account for possible additional costs that may be required to construct foundations and earthwork as recommended herein. Additional costs may be incurred for various reasons including undercutting of unsuitable soils, variation of soil between borings and difficulty obtaining compaction during cold or wet weather.

This report should be made available to prospective bidders for informational purposes. We recommend that the project specifications contain the following statement:

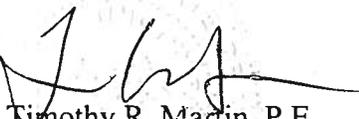
"A geotechnical engineering report has been prepared for this project by Geotechnical Engineering Solutions, LLC. This report is for informational purposes only and should not be considered part of the contract documents. The opinions expressed in this report are those of the Geotechnical Engineer and represent his interpretation of the subsoil conditions, tests, and the results of analyses which he has conducted. Should the data contained in this report not be adequate for the Contractor's purposes, the Contractor may make, prior to bidding, his own investigation, tests and analyses. This report may be examined by bidders at the office of the Architect/Engineer or copies may be procured from the Architect/Engineer at nominal charge."

We have prepared this report in accordance with generally accepted geotechnical engineering practice and make no warranties, either express or implied, as to the professional advice provided under the terms of our agreement and included in this report.

We appreciate the opportunity to be of service for this project. Please contact the undersigned if clarification is needed for any aspect of this report.

Sincerely,

GEOTECHNICAL ENGINEERING SOLUTIONS, LLC



Timothy R. Martin, P.E.  
Geotechnical Engineer

Enclosure

# GES, LLC.

207 WEST CONESTOGA STREET  
 NEW HOLLAND, PA 17557  
 (717) 468-6986 (717) 355-5398 fax

## TEST BORING LOG

BORING ELEVATION: 363.5 BORING: B-1

DRILLING CONTRACTOR: Connelly & Associates, Inc.

DRILLER:

PROJECT: Hampton National Historical Site  
 Baltimore, Maryland

DATE STARTED: 7-28-09 DATE FINISHED: 7-28-09

JOB NUMBER: GES9020

COMMENTS: Groundwater encountered during drilling at a depth of 8.5 feet.  
 Groundwater observed at a depth of 8 feet 1.5 hours following completion of drilling.

GES ENGINEER: T. Martin

STRATUM	SAMPLE DEPTH	BLOW COUNTS	DEPTH (FEET)	STRATA DESCRIPTION
A	0-1.5	6-14-10	0	5" Gravel
	2.5-4	3-4-5	0.4	SANDY SILT CONTAINS ROCK FRAGMENTS MOIST BROWN (ML) w = 13.6%
	5-6.5	5-5-6	5	d.o. WITH SAND w = 36.0%
	8.5-10	6-6-9	8.5	SILTY SAND CONTAINS ROCK FRAGMENTS WET BROWN (SM)
			12	Auger Refusal @ 12 Feet

# GES, LLC.

207 WEST CONESTOGA STREET  
NEW HOLLAND, PA 17557  
(717) 468-6986 (717) 355-5398 fax

## TEST BORING LOG

BORING ELEVATION: 365

BORING: B-2

DRILLING CONTRACTOR: Connelly & Associates, Inc.

DRILLER:

PROJECT: Hampton National Historical Site  
Baltimore, Maryland

DATE STARTED: 7-28-09 DATE FINISHED: 7-28-09

JOB NUMBER: GES9020

COMMENTS: Groundwater not encountered during drilling.

GES ENGINEER: T. Martin

STRATUM	SAMPLE DEPTH	BLOW COUNTS	DEPTH (FEET)	STRATA DESCRIPTION
A	0-1.5	2-4-4	0	8" Topsoil
	2.5-4	3-4-5	0.7	SILT WITH SAND MOIST BROWN (ML)
	5-6.5	4-4-5	5.5	d.o. CONTAINS ROCK FRAGMENTS w = 30.3%
	8.5-9.9	5-6-50/5	7.5	SILTY SAND CONTAINS ROCK FRAGMENTS MOIST BROWN (SM)
B			9.5	DISINTEGRATED ROCK MOIST BROWN
			10.5	Auger Refusal @ 10.5 Feet

# GES, LLC.

207 WEST CONESTOGA STREET  
 NEW HOLLAND, PA 17557  
 (717) 468-6986 (717) 355-5398 fax

## TEST BORING LOG

**BORING ELEVATION:** 362 **BORING:** B-3

**DRILLING CONTRACTOR:** Connelly & Associates, Inc.

**DRILLER:**

**PROJECT:** Hampton National Historical Site  
 Baltimore, Maryland

**DATE STARTED:** 7-28-09 **DATE FINISHED:** 7-28-09

**JOB NUMBER:** GES9020

**COMMENTS:** Groundwater encountered during drilling at a depth of 2.5 feet.  
 Groundwater observed at a depth of 7.5 feet 2 hours following completion of drilling.

**GES ENGINEER:** T. Martin

STRATUM	SAMPLE DEPTH	BLOW COUNTS	DEPTH (FEET)	STRATA DESCRIPTION
A	0-1.5	2-2-5	0	8" Topsoil
	2.5-4	7-8-9	0.7	SILTY SAND MOIST BROWN (SM) d.o. WET
			2.5	
	5-6.5	7-9-9	4.5	SILT WITH SAND CONTAINS ROCK FRGMENTS WET BROWN (ML)
	8.5-10	2-3-5		
	13.5-14.1	4-50/2		
B			14	DISINTEGRATED ROCK MOIST BROWN
			15.2	Auger Refusal @ 15.2 Feet

# GES, LLC.

207 WEST CONESTOGA STREET  
NEW HOLLAND, PA 17557  
(717) 468-6986 (717) 355-5398 fax

## TEST BORING LOG

BORING ELEVATION: 359 BORING: B-4

DRILLING CONTRACTOR: Connelly & Associates, Inc.

DRILLER:

PROJECT: Hampton National Historical Site  
Baltimore, Maryland

DATE STARTED: 7-28-09 DATE FINISHED: 7-28-09

JOB NUMBER: GES9020

COMMENTS: Groundwater encountered during drilling at a depth of 2 feet.  
Groundwater observed at a depth of 6.5 feet 1 hours following completion of drilling.

GES ENGINEER: T. Martin

STRATUM	SAMPLE DEPTH	BLOW COUNTS	DEPTH (FEET)	STRATA DESCRIPTION
A	0-1.5	1-2-2	0	8" Topsoil
			0.7	SILT WITH SAND MOIST BROWN (ML) w = 21.8%
	2.5-4	3-6-8	2	SILTY SAND WET BROWN (SM)
	5-6.5	6-6-8	6	SILT WITH SAND CONTAINS ROCK FRGMENTS WET BROWN (ML)
	8.5-10	2-3-3	8.5	d.o. SANDY
			12	Auger Refusal @ 12 Feet

# GES, LLC.

207 WEST CONESTOGA STREET  
NEW HOLLAND, PA 17557  
(717) 468-6986 (717) 355-5398 fax

## TEST BORING LOG

BORING ELEVATION: 361

BORING: B-5

DRILLING CONTRACTOR: Connelly & Associates, Inc.

DRILLER:

PROJECT: Hampton National Historical Site  
Baltimore, Maryland

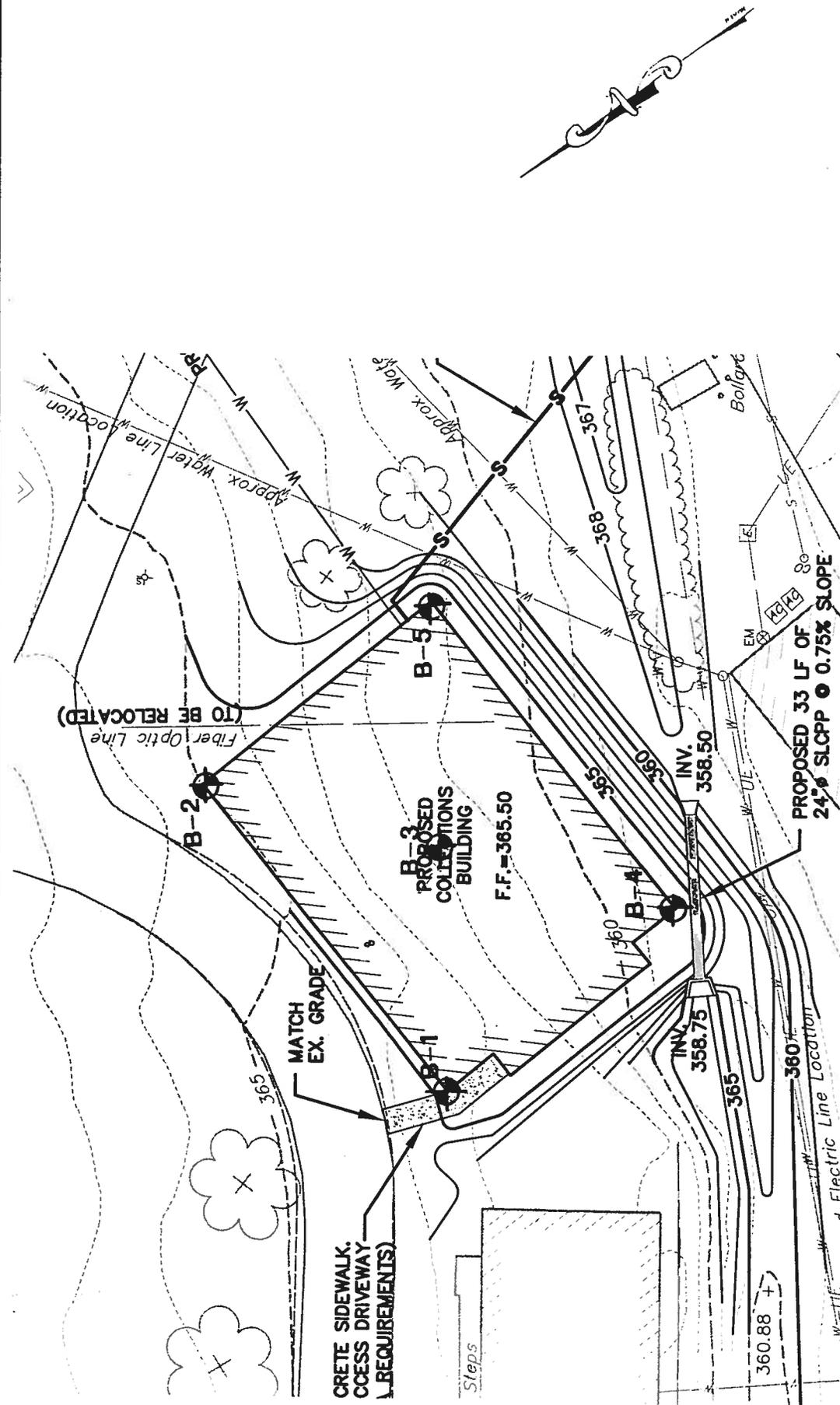
DATE STARTED: 7-28-09 DATE FINISHED: 7-28-09

JOB NUMBER: GES9020

COMMENTS: Groundwater encountered during drilling at a depth of 13.5 feet.  
Groundwater observed at a depth of 8.5 feet 3.5 hours following completion of drilling.

GES ENGINEER: T. Martin

STRATUM	SAMPLE DEPTH	BLOW COUNTS	DEPTH (FEET)	STRATA DESCRIPTION
A	0-1.5	2-4-7	0	7" Topsoil
	2.5-4	6-7-10	0.6	SANDY SILT MOIST BROWN (ML) w = 32.7%
	5-6.5	7-7-7		w = 34.0%
	8.5-10	2-2-4		
	13.5-14.1	WOH/6-50/1	13.5	d.o WET
B			14	DISINTEGRATED ROCK MOIST BROWN
			14.1	Auger Refusal @ 14.1 Feet



○ - APPROXIMATE TEST BORING LOCATION

LEGEND

GEOTECHNICAL ENGINEERING SOLUTIONS, LLC		207 West Conestoga Street New Holland, PA 17557 (717) 468-6986 (717) 355-5398 fax	
SCALE: 1in = 30ft DATE: 8-12-09	APPROVED BY:		
DRAWN BY TRM REVISED		NEW STORAGE BUILDING HAMPTON NATIONAL HISTORICAL SITE BALTIMORE, MARYLAND	
LOCATION PLAN		DRAWING NUMBER <b>GES9020</b>	

## SECTION 02100 - CLEARING AND GRUBBING

### 1PART - GENERAL

#### 1.1 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Clearing
2. Grubbing
3. Stripping and stockpiling topsoil
4. Debris disposal

B. Related Work Specified Elsewhere:

- |  |               |
|--|---------------|
| 1. Site excavation and placement of fill material: | Section 02210 |
| 2. Trenching, backfilling and compacting:          | Section 02221 |
| 3. Soil erosion and sedimentation control:         | Section 02270 |
| 4. Finish grading, seeding, and sodding:           | Section 02485 |

C. Definitions:

1. Clearing is defined as the removal of trees, brush, down timber, rotten wood, rubbish, any above original ground elevation not designated to be saved. Clearing also includes removal of fences, walls, guard posts, guiderail, signs, and other obstructions interfering with the proposed work.
2. Grubbing is defined as the removal from below the surface of the natural ground of stumps, roots and stubs, brush, organic materials and debris.

D. Applicable Standard Details: NONE

#### 1.2 QUALITY ASSURANCE - Section not utilized

#### 1.3 SUBMITTALS

A. Permits:

1. Submit two copies of each on-site burning permit if such permits are required.
2. For off-site disposal, submit two copies of the agreement with each property owner releasing the OWNER and ENGINEER from responsibility in connection with the disposal of the debris, and permits or approvals from regulatory agencies.

#### 1.4 JOB CONDITIONS

- A. The CONTRACTOR may clear all obstructions within the construction limits or permanent and construction rights-of-way except those specifically designated to be saved or restored on the Contract Drawings or Specifications.

## 2PART - PRODUCTS

### 2.1 MATERIALS

#### A. Temporary Fencing:

1. Undamaged picket snow fence, 4' high, formed of wooden slats, tightly woven with wire cable.
2. Soil-set fence posts, studded "T" type, 6' high.

## 3PART - EXECUTION

### 3.1 PREPARATION

- A. Notify the OWNER and regulatory agencies at least 72 hours prior to beginning any clearing work.
- B. Protect benchmarks, utilities, existing trees, shrubs and other landscape features designated for preservation with temporary fencing or barricades satisfactory to the ENGINEER and OWNER. No material shall be stored or construction operation carried on within 4-feet of any tree to be saved or within the tree protection fence. No materials shall be stored or construction operation carried on within the drip line of any tree to be saved or within tree protection fence. Delineation of temporary fencing and barricade to be determined onsite with COTR and Resource Manager.
- C. When a private enclosure fence encroaches on the work area, notify the property owner at least 5 days in advance of the clearing/grubbing operations to permit the OWNER to remove it, construct a supplemental fence, or make such other arrangements as may be necessary for security purposes. Upon failure of the property owner to reasonably proceed with the work required to secure his property, carefully remove the fence, in whole or in part and neatly pile the materials onto the OWNER's property.

### 3.2 UTILITY RELOCATIONS

- A. Inform all companies, individuals and others owning or controlling facilities or structures within the limits of the work which have to be relocated, adjusted or reconstructed in sufficient time for the utility to organize and perform such work in conjunction with or in advance of the CONTRACTOR's operations.
- B. Comply with the requirements of Maryland Underground Utility Damage Prevention Act.

### 3.3 CLEARING

- A. Confine clearing to within the construction limits.
- B. Clear in a manner that will avoid damage to trees, shrubs, structures, and other installations which are to be retained.
- C. Where stumps are not required to be grubbed, flushcut and grind to a depth of 12" below ground elevation.

### 3.4 GRUBBING

- A. Grub areas within the construction limits to remove roots and other objectionable material to a minimum depth of 24".
- B. Remove all stumps within the cleared areas.

### 3.5 STRIPPING AND STOCKPILING TOPSOIL

- A. Strip topsoil to whatever depth it may occur from areas to be excavated, filled, or graded and stockpile.
- B. The topsoil is the property of the OWNER and shall not be used as backfill or removed from the site.

### 3.6 DEBRIS DISPOSAL

- A. Trees, logs, branches, brush, stumps, and other debris resulting from clearing and grubbing operations shall become the property of the CONTRACTOR and shall be legally disposed of.
- B. Do not deposit or bury on the site debris resulting from the clearing and grubbing work.
- C. Discarded materials within the right-of-way limits necessary to perform the work shall be removed and properly disposed of at the CONTRACTOR's expense.

### 3.7 RESTORATION

- A. Repair all injuries to bark, trunk, limbs, and roots or remaining plants using approved arboricultural practices and materials. NPS Chief, Resource Management shall be notified of any tree damage. All tree repairs will be completed by a certified arborist at CONTRACTOR'S expense
- B. Replace trees, shrubs and plants designated to be saved which are permanently injured or die during the life of the Contract and warranty period as a result of construction operations with like species acceptable to the OWNER.
- C. Remove protective fences, enclosures and guards upon the completion of the project.
- D. Restore guard posts, guiderail, signs and other interferences to the condition equal to that existing before construction operations.
- E. Fences, mail boxes, and signs within the line of work shall be carefully removed, stored, and upon completion of backfill, reset or replaced to their original condition and location, at the CONTRACTOR's expense.

END OF SECTION



## SECTION 02210 - SITE EXCAVATION AND PLACEMENT OF FILL MATERIAL

### 1PART - GENERAL

#### 1.1 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Excavation
2. Blasting
3. Placement and compaction of fill material

B. Related work specified elsewhere:

- |  |               |
|--|---------------|
| 1. Clearing and grubbing:                  | Section 02100 |
| 2. Trenching, backfilling and compacting:  | Section 02221 |
| 3. Soil erosion and sedimentation control: | Section 02270 |
| 4. Finish grading, seeding, and sodding:   | Section 02485 |

C. Definitions: NONE

D. Applicable Standard Details: NONE

#### 1.2 QUALITY ASSURANCE

A. Reference Standards:

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

D698	Test Method of Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft.-lbf./ft <sup>3</sup> )
D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lbf./ft <sup>3</sup> )
D2922	Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)

2. American Association of State Highway and Transportation Officials (AASHTO):

T89	Determining Liquid Limit of Soils
T90	Determining Plastic Limit and Plasticity Index of Soils

B. Testing Agency:

1. Compaction testing shall be performed by a Soils Testing Laboratory engaged and paid for by the CONTRACTOR and approved by the ENGINEER.

C. Compaction Testing:

1. Determine compaction by the testing procedure contained in ASTM D698 or ASTM D1557 at the locations and frequencies specified in Section VIII.

### 1.3 SUBMITTALS

#### A. Certificates:

1. Submit certified compaction testing results from the Soils Testing Laboratory.

### 1.4 JOB CONDITIONS

#### A. Classification of Excavation:

1. All site excavation work performed under this contract is UNCLASSIFIED, and includes excavation and removal of all soil, shale, rock, boulders, fill, and all other materials encountered of whatever nature.

#### B. Control of Traffic:

1. Employ traffic control measures as necessary to maintain vehicular traffic and reasonable access for employees and visitors.

#### C. Protection of Existing Utilities and Structures:

1. Take all precautions and utilize all facilities required to protect existing utilities and structures in compliance with the Maryland Underground Utility Damage Prevention Act. Request cooperative steps of the Utility and suggestions for procedures to avoid damage to its lines.
2. Allow free access to Utility personnel at all times for purposes of maintenance, repair and inspection.

## 2PART - PRODUCTS

### 1.1 ACCEPTABLE MATERIALS

For purposes of construction control, the following materials may be deemed acceptable for use in placement of fills:

- A. Soil. Soil shall include all inorganic material having a maximum size that can be readily placed and compacted in loose 8 inch layers and of which more than 35 percent shall pass the No. 200 sieve. Soil shall have a minimum dry weight density of 98 pounds per cubic foot as determined in accordance with PTM No. 106, Method B and a maximum liquid limit of 65 as determined in accordance with AASHTO Designation T89. The plasticity index, as determined by AASHTO Designation T90 for soils having liquid limits of 41 to 65 inclusive, shall be not less than that determined by the formula: Plasticity Index = Liquid Limit - 30.
- B. Granular Material. Granular material shall include all natural or synthetic mineral aggregates having a maximum size that can be readily placed and compacted in loose 8 inch layers and of which 35 percent or less shall pass the No. 200 sieve.
- C. Shale. Shale shall include all rock-like materials formed by the natural consolidation of mud, clay, silt and fine sand and usually thinly laminated, comparatively soft and easily split, having a maximum size that can be readily placed and compacted in loose 8 inch layers.

- D. Rock. Rock shall include all igneous, metamorphic and sedimentary rock having a maximum size that can be readily placed and compacted in loose 8 inch layers and which generally has sufficient fines to normally fill all the voids in each layer.
- E. Random Materials. Random material shall include any combination of the above classifications and may include old concrete, brick, etc., from demolition having a maximum size that can be readily placed and compacted in loose 8 inch layers, and which have been approved by the ENGINEER.
- F. Flowable Fill. As defined in Section 02221 and approved in advance by the ENGINEER.

### 3PART - EXECUTION

#### 3.1 MAINTENANCE AND PROTECTION OF TRAFFIC

- A. Coordinate the work to ensure the least inconvenience to traffic and maintain traffic on one or more unobstructed lanes unless closing of the roadway is authorized.
- B. Maintain access to all streets and private drives and for emergency vehicles.
- C. Provide and maintain signs, flashing warning lights, barricades, markers, and other protective devices as required to conform with construction operations and to keep traffic flowing with minimum restrictions.
- D. Comply with State and local codes, permits and regulations.

#### 3.2 SALVAGE TOPSOIL

- A. Within the areas indicated for grading, strip topsoil to the depth of suitable topsoil material and stockpile for subsequent topsoiling operations. See Section 02100.

#### 3.3 PLACEMENT OF FILL MATERIAL

- A. After removal of topsoil, areas to receive fill shall be thoroughly rolled, and any soft spots disclosed by rolling shall be excavated and the unsuitable material removed and disposed of in a waste area. The excavated area shall be filled with suitable fill material approved by the ENGINEER and re-compacted. Suitable fill material shall be spread in layers of not more than 8 inches (loose) over the full area of the fill, and compacted to the required density by the use of compaction equipment. All fill material shall be compacted to not less than 95% of its maximum dry weight density at its optimum moisture content, plus or minus 2%, as determined by ASTM D698, under roadways, shoulders, driveways, curbs, sidewalks, gravel and sand parking areas and not less than 90% in yards, fields and sand areas.

When the material is too coarse to satisfactorily use these methods, compaction will be determined by the ENGINEER based on non-movement of the material under the compaction equipment.

- B. Fill material placed in areas inaccessible to the compaction equipment shall be placed in uniform loose layers not exceeding 4 inches in depth and compacted by means of approved mechanical tampers to the density requirements herein specified.

- C. When a previously constructed fill requires additional material to bring it to required elevation, the top of the fill shall be thoroughly scarified before the required additional material is placed.
- D. Material containing moisture in excess of that percentage which will ensure satisfactory compaction shall not be placed in the fill and fill material shall not be placed on material that has become unstable due to excessive moisture.
- E. Frozen fill material shall not be placed in fills, and fill material shall not be placed on frozen material. If during construction the top of the fill freezes, all frozen material shall be removed before additional material is placed.
- F. Wet or frozen materials which would be suitable when dried or when thawed and dried, may be wasted by the CONTRACTOR for his convenience only with the written permission of the ENGINEER, and subject to replacement in equivalent volume, at the expense of the CONTRACTOR. However, in no case shall waste material be disposed of in the flood channel or floodway area of any stream.
- G. Shale and random material containing an excessive quantity of large fragments shall be so placed that the coarser material is in areas where no building foundations or utility trenches are to be located. The large pieces shall then be broken down by the use of approved equipment until all voids are filled. Mixtures of shale and rock shall be placed in accordance with the requirements for placing shale.
- H. Where fill is to be constructed on a slope, the slope shall be benched to the width and depth shown on the drawings or as approved by the ENGINEER.

#### 3.4 EXCAVATION

- A. Perform excavation of borrow material in a manner satisfactory to the ENGINEER. Strip borrow pits of brush, trees, roots, grass and other vegetation prior to removal of material for use in fill. During the excavation operation, grade the borrow area to ensure free drainage of water from the area. Place and maintain erosion control devices after completion of the excavation, grade the excavated area, including side slopes, to drain and present a uniformly trim appearance merging into the surrounding terrain. After borrowing operations are complete, re-grade area, if necessary, to prevent erosion.

#### 3.5 CONTROL OF EXCAVATED MATERIAL

- A. Provide temporary barricades to prevent excavated material from encroaching on private property, walks, gutters, storm drains, and vegetation, especially trees, to be preserved.
- B. Maintain accessibility to all fire hydrants, valve pit covers, valve boxes, curb boxes, fire and police call boxes, and other utility controls at all times. Keep gutters clear or provide other satisfactory facilities for street drainage. Do not obstruct natural water courses. Where necessary, provide temporary channels to allow the flow of water either along or across the site of the work.
- C. Comply with requirements of Section 02270- Soil Erosion and Sedimentation Control.

### 3.6 DEWATERING

- A. Keep excavations dry and free of water. Dispose of precipitation and subsurface water clear of the work.
- B. Intercept and divert surface drainage away from excavations. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.
- C. Comply with Federal and State requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.

### 3.7 TOPSOILING

- A. Topsoiling as specified in Section 02485, Finish Grading, Seeding and Sodding.

### 3.8 DISPOSAL OF EXCAVATED MATERIAL

- A. Excavated material remaining after completion of placement of fills shall remain the property of the CONTRACTOR, removed from the construction area, and properly disposed of.

### 3.9 FOREIGN BORROW MATERIAL

- A. Foreign borrow consists of excavation, placement and compaction in fill areas of approved material obtained from sources outside the project limits.
- B. The CONTRACTOR shall make his own arrangements for obtaining all foreign borrow material and pay all costs involved.

END OF SECTION



## SECTION 02221 - TRENCHING, BACKFILLING AND COMPACTING

### 1PART - GENERAL

#### 1.1 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Cutting paved surfaces
2. Trench excavation, backfill and compaction
3. Support of excavation
4. Pipe bedding requirements
5. Control of excavated material
6. Rough grading
7. Restoration of unpaved surfaces

B. Related work specified elsewhere:

- |  |               |
|--|---------------|
| 1. Clearing and grubbing:                  | Section 02100 |
| 2. Soil erosion and sedimentation control: | Section 02270 |
| 3. Finish grading, seeding and sodding:    | Section 02485 |

C. Definitions: NONE

D. Applicable Standard Details: NONE

#### 1.2 QUALITY ASSURANCE

A. Reference Standards:

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

C33	Specifications for Concrete Aggregates
D698	Test Method of Laboratory Compaction Characteristics of Soil Using Standard Effort
D2922	Test for Density of Soil and Soil Aggregate in Place by Nuclear Methods

B. Testing Agency:

1. Compaction testing shall be performed by a PennDOT approved Soils Testing Laboratory engaged and paid for by the OWNER and approved by the ENGINEER.

C. Compaction Testing:

1. Determine compaction by the testing procedure contained in ASTM D698 or ASTM D2922. Compaction to be performed at the request of the ENGINEER at the CONTRACTOR'S expense if improper compaction is suspected.

### 1.3 SUBMITTALS

#### A. Certificates:

1. Submit certification from aggregate suppliers attesting that the pipe bedding and select material stone backfill materials conform to the specifications herein.

#### B. Compaction Equipment List:

1. Submit a list of all equipment to be utilized for compacting, including manufacturers' lift thickness limitations.

### 1.4 JOB CONDITIONS

#### A. Classification of Excavation:

1. All excavation work performed under this contract is UNCLASSIFIED, and includes excavation and removal of all soil, shale, rock, boulders, fill, and all other materials encountered of whatever nature.

#### B. Compaction of Backfill:

1. The degree of compaction required for a vegetative surface is 90%. 95% compaction is required for all other surfaces.

#### C. Control of Traffic:

1. Employ traffic control measures as necessary to maintain vehicular traffic and reasonable access for employees and visitors.

#### D. Protection of Existing Utilities and Structures:

1. Take all precautions and utilize all facilities required to protect existing utilities and structures. Comply with the requirements of the Maryland Underground Utility Damage Prevention Act. Request cooperative steps of the Utility and suggestions for procedures to avoid damage to its lines.
2. Advise each person in physical control of powered equipment or explosives used in excavation or demolition work of the type and location of utility lines at the job site, the Utility assistance to expect, and procedures to follow to prevent damage.
3. Immediately report to the Utility and the ENGINEER any break, leak or other damage to the lines or protective coatings made or discovered during the work and immediately alert the occupants of premises of any emergency created or discovered.
4. Allow free access to Utility personnel at all times for purposes of maintenance, repair and inspection.

## 2PART - PRODUCTS

### 2.1 PIPE BEDDING MATERIAL

#### A. Type III and Type IV Bedding Material:

1. AASHTO No. 57 coarse aggregate. Do not use slag or cinders.

#### B. Type V Bedding:

1. AASHTO No. 10 coarse aggregate. Do not use slag or cinders.

### 2.2 BACKFILL MATERIAL

#### A. Select Material Backfill:

1. Crushed stone or gravel aggregate conforming to Select Granular Material (2RC). Do not use slag or cinders.

#### B. Suitable Backfill Material (Highways, driveways, and shoulders):

1. From top of pipe bedding material to subgrade elevation:
  - a. Select Material Backfill
  - b. Flowable Backfill Material - Where directed or approved

#### C. Suitable Backfill Material (Other than highways, driveways, and shoulders):

1. From top of pipe bedding material to 24" over top of pipe:
  - a. Material excavated from the trench if free of stones larger than 2" in size and free of wet, frozen, or organic materials.
2. From 24" above pipe to subgrade elevation:
  - a. Material excavated from the trench if free of stones larger than 8" in size and free of wet, frozen, or organic materials.

## 3PART - EXECUTION

### 3.1 MAINTENANCE AND PROTECTION OF TRAFFIC

#### A. Maintain traffic in one or more unobstructed lanes and provide access to all streets and private drives.

#### B. Provide and maintain protective devices as required by state and local codes, permits, and regulations.

### 3.2 CUTTING PAVED SURFACES PRIOR TO TRENCHING

- A. Where installation of pipelines, miscellaneous structures, and appurtenances necessitate breaking a paved surface, make cuts in a neat uniform fashion forming straight lines parallel with the centerline of the trench. Cut offsets at right angles to the centerline of the trench.
- B. Protect edges of cut pavement during excavation to prevent raveling or breaking; square edges prior to pavement replacement.
- C. The requirement for neat line cuts, in other than state highways, may be waived if the final paving restoration indicates overlay beyond the trench width.

### 3.3 TRENCH EXCAVATION

#### A. Depth of Excavation:

##### 1. Gravity Pipelines:

- a. Excavate mainline trenches to the required depth and grade for the invert of the pipe plus that excavation necessary for placement of pipe bedding material.
- b. Excavation for laterals shall provide a straight uniform grade from the main pipeline to the right-of-way line (in accordance with Section 02610), plus that excavation necessary for placement of pipe bedding material.

##### 2. Pressure Pipelines:

- a. Excavate trenches to the minimum depth necessary to place required pipe bedding material and to provide a minimum of 42" from the top of the pipe to the finished ground elevation, except where specific depths are otherwise shown on the Contract Drawings.
- 3. Where unsuitable bearing material is encountered in the trench bottom, continue excavation until the unsuitable material is removed, solid bearing is obtained or can be established, or concrete cradle can be placed. If no concrete cradle is to be installed, refill the trench to required pipeline grade with pipe bedding material.
- 4. Where the CONTRACTOR, by error or intent, excavates beyond the minimum required depth, backfill the trench to the required pipeline grade with pipe bedding material.

#### B. Width of Excavation:

- 1. Excavate trenches, including laterals, to a width necessary for placement and jointing of the pipe, and for placing and compacting pipe bedding and trench backfill around the pipe, but not less than 16" or more than 24" plus the pipe outside diameter from the bottom of the trench to a point 12" above the crown of the pipe.
- 2. Shape trench walls completely vertical from trench bottom to at least 2' above the top of the pipe. Trench walls from 2' above the top of the pipe to grade to be benched and sloped, or shaved, to comply with Federal and State laws and codes.
- 2. For pressure pipeline fittings, excavate trenches to a width that will permit placement of

concrete thrust blocks. Provide earth surfaces for thrust blocks that are perpendicular to the direction of thrust and are free of loose or soft material.

C. Length of Open Trench:

1. Do not advance trenching operations more than 100' ahead of completed pipeline, except as specified in the State Highway Occupancy Permit.

3.4 SUPPORT OF EXCAVATION

- A. The adequacy of the design of sheeting, shoring and bracing installations relative to the nature of the material to be encountered and retained is the sole responsibility of the CONTRACTOR and no duty is assumed or to be exercised by OWNER or ENGINEER relative thereto.
- B. Support excavations with sheeting, shoring, and bracing or a "trench box" as required to comply with Federal and State laws and codes.
- C. Install adequate excavation supports to prevent ground movement or settlement of adjacent structures, pipelines or utilities. Damage due to settlement because of failure to provide support or through negligence or fault of the CONTRACTOR in any other manner, shall be repaired at the CONTRACTOR's expense.
- D. Removal of sheeting, shoring and bracing as backfilling proceeds is the CONTRACTOR's responsibility.

3.5 CONTROL OF EXCAVATED MATERIAL

- A. Keep the ground surface on both sides of the excavation free of excavated material to comply with Federal and State laws and codes.
- B. Provide temporary barricades to prevent excavated material from encroaching on private property, walks, gutters, and storm drains.
- C. Maintain accessibility to all fire hydrants, valve pit covers, valve boxes, curb boxes, fire and police call boxes, and other utility controls at all times. Keep gutters clear or provide other satisfactory facilities for street drainage. Do not obstruct natural water courses. Where necessary, provide temporary channels to allow the flow of water either along or across the site of the work.
- D. In areas where pipelines parallel or cross streams, ensure that no material slides, is washed, or is dumped into the stream course. Remove cofferdams immediately upon completion of pipeline construction.
- E. Comply with Section 02270, Soil Erosion and Sedimentation Control.

3.6 DEWATERING

- A. Keep excavations dry and free of water. Dispose of precipitation and subsurface water clear of the work.

- B. Maintain pipe trenches dry until pipe has been jointed, inspected, and backfilled, and concrete work has been completed. Prevent trench water from entering pipelines under construction.
- C. Intercept and divert surface drainage away from excavations. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.
- D. Comply with Federal and State requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.

### 3.7 PIPE BEDDING REQUIREMENTS

#### A. Type III Bedding:

1. Depth of pipe bedding aggregate as shown on the Contract Drawings.
2. Provide Type III bedding when installing reinforced concrete storm drain pipe.

#### B. Type IV Bedding:

1. Depth of pipe bedding aggregate as shown on the Contract Drawings.
2. Provide Type IV bedding when installing all other pipes larger than 2" diameter.

#### C. Type V Bedding:

1. Depth of pipe bedding aggregate as shown on the Contract Drawings.
2. Provide Type V bedding when installing piping 2" diameter and smaller.

D. Shape recesses for the joints or bell of the pipe by hand. Assure that the pipe is supported on the lower quadrant (under "haunches") and the pipe bottom for the entire length of the barrel. Fill all voids below the pipe.

E. Pipe embedment material shall be placed, worked by hand or compacted until a minimum density of 90% in yards and 95% under roadways and sidewalks is achieved (at optimum moisture content, " 2%, standard proctor).

### 3.8 PIPE LAYING

- A. Provide required pipe bedding placed in accordance with these specifications.
- B. Lay pipe as specified in the appropriate Section of these Specifications for pipeline construction.

### 3.9 THRUST RESTRAINT

- A. Provide pressure pipe with concrete thrust blocking or use restrained joint fittings at all bends, tees, valves, and changes in direction, in accordance with the Contract Drawings.

### 3.10 BACKFILLING TRENCHES

- A. After pipe installation and inspection, backfill trenches to 12" above the crown of the pipe with specified backfill material placed and carefully compact with approved compaction equipment in layers of suitable thickness to provide specified compaction. Backfill and compact the remainder of the trench with specified backfill material. Refer to Contract Drawings and this specification for trench backfill material and compaction requirements at each specific location.
- B. Lift Thickness Limitations:
  - 1. Submit a list of the compaction equipment to be utilized on the project, the recommendations of the equipment manufacturer as to the maximum lift thickness which can be placed, and the method of compaction to be used with this equipment to achieve the required compaction. In no case shall maximum lift thickness placed exceed the maximum limits specified by the manufacturer's recommendations. However, if the equipment manufacturer's lift thickness recommendation is followed and the specified compaction is not obtained, the CONTRACTOR shall, at his own expense, remove, replace, and retest as many times as is required to obtain the specified compaction.
  - 2. Lift thickness limitations specified for state highways, shoulders, or embankments shall govern over the compaction equipment manufacturer's recommendations.
- C. Jetting:
  - 1. When approved by the ENGINEER in writing, jetting methods may be used to consolidate backfill. Quality assurance methods to verify adequate compaction will be a condition of the approval by the ENGINEER.
- D. Uncompacted Backfill:
  - 1. Where uncompacted backfill is indicated on the Contract Drawings, backfill the trench from one foot above the pipe to the top of the trench with material excavated from the trench, crowned over the trench to a sufficient height to allow for settlement to grade after consolidation, providing for surface water drainage.
- E. Unsuitable Backfill Material:
  - 1. Where the ENGINEER deems backfill material to be unsuitable and rejects all or part thereof due to conditions prevailing at the time of construction, remove the unsuitable material and replace with select material backfill.

### 3.11 DISPOSAL OF EXCAVATED MATERIAL

- A. Excavated material remaining after completion of backfilling shall remain the property of the CONTRACTOR, removed from the construction area, and legally disposed of.

### 3.12 ROUGH GRADING

- A. Rough subgrade areas disturbed by construction to a uniform finish. Form the bases for terraces, banks, and lawns.

B. Grade areas to be paved to depths required where placing subbase and paving materials.

C. Rough grade areas to be topsoiled and seeded to 4" below indicated finish contours.

### 3.13 RESTORATION OF UNPAVED SURFACES

A. Restore unpaved surfaces disturbed by construction to equal the surface condition prior to construction.

B. Restore grassed areas in accordance with Section 02485, Finish Grading, Seeding and Sodding.

### 3.14 LIMITS OF WORK

A. All disturbances shall be confined to OWNER's property, street rights-of-way, permanent easements, and temporary construction easements shown on the Contract Drawings.

B. The CONTRACTOR shall not permit trucks and equipment to enter private driveways.

END OF SECTION

## SECTION 02270 - SOIL EROSION AND SEDIMENTATION CONTROL

### 1PART - GENERAL

#### 1.1 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Installation of soil erosion and sedimentation control (SESC) measures as per approved plan.
2. Maintenance of SESC measures.
3. Restoration of area and removal of any interim SESC measures placed to protect areas from erosion during stabilization period.

B. Related work specified elsewhere:

- |  |               |
|--|---------------|
| 1. Clearing and grubbing:                          | Section 02100 |
| 2. Site excavation and placement of fill material: | Section 02210 |
| 3. Finish grading, seeding, sodding:               | Section 02485 |
| 4. Storm drain pipe:                               | Section 02618 |

#### 1.2 QUALITY ASSURANCE

A. Reference Standards:

1. 1994 Maryland Standards and Specifications for Soil Erosion and Sediment Control.
2. Asphalt Institute Specifications

#### 1.3 SUBMITTALS

A. Soil Erosion and Sedimentation Control plan for this project is included in The Contract Drawings. The CONTRACTOR shall regard this plan as a minimum standard. This plan may not be adjusted by the CONTRACTOR without prior approval of the County Conservation District and other regulatory agencies as applicable, and by means of a Contract Change Order.

1.4 JOB CONDITIONS: Section Not Utilized.

### 2PART - MATERIALS

#### 2.1 STONE FOR RIP-RAP

A. Stone used shall be the type and size of rip-rap shown on Contract Drawings.

#### 2.2 MATTING FOR EROSION CONTROL

A. The CONTRACTOR shall furnish a certification from the manufacturer that the matting conforms to the requirements prescribed hereinafter.

B. Jute matting for erosion control:

1. As shown on Contract Drawings or Engineer approved equivalent.

C. Excelsior matting:

1. As shown on Contract Drawings or Engineer approved equivalent.

D. Nylon matting:

1. As shown on Contract Drawings or Engineer approved equivalent.

## 2.3 EROSION CONTROL DEVICES

A. Silt Barrier Fence:

1. Geotextiles, Class 3: As shown on Contract Drawings or Engineer approved equivalent.
2. Mesh Support: As shown on Contract Drawings or Engineer approved equivalent.
3. Post:
  - a. Wood or steel or acceptable plastic with equivalent section and sufficient length for height of fence required.
  - b. As shown on Contract Drawings or Engineer approved equivalent.
4. Fasteners: As shown on Contract Drawings or Engineer approved equivalent.
5. Ground Anchors, Guy Wires: As shown on Contract Drawings or Engineer approved equivalent.

## 2.4 TEMPORARY COVER

A. Seed: As specified in Section 02485.

B. Seed Mixtures: As specified in Section 02485.

C. Inoculant: As specified in Section 02485.

## 2.5 SOIL SUPPLEMENT MATERIALS

A. Fertilizer: As specified in Section 02485.

B. Agricultural Lime: As specified in Section 02485.

## 2.6 MULCHING MATERIALS

A. Straw: As specified in Section 02485.

B. Wood Cellulose Fiber: As specified in Section 02485.

C. Mulching Binder

1. Emulsified Asphalt: SS-1, CSS-1, CMS-1, MS-2, RS-1, RS-2, CRS-1, or CRS-2. Designations from Asphalt Institute Specifications.

D. Wood Chips: Wood chips, recovered from clearing and grubbing operation will be acceptable as mulch for seeding and shall be used at a rate of 35 cubic yards per acre.

2.7 STORM DRAIN PIPE

- A. As specified in Section 02618.

2.8 PUMPED SEDIMENT CONTROL DEVICE

- A. Nonwoven geotextile fabric bag that collects silt from pumped water, such as Dirtbag manufactured by ACF Environmental, Inc., Richmond, VA, or approved equal.

- B. Bag must be sized to accommodate flow rates and maintained as recommended by the manufacturer.

2.9 INLET SEDIMENT CONTROL DEVICE

- A. Woven polypropylene fabric bag such as Siltsack, as manufactured by ACF Environmental, Inc., Richmond, VA, or approved equal, sized to fit inlet.

3PART - EXECUTION

- 3.1 Notify Conservation District a minimum of 72 hours prior to initiating earthmoving.

- 3.2 A copy of the SESC Plan must be available at the site of earthmoving activity during construction and until the site is stabilized.

- 3.3 SESC measures shall be implemented by the CONTRACTOR before earthmoving activities are started. The plan shall be strictly adhered to, and the CONTRACTOR shall maintain all SESC measures until permanent soil cover has been established.

- 3.4 The following minimum control measures shall be employed by the CONTRACTOR:

- A. Reduce by the greatest extent practicable the area and duration of exposure of readily erodible soils;
- B. Protect soils by use of temporary vegetation, or by seeding and mulching, or by accelerating the establishment of permanent vegetation and completing disturbed areas of work as rapidly as is consistent with construction schedules;
- C. Retard the rate of runoff from the construction site and control the disposal thereof;
- D. Trap sediment from the construction site in silt basins, including pump discharges from dewatering operations;
- E. Sprinkle or apply dust suppressors to keep dust within tolerable air quality limits on haul roads and at the construction site;

- F. Utilize temporary measures to control soil erosion on construction operations suspended for more than 20 calendar days;
  - G. Provide protection against discharge of pollutants such as chemicals, fuel, lubricants, sewage, etc. into streams or storm water facilities;
  - H. Keep all construction debris, excavated material, rocks, and refuse incidental to the work out of any stream channel, gutter lines and drainage channels.
- 3.5 The CONTRACTOR shall not permit mud or silt-laden water to leave the construction site, and is responsible for any and all damages to downstream properties as a result of his failure to prevent such damages.
- 3.6 At such time permanent soil cover has been established, the CONTRACTOR shall remove all temporary SESC measures.
- 3.7 Temporary control measures must be maintained, including disposal and replacement of damaged or filled devices.

END OF SECTION

## SECTION 02485 - FINISH GRADING, SEEDING AND SODDING

### 1PART - GENERAL

#### 1.1 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Placing topsoil
2. Soil conditioning
3. Finish grading
4. Seeding
5. Sodding
6. Mulching
7. Maintenance

B. Related work specified elsewhere:

1. Clearing and grubbing: Section 02100
2. Trenching, backfilling and compacting: Section 02221

C. Definitions: NONE

D. Applicable Standard Details: NONE

#### 1.2 QUALITY ASSURANCE

A. Reference Standards:

1. American Association of State Highway Transportation Officials (AASHTO):

T194Determination of Organic Matter in Soils by Wet Combustion

2. Others:

Agricultural Liming Materials Act of 1978, P.L.15  
Rules for Testing Seeds of the Association of Official Seed Analysts  
Federal and State pesticide acts and registration requirements

B. Sod Producer - Company specializing in sod production and harvesting with a minimum of 5 years experience.

C. Sod Installer - Company specializing in performing this work with a minimum of 5 years experience.

#### 1.3 SUBMITTALS

A. Samples:

1. Unless otherwise directed, furnish three strips of sod, 4-1/2 feet long by 12" wide, laid on 3" of topsoil and tamped in place. The samples shall be representative of the sod and workmanship to be provided. Include sod source location.
2. Advise the ENGINEER of the location of the field, and area within the field, from which the sod is to be taken for approval.

B. Certificates:

1. Unless directed otherwise, prior to use or placement of material, submit certifications of material composition of the following for approval:
  - a. Topsoil analysis
  - b. Fertilizer
  - c. Lime
  - d. Seed mixtures
  - e. Inoculant
  - f. Sod

1.4 JOB CONDITIONS - Section not utilized

2PART - PRODUCTS

2.1 TOPSOIL

- A. Having a pH of between 6.0 and 7.0; containing not less than 2% nor more than 10% organic matter as determined by AASHTO T194.
- B. Fertile friable loam, sand loam, or clay loam which will hold a ball when squeezed with the hand, but which will crumble shortly after being released.
- C. Free of clods, grass, roots, or other debris harmful to plant growth.
- D. Free of pests, pest larvae, and matter toxic to plants.

2.2 FERTILIZER

- A. Basic Dry Formulation Fertilizer:
  1. Analysis 10-20-20 in accordance with Maryland Nutrient Management Regulations and University of Maryland Cooperative Extension Guidelines.
- B. Starter Fertilizer:
  1. Analysis 38-0-0 or 31-0-0 in accordance with Maryland Nutrient Management Regulations and University of Maryland Cooperative Extension Guidelines.

2.3 LIME

- A. Apply limestone as required according to soil tests or seeding restoration table.
- B. Pulverized limestone shall be of such fineness that a minimum of 50% of the ground limestone shall be able to pass through a 100 mesh sieve, and a minimum of 98% shall be able to pass through a 20 mesh sieve. Pulverized limestone applications over 50 pounds per 1000 ft<sup>2</sup> shall be uniformly incorporated into the upper 4.0 to 6.0 inches of the soil surface; pulverized limestone applications of 50 pounds per 1000 ft<sup>2</sup> or less may be incorporated or left on the soil surface. Pulverized limestone shall be distributed with drop spreaders at times when high winds will not interfere with uniform distribution or cause nuisance dust. Pulverized limestone shall not be distributed with rotary spreaders or other spreaders. Pulverized limestone may be included in the hydraulic seeding slurry.

2.4 SEED

- A. Deliver seed fully tagged and in separate packages according to species or seed mix. Seed which has become wet, moldy, or otherwise damaged in transit or storage will not be accepted.
- B. Fresh, clean, dated material from the last available crop and within the date period specified, with a date of test not more than 9 months prior to the date of sowing. Percentage of pure seed present shall represent freedom from inert matter and from other seeds distinguishable by their appearance. All seeds will be subject to analysis and testing.
- C. Seed intended for fine turfgrass areas shall carry either "Maryland Interagency Certified" tags or other "Certified State of Origin" tags on their bags or containers at the time of seeding, and shall conform to applicable Maryland seed laws and standards of minimum purity, minimum germination, maximum crop seed, maximum weed seed, and be free of noxious weed seed as specified for the species and summarized in the seed quality standards of TABLE 1. Cultivars of species included in seed mixtures for fine turfgrass areas shall be selected from those recommended by University of Maryland Dept. of Natural Resource Sciences. Refer to the most current update of "U.M. Turfgrass Technical Update TT-77: Recommended Turfgrass Cultivars for Certified Sod and Professional Seed Mixtures", which may be accessed via the internet at [www.md turf council.org](http://www.md turf council.org).

TABLE 1 - GRASS AND AGRICULTURAL SEEDS

<u>Species</u>	<u>Maximum Guaranteed Purity (Percent)</u>	<u>Minimum Weed Seed (Percent)</u>	<u>Minimum Guaranteed Germination (Percent)</u>
Tall Fescue	98	0.20	85

2.5 SEED MIXTURES

- A. See "Seeding Restoration Table" at end of this Section.

2.6 MULCHING MATERIALS

A. Mulches for seeded areas shall be one, or a combination of, the following:

1. Straw:

- a. Cured to less than 20% moisture content by weight.
- b. Contain no stems of tobacco, soybeans, or other coarse or woody material.
- c. Wheat or oat straw.

2. Wood Cellulose:

- a. No growth or germination inhibiting substances.
- b. Green, air dried. Packages not exceeding 100 pounds.
- c. Requirements:

Moisture Content:	12% <sup>3%</sup>
Organic Matter:	98.6% <sup>0.2%</sup> on the oven dried basis.
Ash Content:	1.4% <sup>0.2%</sup>
Minimum Water-Holding Capacity:	1,000%

3. Mushroom Manure:

- a. Organic origin, free of foreign material larger than 2" and substances toxic to plant growth.
- b. Organic Matter: 20% minimum
- c. Water-Holding Capacity: 120% minimum
- d. pH: 6.0

B. Sewage sludge compost is not permitted.

2.7 SOD

- A. Well-rooted Turf-Type Tall Fescue sod containing a growth of not more than 10% of other grasses and clovers.
- B. Free from noxious weeds such as Bermuda grass, wild mustard, crab grass, and kindred grasses.
- C. Mow sod in the field to a height of not more than 2-1/2" within 5 days prior to lifting.
- D. Cut sod to a depth equal to the growth of the fibrous roots, but in no case less than 1-1/2", exclusive of grass and thatch. Do not cut sod when the ground temperature is below 32°F.
- E. Deliver sod to the project site within 24 hours after being cut and place sod within 36 hours after being cut. Do not deliver small, irregular, or broken pieces of sod. Do not deliver more sod than can be laid within 24 hours.
- F. During wet weather, allow sod to dry sufficiently to prevent tearing during handling and placing. During dry weather, moisten sod to ensure its vitality and to prevent dropping of the soil during handling. Sod which dries out will be rejected.

## 3PART - EXECUTION

### 3.1 TIME OF OPERATIONS

#### A. Spring Seeding:

1. Preliminary operations for seed bed preparation may commence as soon after February 15 as ground conditions permit.

#### B. Fall Seeding:

1. Preliminary operations for seed bed preparation may commence after July 15.

### 3.2 FINISH GRADING

#### A. Preparation of Subgrade:

1. "Hard pan" or heavy shale:
  - a. Plow to a minimum depth of 6".
  - b. Loosen and grade by harrowing, discing, or dragging.
  - c. Hand rake subgrade. Remove rocks over 2" in diameter and other debris.
2. Loose loam, sandy loam, or light clay:
  - a. Loosen and grade by harrowing, discing, or dragging.
  - b. Hand rake subgrade. Remove rocks over 2" in diameter and other debris.

#### B. Placing Topsoil:

1. Place topsoil and spread over the prepared subgrade to obtain the required depth and grade elevation. Compact with a roller having not more than 65 pounds per roller foot width to a final compacted thickness of not less than 4".
2. Hand rake topsoil and remove all materials unsuitable or harmful to plant growth.
3. Do not place topsoil when the subgrade is frozen, excessively wet, or extremely dry.
4. Do not handle topsoil when frozen or muddy.

#### C. Tillage:

1. After seed bed areas have been brought to proper compacted elevation, thoroughly loosen to a minimum depth of 4" by discing, harrowing, or other approved methods. Do not work topsoiled areas when frozen or excessively wet.
2. Liming:
  - a. Distribute lime uniformly at the specified rates.
  - b. Thoroughly incorporate into the topsoil to a depth of 4".

c. Incorporate as a part of the tillage operation.

3. Basic Fertilizer:

- a. Distribute basic fertilizer uniformly at the specified rate.
- b. Thoroughly incorporate into the topsoil to a depth of 4".
- c. Incorporate as a part of tillage operation.

D. Finish Grading:

1. Remove unsuitable material larger than ½" in any dimension.
2. Uniformly grade surface to the required contours without the formation of water pockets.
3. Rework areas which puddle by the addition of topsoil and starter fertilizer and rake.

3.3 SEEDING

A. Distribute starter fertilizer at the specified rates.

B. Incorporate starter fertilizer into the upper 1" of soil.

C. Uniformly sow specified seed mix by use of approved hydraulic seeder, power-drawn drill, power-operated seeder, or hand-operated seeder. Do not seed when winds are over 15 mph.

D. Upon completion of sowing, cover seed to an average depth of 1/4" by hand raking or approved mechanical methods.

E. Mulch immediately after seeding, using one of the following methods:

1. Place straw mulch in a continuous blanket at a minimum rate of 1,200 pounds per 1,000 square yards.
  - a. Anchor straw mulch by use of twine, stakes, wire staples, paper, or plastic nets.
  - b. Emulsified asphalt may be used for anchorage provided it is applied uniformly at a rate not less than 31 gallons per 1,000 square yards.
  - c. Chemical mulch binders may be used for anchorage if they are applied uniformly at the manufacturer's recommended rate.
  - d. Chemical mulch binders or a light covering of topsoil may be used for anchorage when the size of the area precludes the use of mechanical equipment.
2. Apply wood cellulose fiber hydraulically at a rate of 320 pounds per 1,000 square yards. Incorporate as an integral part of the slurry after seed and soil supplements have been thoroughly mixed.
3. Spread mushroom manure uniformly to a minimum depth of ½" or to the depth indicated on the Contract Drawings.

F. When mulch is applied to grass areas by blowing equipment, the use of cutters in the equipment will be permitted to the extent that a minimum of 95% the mulch is 6" or more in length. For cut mulches applied by the blowing method, achieve a loose depth in place of not less than 2".

G. When mulching by the asphalt mix method, apply the mulch by blowing. Spray the asphalt

binder material into the mulch as it leaves the blower. Apply the binder to the mulch in the proportion of 1.5 to 2.0 gallons per 45 pounds of mulch.

1. Protect structures, pavements, curbs, and walls to prevent asphalt staining.
2. Erect warning signs and barricades at intervals of 50 feet or less along the perimeter of the mulched area.
3. Do not spray asphalt and chemical mulch binders onto any area within 100 feet of a stream or other body of water.

### 3.4 SODDING

- A. Prior to sod placement, complete finish grading and moisten prepared surface to receive sod.
- B. Do not place sod when the temperature is lower than 32°F.
- C. Place sod by hand with tight joints and no overlap. Transverse joints shall be broken or staggered.
- D. Place sod so that the top of the sod is flush with the surrounding grade.
- E. Use of tools which damage the sod or dumping of sod from vehicles will not be permitted.
- F. Water sod to the saturation point immediately after placement.
- G. After watering, tamp with an approved tamper to close all joints and insure close contact between sod and sod bed. After tamping, the sod shall present a smooth, even surface free from bumps and depressions. If so directed, use a light roller, weighing not more than 65 pounds per foot of roller width to complete firming and smoothing the sod.
- H. When placing sod in ditches, place the strip with the long dimension at right angles to the flow of water. At any point where water will start flowing over a sodded area, the upper edge of the sod strips shall be turned into the soil below the adjacent area and a layer of compacted earth placed over this juncture to conduct the water over the edge of the sod.
- I. In ditches and on slope areas, stake each strip of sod securely with at least 1 wood stake for each 2 square feet of sod. Stakes shall be ½" by 1" with a length of 8" to 12". Drive stakes flush with the top of the sod, with the long face parallel to the slope contour.

### 3.5 MAINTENANCE

- A. Maintenance includes watering, weeding, cleanup, edging and repair of depressions, washouts or gullies.
- B. Those areas which do not show a prompt catch of grass within 14 days of seeding or sodding shall be reseeded or resodded until complete grass catch occurs.
- C. Maintain sodded areas for 3 months from date of substantial completion, mow to maintain maximum height of 2-1/2" or as specified on Contract Drawings.

SEEDING RESTORATION TABLE

<u>RESTORATION CONDITION</u>	<u>TOPSOIL</u>	<u>LIME*</u>	<u>BASIC FERTILIZER</u>	<u>STARTER FERTILIZER</u>	<u>SEED MIX &amp; SOWING RATE (% BY WEIGHT)</u>
All Conditions	Yes	800# per 1,000 Sq. Yds.	10-20-20 @ 140# per 1,000 Sq. Yds.	38-0-0 @ 50# per 1,000 Sq. Yds. <u>or</u> 31-0-0 @ 61# per 1,000 Sq. Yds.	100% Tall Fescue Sow 21# per 1,000 Sq. Yds. Mar. 15 thru May/Aug. thru Oct. 15

\*Unless lesser rate indicated by soils tests

END OF SECTION

## SECTION 02602 - STORM INLETS, CATCH BASINS, ENDWALLS

### 1PART - GENERAL

#### 1.1 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Storm drainage inlets
2. Storm drainage catch basins
3. Storm drainage pipe endwalls
4. Pipe culvert end sections

B. Related work specified elsewhere:

- |  |               |
|--|---------------|
| 1. Trenching, backfilling and compacting:  | Section 02221 |
| 2. Soil erosion and sedimentation control: | Section 02270 |
| 3. Finish grading, seeding and sodding:    | Section 02485 |
| 4. Storm drain pipe:                       | Section 02618 |

C. Definitions: NONE

D. Applicable Standard Details: NONE

#### 1.2 QUALITY ASSURANCE

A. Reference Standards:

1. Maryland State Highway Administration:

Standard Specifications for Construction and Materials  
Book of Standards for Highway and Incidental Structures

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

A36 Specification for Carbon Structural Steel  
A47 Specification for Ferritic Malleable Iron Castings  
A48 Specification for Gray Iron Castings  
A185 Specification for Steel Welded Wire Fabric for Concrete Reinforcement  
A536 Specification for Ductile Iron Castings  
A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement  
C32 Specification for Sewer and Manhole Brick (made from clay or shale)  
C270 Specification for Mortar for Unit Masonry

#### 1.3 SUBMITTALS

A. Certificates:

1. Submit certification from material suppliers attesting that materials provided meet or exceed specification requirements.

B. Shop Drawings:

1. Submit detailed Shop Drawings, including reinforcing steel details.

C. Submit concrete mix designs, certified results of compressive strength tests, certified field tests and copies of batch slips for all cast-in-place inlets, catch basins or endwalls.

1.4 JOB CONDITIONS: Section not utilized.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Precast Concrete Units:

1. After fabrication and curing, transport the units to the job site. Protect until required for installation.
2. Handle to avoid damage to surfaces, edges and corners and to avoid creation of stresses within the units.

B. Inspections

1. Inspection by the ENGINEER will, at a minimum, be made of materials upon delivery to the job site; of the subgrade, prior to construction or placement; and of the completed structure, prior to backfill.
2. Precast cement concrete products shall be subject to rejection for failure to conform with these specifications or if any one of the following conditions is noted:
  - a. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
  - b. Defects that indicate incorrect proportioning, mixing, and molding.
  - c. Surface defects larger than ½" diameter indicating honey-combed or open texture.
  - d. Damaged or cracked ends, where such damage would prevent making a satisfactory joint.

2PART - PRODUCTS

2.1 MATERIALS

A. Crushed Stone Subbase:

1. AASHTO No. 57, Type C, Crushed Stone or Gravel aggregate. Do not use slag or cinders.

B. Brick: ASTM C32 Grade SS, solid.

C. Masonry Mortar: ASTM C270, Type S.

D. Malleable Iron Castings: ASTM A47, Grade 35018, Domestic.

E. Ductile Iron Castings: ASTM A536, Grade 60-40-18, Domestic.

F. Structural Grade Carbon Steel: ASTM A36.

G. Cast Gray Iron Castings: ASTM A48.

## 2.2 FABRICATIONS

A. Precast Cement Concrete Units:

1. Comply with the requirements of Section 305, MDSHA Specifications.
2. 6' inlets shall be similar in all respects to standard inlets except that the longitudinal dimension shall be increased by 24".

B. Pipe Culvert End Sections:

1. Concrete or Metal - Comply with the requirements of Section 305, MDSHA Specifications.
2. Polyethylene end sections shall have smooth interior and be anchored at the flared end.

C. Outlet Structures

1. Precast concrete or cast-in-place concrete in accordance with Paragraph A.
2. Construct outlet structures to dimensions shown on Contract Drawings.
3. Flared end sections shall be high density polyethylene meeting ASTM D3350 minimum cell classification 213320C as manufactured by ADS, Inc. or an approved equal.

## 3PART - EXECUTION

### 3.1 EXCAVATION

A. Excavate as specified in Section 02221, Paragraph 3.04.

B. Excavate at location marked in the field.

C. Excavate to the required depth and grade for the bottom of the unit plus that excavation necessary for placement of base material.

### 3.2 CONSTRUCTION

A. Construct endwalls to the dimensions and design as indicated in MDSHA Standard Drawings and of the type shown on the Contract Drawings. Construct endwalls of monolithically cast reinforced concrete.

B. Do not permit pipes to project more than 2" into inlets. Do not expose end of pipe through faces of endwalls.

- C. Install polyethylene end sections in accordance with manufacturer's instructions, bedded and anchored as required.
- D. Construct basin outlet structures with inverts, grates and openings at the required elevations shown on the Contract Drawings. Connect to new or existing outlet pipes, relaying or adding pipe as needed to meet the structure.

### 3.3 BACKFILLING

- A. Backfill structures only after inspection by the ENGINEER.
- B. Perform backfilling and compaction as specified in Section 02221, Paragraph 3-10.

### 3.4 DISPOSAL OF EXCAVATED MATERIAL: Section 02221, Paragraph 3-11.

### 3.5 RESTORATION OF SURFACE AREAS

- A. Restore paved areas in accordance with the Contract Drawings.
- B. Restore unpaved surfaces in accordance with Section 02221, Paragraph 3-13.

END OF SECTION

## SECTION 02610 - SANITARY SEWER PIPE

### 1PART - GENERAL

#### 1.1 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Sanitary sewer gravity pipelines
2. Sanitary sewer pressure pipelines and valves
3. Laterals/service connections

B. Related work specified elsewhere:

- |  |               |
|--|---------------|
| 1. Trenching, backfilling and compaction:  | Section 02221 |
| 2. Soil erosion and sedimentation control: | Section 02270 |
| 3. Finish grading, seeding and sodding:    | Section 02485 |

C. Definitions:

1. Dimension Ratio (DR) - Constant ratio between outside pipe diameter and wall thickness.
2. Standard Dimension Ratio (SDR) - Constant ratio based on Renard numbers and rated for pressure.

D. Applicable Standard Details:

- 02610-1 Lateral Detail
- 02610-2 Lateral Detail with Cleanout
- 02610-3 Subbase Drain Detail
- 02610-4 Combination Air Release Valve

#### 1.2 QUALITY ASSURANCE

A. Reference Standards:

1. American National Standards Institute (ANSI):

- A21.4Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings
- A21.10 Gray-Iron and Ductile-Iron Fittings
- A21.11 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
- A21.51 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for water or other liquids

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

- |     |  |
|-----|--|
| A53 | Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless |
| A74 | Specification for Cast Iron Soil Pipe and Fittings                                   |
| C14 | Specification for Concrete Sewer, Storm Drain and Culvert Pipe                       |

C76	Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C425	Specification for Compression Joints for Vitrified Clay Pipe and Fittings
C443	Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets
C564	Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
C700	Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated
D1785	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
D1869	Specification for Rubber Rings for Asbestos-Cement Pipe
D2241	Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR series)
D2321	Practice for Underground Installation of Termoplastic Pipe for Sewers and other Gravity-Flow Applications.
D2564	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
D2855	Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
D3034	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
D3139	Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
D3212	Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
F477	Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
F679	Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

3. American Water Works Association (AWWA):

C301	Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids
C504	Rubber Seated Butterfly Valves
C507	Ball Valves, 6" through 48"
C900	Poly (Vinyl Chloride) PVC Chloride (PVC) Pressure Pipe, 4" through 12" for Water Distribution

B. Materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, or acid solder will be rejected.

1.3 SUBMITTALS

A. Certificates:

1. Submit 2 copies of each manufacturer's certification attesting that the pipe, pipe fittings, valves, joints, joint gaskets and lubricants and detectable warning tape meet or exceed specification requirements.

B. Manufacturer's Literature:

2. Submit 2 copies of the manufacturer's recommendations on installation, handling and storage of materials.

C. Details of bypass pumping operation and pump curves.

1.4 JOB CONDITIONS: Section not utilized.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling:

1. Do not place materials on private property without written permission of the property owner.
2. During loading, transporting and unloading, exercise care to prevent damage to materials.
3. Do not drop pipe or fittings. Avoid shock or damage at all times.
4. Take measures to prevent damage to the exterior surface or internal lining of the pipe.

B. Storage:

1. Do not stack pipe higher than recommended by the pipe manufacturer.
2. Store PVC pipe and gaskets for mechanical and push-on joints in a cool, dry location out of direct sunlight and not in contact with petroleum products.

2PART - PRODUCTS

2.1 VITRIFIED CLAY GRAVITY SEWER PIPE

A. Pipe and Pipe Fittings: ASTM C700, Extra Strength.

B. Joints: Compression Type, ASTM C425.

2.2 CEMENT CONCRETE SEWER PIPE

A. Reinforced Gravity Sewer Pipe and Fittings:

1. ASTM C76.
2. Provide in load class indicated on Contract Drawings, minimum Class II.

B. Prestressed Concrete Pressure Pipe and Fittings:

1. AWWA C301
2. Design internal pressure 150 psi unless indicated otherwise on the Contract Drawings.

C. Joints:

1. Tongue and groove
2. Bell and spigot

D. Gaskets: Solid circular cross-section O-ring, ASTM C443.

## 2.3 DUCTILE IRON PIPE

A. Pipe:

1. ANSI A21.51, Thickness Class as indicated on the Contract Drawings, minimum Class 50.
2. Standard cement-mortar lining, ANSI A21.4.
3. Standard bituminous coating, interior and exterior.

B. Fittings:

1. Ductile-iron or gray-iron, ANSI A21.10.
2. Provide with standard lining and coating as for ductile iron pipe.

C. Joints:

1. Where not specifically shown on the Contract Drawings, pipe joints may be either mechanical joint or push-on joint.
2. Fitting joints shall be mechanical joint, unless specified otherwise.

D. Rubber gaskets, lubricants, gland, bolts and nuts: ANSI A21.11

## 2.4 POLY (VINYL CHLORIDE) (PVC) SEWER PIPE

A. Gravity Sewer Pipe and Fittings:

1. Pipe 15" diameter and smaller: ASTM D3034, minimum SDR-35.
2. Pipe 18" to 27" diameter: ASTM F679.
3. Flexible Elastomeric Seals: ASTM D3212  
Seal Material: ASTM F477
4. Where specifically approved by local authority or municipality with jurisdiction, pipe 15" and smaller: ASTM F789 may be substituted.

B. Pressure Sewer Pipe and Fittings:

1. Pressure-Rated:
  - a. ASTM D2241, Pressure rating as indicated on the Contract Drawings, 125 psi minimum.
2. Schedule-Rated:
  - a. ASTM D1785, Schedule rating as indicated on the Contract Drawings, Schedule 40 minimum.

3. Dimension-Rated:

- a. AWWA C900, DR 18 minimum (150 psi), for 4" diameter and larger.
- b. AWWA DR 21 minimum (200 psi), for 2" diameter and smaller.

4. Flexible Elastomeric Seals: ASTM D3139  
Seal Material: ASTM F477

2.5 CAST IRON SOIL PIPE (PLUMBING)

A. Pipe and Fittings: ASTM A74, Service Class

1. Hub and spigot or double hub

B. Joints

1. Gaskets: Double-seal compression gaskets conforming to physical requirements of ASTM C564.

2.6 FLEXIBLE COUPLINGS: Leakproof, PVC compound with stainless steel clamps suitable for the pipe materials as manufactured by Fernco, Inc., Davison, MI, or approved equal.

2.7 CLEANOUTS

A. Cleanout riser pipe and fitting shall be PVC SDR 35.

B. Cleanout caps:

1. Brass - Style A as manufactured by the General Engineering Company (GENECO), Frederick, MD, or approved equal.
2. PVC- Schedule 40

2.8 DETECTABLE WARNING TAPE

A. Detectable warning tape shall consist of a minimum thickness of 0.5 mils solid aluminum foil core running the full length and width encased in a protective, high visibility, green color coded inert plastic jacket that is impervious to all known alkalis, acids, chemical reagents and solvents found in the soil. Foil to be visible on unprinted side. Minimum overall thickness shall be 5.5 mils. Minimum tensile strength shall be 5000 psi. Minimum weight of 2 ½ pounds per 1" x 100' unit. Tape width shall be a minimum of 6 inches and have the words "Caution Buried Sewer Line Below" imprinted on the color side. Tape shall meet Office of Pipeline Safety regulations, U.S. Department of Transportation, USAS Code B31.8.

2.9 VALVES

A. Plug valves

1. Plug valves shall be of the non-lubricated, eccentric type, and shall be designed for a working pressure of 175 psi for valves 12" and smaller. Valves shall be of round port design. If a rectangular style design is employed, port area shall be a minimum of 100% of the corresponding pipe area.

2. Valves shall provide tight shut-off with rated pressure from either direction, where required. The plug valves shall be manufactured by Dezurik of Sartell, MN, Keystone Valve of Houston, TX, or approved equal.
3. Plug valves shall be furnished with replaceable permanently lubricated sleeve-type 18-8 stainless steel bearings in the upper and lower journals. Valve seats shall be nickel with raised surface completely covered to ensure that the plug face contacts only nickel.
4. Manual gear operators shall be totally enclosed worm and gear type, permanently lubricated. Manual operator components shall withstand, without damage, a pull of 80 to 200 lbs. on the handwheel, with buried service gear units capable of withstanding input torque on the operating nut as required by AWWA C504, Section 3.8.3 and AWWA C507, Section 11, Paragraph 11.9. Gear segment shall be of ductile iron, ASTM A536, Grade 56-45-12 supported on bronze bushings.
5. Plug valves shall be tested in accordance with AWWA C504, Section 5. The leakage test shall be applied to the face of the plug tending to unseat the valve. Certified copies of reports covering proof of design testing as described in Section 5.5 shall be provided to the ENGINEER.

B. Combination Air Release Valves

1. Cast iron body and cover, stainless steel float, orifice and linkage mechanism, mountings and trim. Buna-N orifice valve. 150 psi minimum rated working pressure.
2. Orifice size as indicated on Contract Drawings.

### 3PART - EXECUTION

#### 3.1 PREPARATION

- A. Perform trench excavation as specified in Section 02221, Paragraph 3-3.
- B. Unless otherwise required by the ENGINEER, provide for a minimum cover of 4 feet above the top of pipe laid in trenches in non-traffic areas, and 5 feet in traffic areas.
- C. Provide Type IV bedding as specified in Section 02221, Paragraph 3-7. Place so that the pipe can be laid to the required tolerances in accordance with ASTM D2321.
- D. Provide Type V bedding for 2" dia. and smaller pressure sewers, unless otherwise specified in Section VIII.

#### 3.2 LAYING PIPE IN TRENCHES

- A. Give ample notice to the ENGINEER in advance of pipe laying operations, minimum twenty-four hours.
- B. Maintain no less than three batter boards or their equivalent between adjoining manholes during pipe laying operations, or use laser alignment instruments.

- C. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to pipe. Do not drop pipe or fittings.
- D. Lay pipe proceeding up-grade with the bell or groove pointing upstream.
- E. Lay pipe to a true uniform line with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- F. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.
- G. Clean and inspect each section of pipe before joining. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. Use lubricant recommended by the pipe and fitting manufacturer for making joints. If unusual joining resistance is encountered or if the pipe cannot be fully inserted into the bell, disassemble joint, inspect for damage, reclean joint components, and reassemble joint.
- H. Assemble joints in accordance with recommendations of the manufacturer.

1. Push-on joints:

- a. Clean the inside of the bell and the outside of the spigot. Insert rubber gasket into the bell recess.
- b. Apply a thin film of gasket lubricant to either the inside of the gasket or the spigot end of the pipe, or both.
- c. Insert the spigot end of the pipe into the socket using care to keep the joint from contacting the ground. Complete the joint by forcing the plain end to the bottom of the socket. Mark pipe that is not furnished with a depth mark before assembly to assure that the spigot is fully inserted.

2. Mechanical joints:

- a. Wash the socket and plain end. Apply a thin film of lubricant. Slip the gland and gasket over the plain end of the pipe. Apply lubricant to gasket.
- b. Insert the plain end of the pipe into the socket and seat the gasket evenly in the socket.
- c. Slide the gland into position, insert bolts, and finger-tighten nuts.
- d. Bring bolts to uniform tightness. Tighten bolts 180 degrees apart, alternately.

Torque Required:

<u>Bolt Size, In.</u>	<u>Torque, Ft.-Lbs.</u>
5/8	45 - 60
3/4	75 - 90
1	100 - 120

3. Solvent cemented joints:

- a. Chamfer and deburr pipe. Clean socket and plain end. Measure and mark the socket depth on the outside of the pipe.
- b. Apply primer to inside socket surface using a scrubbing motion to ensure penetration. Repeated applications may be necessary. Soften surface of male end of pipe to depth of fitting socket by applying a liberal brush coat of primer. Do not pour primer on. Assure entire surface is well softened.
- c. Repeat application of primer to inside socket surface, then apply cement to pipe while surfaces are still wet with primer. Apply cement uniformly taking care to keep excess cement out of socket.
- d. Immediately after applying the last coat of cement to the pipe, and while both the inside socket surface and outside pipe surface are soft and wet, forcefully seat the pipe into the socket. Turn the pipe 1/4 -turn during assembly to distribute cement evenly. Assembly should be completed within 20 seconds after the last application of cement. Insert pipe with a steady, even motion. Do not use hammer blows.
- e. Hold joint in place until cement has set. Wipe excess cement from the pipe.

4. Coupled joints:

- a. Assemble in accordance with the manufacturer's recommendations.

- I. Disassemble and remake improperly assembled joints using a new gasket.
- J. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. A deviation from the designed grade as shown on the Contract Drawings, or deflection of pipe joints, will be cause for rejection.
- K. Place sufficient compacted backfill on each section of pipe, as it is laid, to hold firmly in place.
- L. Clean interior of the pipe as work progresses. Where cleaning after laying is difficult because of small pipe size, use a suitable swab or drag in the pipe and pull forward past each joint immediately after the jointing has been completed.
- M. Keep trenches and excavations free of water during construction.
- N. When the work is not in progress, and at the end of each work day, securely plug open ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.
- O. Deflection:
  1. When it is necessary to deflect pressure sewer mains from a straight alignment horizontally or vertically, do not exceed the following limits:
    - a. Ductile Iron Pipe: <12" diameter - 5° maximum deflection per joint  
>12" diameter - 3° maximum deflection per joint
    - b. PVC Pipe: 4 degree maximum deflection per joint.
    - c. Reinforced Concrete Pipe: 1-degree maximum deflection per joint.

- P. Make connections in accordance with the Contract Drawings, and perform any adjustments and ensure a watertight installation. Connections to the existing sewers shall be made under the direct observation of the ENGINEER or his authorized representative. Do not permit any water, earth, debris or other materials to enter the existing sewer system.
- Q. As soon as connections are completed, install an adequately sized plumber's stopper in the existing manhole and brace to prevent a "blowout". The stopper is to prevent flow from the new line from entering the existing system and it shall not be removed until written authorization to do so is given by the ENGINEER. Routinely remove any accumulated ground and surface water from the line upstream and shall be totally responsible for any damages to existing facilities.

### 3.3 WYE BRANCHES AND TEES

- A. Install wye branches or pipe tees at locations designated concurrent with pipe laying operations. Use standard fittings of the same material and joint type as the pipeline into which they are installed.
- B. For taps into an existing pipeline, install a wye or tee with stainless steel clamps and watertight resilient boot.
- C. Where specifically approved by the OWNER, for taps into an existing pipeline, use a saddle wye or tee with stainless steel clamps or core drill pipe and install watertight resilient boot. Mount saddles with gasket and secure with metal bands. Lay out holes with a template and cut holes with a mechanical hole cutter.
- D. Where lateral is not to be installed, install an approved water-tight plug, braced to withstand pipeline test pressure thrust.

### 3.4 LATERALS

- A. Construct laterals from the wye branch to a terminal point in accordance with the Contract Drawings. Lateral risers are not permitted.
- B. Install an approved watertight plug, braced to withstand pipeline test pressure thrust, at the termination of the lateral. Install a temporary marker stake (minimum 2" x 2") extending from the end of the lateral to 1 foot above finished grade.
- C. Laterals shall be installed at a slope of 1/4"/ft. (4" diameter) or 1/8"/ft. (6" diameter) from the main to the cleanout or plug. The minimum depth under streets shall be 5'. Any deviations must be approved by the ENGINEER prior to installation.

### 3.5 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of pipe by the ENGINEER.
- B. Backfill trenches as specified in Section 02221, Paragraph 3-10.
- C. Install the detectable warning tape along the entire length of PVC force main on top of the pipe bedding but no deeper than 48 inches below finished grade. The pipe bedding (12" cover) shall maintain sufficient separation between the tape and the line.

### 3.6 SURFACE RESTORATION

- A. Restore unpaved areas in accordance with Section 02221, Paragraph 3-13.
- B. Restore other areas in accordance with the Contract Drawings.

### 3.7 BYPASS PUMPING

- A. Provide one (1) reliable pump capable of handling the existing wastewater flows and daily fluctuations and enough discharge piping to bypass pump from upstream manhole to downstream manhole. Provide one (1) backup pump on-site or provide evidence of ability to obtain backup pump within 30 minutes in case of pump failure. Bypass pumping system shall not allow backup in collection system beyond two (2) manholes. Bypass piping shall be watertight and not allow any discharge to the surface. Any leaks in the system will be just cause to discontinue bypass operation and pipe installation and tie piping back into gravity flow.
- B. At the end of each workday, the bypass pumping shall stop and the new PVC piping shall be connected to the existing piping with a watertight flexible coupling. All trenches shall be properly backfilled and compacted except in the immediate area of the tie-in. Open trenches in traffic areas shall be protected with jersey barriers and steel plating and all trenches shall be protected with construction fencing.

END OF SECTION

## SECTION 02615 - WATER MAINS

### 1PART - GENERAL

#### 1.1 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Installing and repairing water mains and fittings, in excess of 2" diameter.

B. Related work specified elsewhere:

1. Trenching, backfilling and compacting: Section 02221
2. Soil erosion and sedimentation control: Section 02270
3. Finish grading, seeding and sodding: Section 02485
4. Valves and fire hydrants: Section 02640
5. Testing and disinfecting water mains: Section 02653

C. Definitions: NONE

D. Applicable Standard Details: NONE

#### 1.2 QUALITY ASSURANCE

A. Reference Standards:

1. American Water Works Associations (AWWA) most recent revisions:

- C104 Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe Fittings for Water
- C105 Polyethylene Encasement for Ductile Iron Pipe Systems
- C110 Gray Iron and ductile Iron Fittings 3-inch through 48 inches
- C111 Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings
- C115 Flanged Cast Iron and Ductile Iron Pipe with Threaded Flanges
- C116 Protective Fusion-Bonded Epoxy Coatings for Interior & Exterior Surfaces of Ductile Iron and Gray Iron Fittings for Water Supply Service
- C150 Thickness Design of Ductile Iron Pipe
- C151 Ductile Iron Pipe for Water or other Liquids
- C153 Ductile Iron Compact Fittings, 3 inch through 24 inch for Water Service
- C200 Steel Water Pipe 6 inches and Larger
- C203 Coal Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape Hot Applied
- C205 Cement Mortar Protective Lining and Coating for Steel Water Pipe 4 inch and Larger - Shop Applied
- C206 Field Welding of Steel Water Pipe
- C207 Steel Pipe Flanges
- C300 Reinforced Concrete Pressure Pipe, Steel Cylinder Type
- C301 Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and other Liquids
- C302 Reinforced Concrete Pressure Pipe, Non-Cylinder Type, for Water and other Liquids
- C303 Reinforced Concrete Water Pipe, Steel Cylinder Type, Pretensioned

- C304 Design of Prestressed Concrete Cylinder Pipe Asbestos-Cement Pipe
- C400 Asbestos-Cement Pressure Pipe, 4 inch through 16 inch for Water Distribution Systems
- C401 Selection of Asbestos-Cement Pressure Pipe 4 inch through 16 inch
- C402 Asbestos-Cement Transmission Pipe, 18 inch through 42 inch for Potable Water & Other Liquids
- C403 Selection of Asbestos-Cement Transmission & Feeder Main Pipe, sizes 18 inch through 42 inch
- C600 Installation of Ductile Iron Water Mains and Appurtenances
- C900 Poly (Vinyl Chloride) (PVC) Pressure Pipe, 4 inches through 12 inches, for water distribution

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

- D1785 Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- D2241 Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Plastic Pipe (SDR Series)
- D3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

- A. Materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, or acid solder will be rejected.

1.3 SUBMITTALS

A. Manufacturers' Literature:

1. Submit two copies of manufacturers' catalog information for each type of pipe, fittings, couplings, adapters, gaskets and assembly of joints for approval of the ENGINEER. Include manufacturers' recommendations for deflection in pipe joints.

B. Certificates:

1. Submit two copies of certifications for each type of pipe, fittings, gaskets, lubricants or other joint materials from the manufacturers attesting that each of these meets or exceeds specifications requirements.

1.4 JOB CONDITIONS: Section not utilized.

1.5 PRODUCTS DELIVERY, STORAGE AND HANDLING

A. Delivery and Handing:

1. Do not place materials on private property without written permission from the property owner.
2. During loading, transporting and unloading, exercise care to prevent damage to materials.
3. Do not drop pipe or fittings. Avoid shock or damage at all times.
4. Use padded slings, hooks and tongs to prevent damage to the exterior surface or internal

lining of the pipe.

B. Storage:

1. Do not stack higher than Maximum Staking Heights shown in AWWA C600 or as recommended by the pipe manufacturer.
2. Keep interior of pipe and fittings free from dirt, water or other foreign matter.
3. Store gaskets for mechanical and push-on joints in cool location out of direct sunlight and not in contact with petroleum products.

## 2 PART - PRODUCTS

### 2.1 PIPE, FITTINGS AND JOINTS

A. Ductile Iron (DI):

1. Ductile Iron Pipe: AWWA C150 and C151:
  - a. Cement mortar lined in accordance with AWWA C104.
  - b. Class as indicated on the Contract Drawings, minimum Class 50.
2. Ductile Iron and Cast Iron Fittings: AWWA C110:
  - a. Cement mortar lined in accordance with AWWA C104.
  - b. Pressure rating as indicated on the Contract Drawings, minimum 350 psi for mechanical joint; 250 psi for flanged joint.
3. Joints:
  - a. Mechanical or push-on joints conforming with AWWA C111.
  - b. Flanged joints conforming with AWWA C110 and AWWA C115.

B. Reinforced Concrete (RC):

1. Reinforced concrete pressure pipe, steel cylinder type: AWWA C300.
2. Prestressed concrete pressure pipe, steel cylinder type: AWWA C301.
3. Reinforced concrete pressure pipe, non-cylinder type: AWWA C302.
4. Reinforced concrete pressure pipe, steel cylinder type, pretensioned: AWWA C303.
5. Fittings: Type B
6. Joints: Rubber gasket and steel bell and spigot joint rings.
7. Minimum steel cylinder thickness: 16 gauge.

C. Poly (Vinyl Chloride) (PVC) Plastic Pipe:

1. Pipe:
  - a. Outside diameter dimension pipe: AWWA C900, pressure class and dimension ratio as indicated on the Contract Drawings.

2. Manufactured from Poly (Vinyl Chloride) 1120 or 1220.
3. National Sanitation Foundation Seal of Approval for use with potable water required.
4. Joints: Push-on: ASTM D3139.
5. Fittings: Cast or ductile iron fittings for PVC pressure pipe: AWWA C110.

D. Steel:

1. Pipe: AWWA C200.
  - a. Cement mortar lined in accordance with AWWA C205.
  - b. Coal tar coated in accordance with AWWA C203.
  - c. Internal pressure and minimum wall thickness as indicated on the Contract Drawings.
2. Fittings: AWWA C200.
3. Joints:
  - a. Welded: AWWA C206.
  - b. Flanged: AWWA C207.
  - c. Mechanically coupled: Dresser Style 38, Rockwell 411 or equal.

2.2 REPAIR PRODUCTS

A. Couplings:

1. Threaded Compression ( $\frac{1}{2}$ " - 2" nominal diameter pipe)
  - a. Short or long body style.
  - b. Conductive gasket.
  - c. 150 psi pressure rating.
  - d. Ductile iron material.
2. Bolted Compression (4" - 12" nominal diameter pipe)
  - a. Ductile iron material.
  - b. 150 psi pressure rating.

B. Clamps

1. Gridded gasket
2. Full gasket coverage
3. Stainless steel hardware
4. Stainless steel material

### 3PART - EXECUTION

#### 3.1 EXCAVATION

- A. Excavate trenches as specified in Section 02221, Paragraph 3-4. Provide at least 4 ft. of cover from the top of the pipe to the finished grade elevation.

#### 3.2 PIPE BEDDING

- A. Provide Type IV bedding as shown on the Contract Drawings.
- B. Shape recesses for the joints or bell of the pipe by hand. Assure that the pipe is supported for the entire length of the barrel.

#### 3.3 PIPE LAYING

- A. Clean and inspect each length of pipe or fitting before lowering in the trench. Do not lower pipe into the trench except that which is to be immediately installed.
- B. Lay pipe to a uniform line with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings, and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- C. Lay each section of pipe in such a manner as to form a close concentric joint with adjoining section and to avoid offsets.
- D. Lubricate pipe and gaskets as recommended by the manufacturer. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement.
- E. Check each pipe installed as to line and grade in place. Correct deviations immediately. Deflection of pipe joints in excess of maximum recommended by manufacturer will be cause for rejection.
- F. Install fittings and valves as pipe laying progresses. Do not support weight of fittings and valves from pipe.
- G. When the work is not in progress, and at the end of each work day, securely plug the ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.
- H. Backfill concurrently with pipe laying to hold installed pipe in place. When pipe laying is terminated for any reason, provide at least 2 feet of backfill over all pipe except the last piece laid.
- I. Joint Assembly
  - 1. Push-on Joints:
    - a. Clean the inside of the bell and the outside of the spigot. Insert rubber gasket into the bell recess.
    - b. Apply a thin film of gasket lubricant to either the inside of the gasket or the spigot end of the pipe, or both.

- c. Insert the spigot end of the pipe into the socket using care to keep the joint from contacting the ground. Complete the joint by forcing the plain end to the bottom of the socket. Mark pipe that is not furnished with a depth mark before assembly to assure that the spigot is fully inserted.

2. Mechanical Joints:

- a. Wash the socket and plain end. Apply a thin film of lubricant. Slip the gland and gasket over the plain end of the pipe. Apply lubricant to gasket.
- b. Insert the plain end of the pipe into the socket and seat the gasket evenly in the socket.
- c. Slide the gland into position, insert bolts, and finger-tighten nuts.
- d. Bring bolts to uniform tightness. Tighten bolts 180 degrees apart, alternately.  
Torque Required:

<u>Bolt Size, In.</u>	<u>Torque, Ft.-Lbs.</u>
5/8	45 - 60
3/4	75 - 90
1	100 - 120

3.4 CUTTING

- A. Saw cut pipe full depth without damaging pipe or lining.
- B. Grind cut ends and rough edges smooth. Bevel end for push-on joints.
- C. Do not field cut reinforced concrete pipe. Provide special lengths to make up distance shown.

3.5 DEFLECTION

- A. When it is necessary to deflect water mains from a straight alignment horizontally or vertically, do not exceed limits as follows:
  - 1. Ductile Iron Pipe:      <12" dia. - 5° maximum deflection per joint.  
   >12" dia. - 3° maximum deflection per joint.
  - 2. PVC Pipe: 4 degree maximum deflection per joint.
  - 3. Reinforced Concrete Pipe: 1 degree maximum deflection per joint.

3.6 THRUST RESTRAINT

- A. Provide all valves, tees, bends, caps, and plugs with concrete thrust blocks in accordance with Standard Detail 03050-3. Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks to contain the resultant force and so pipe and fitting joints will be accessible for repair.
- B. Furnish and install tie rods, clamps, set screw retainer glands, or restrained joints if indicated on the Contract Drawings or required by the ENGINEER. Protect metal restrained joint components

against corrosion by applying a bituminous coating.

### 3.7 SPECIAL CONDITIONS

#### A. Connections to existing facilities:

1. Construct connections as shown on the Contract Drawings.
2. For connecting pipe of different materials, use transition fittings as recommended by the manufacturer and approved by the ENGINEER.

#### B. Wall Sleeves:

1. Provide pipes passing through concrete or masonry construction with sleeves and mechanical seal of the type and size required or as indicated on the Contract Drawings.

### 3.8 COMPLETION

- #### A. Test and disinfect water mains as specified in Section 02653, Paragraph 3-3.

### 3.9 SURFACE RESTORATION

- #### A. Restore unpaved areas in accordance with Section 02221, Paragraph 3-13.

- #### B. Restore other areas in accordance with the Contract Drawings.

END OF SECTION



## SECTION 02618 - STORM DRAIN PIPE

### 1PART - GENERAL

#### 1. DESCRIPTION

##### A. The work of this section includes, but is not limited to:

1. Storm sewer pipelines

##### B. Related work specified elsewhere:

1. Trenching, backfilling and compacting: Section 02221
2. Soil erosion and sedimentation control: Section 02270
3. Finish grading, seeding and sodding: Section 02485
4. Storm inlets, catch basins, endwalls: Section 02602

##### C. Definitions:

1. Polyethylene pipe Type C - full circular cross-section with corrugated surface both inside and outside.
2. Polyethylene pipe Type S - full circular cross-section with outer corrugated pipe wall and smooth inner wall.

##### D. Applicable Standard Details: NONE

#### 1.2 QUALITY ASSURANCE

##### A. Reference Standards:

1. Maryland State Highway Administration, latest revision:

Standard Specifications for Construction and Materials

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

C76	Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C507	Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
D2241	Specification for Poly(Vinyl Chloride)(PVC) Pressure Rated Pipe (SDR series)
D2321	Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
F405	Specification for Corrugated Polyethylene (PE) Tubing and Fittings
F667	Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings

3. American Association of State Highway Transportation Officials (AASHTO):

M36	Metallic (zinc or aluminum) coated corrugated steel culverts and underdrains
M246	Precoated galvanized steel sheet for culverts and underdrains
M252	Corrugated Polyethylene Drainage Tubing

M278 Class PS50 Polyvinyl Chloride (PVC) Pipe  
M294(and MP6-95) Corrugated Polyethylene Pipe, 12" to 36" Diameter

### 1.3 SUBMITTALS

#### A. Certificates:

1. Submit two copies of manufacturer's certification attesting that the pipe, fittings, and joints meet or exceed specification requirements.

#### B. Manufacturer's Literature:

1. Submit two copies of the manufacturer's recommendations on installation, handling, and storage of materials.

### 1.4 JOB CONDITIONS: Section not utilized.

### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. During loading, transporting, and unloading, exercise care to prevent damage to materials.

B. Do not drop pipe or fittings. Avoid shock or damage at all times.

C. Do not place materials on private property without written permission from the property owner.

## 2PART - PRODUCTS

### 2.1 CORRUGATED GALVANIZED STEEL PIPE AND PIPE ARCH

#### A. Pipe and Coupling Bands:

1. MDSHA Specifications, Section 905.
2. AASHTO M36, Type I or AASHTO M218, Type I or AASHTO M274, Type II.
3. Metal sheet thickness and corrugation size as indicated on the Contract Drawings.

### 2.2 REINFORCED CONCRETE PIPE

#### A. Pipe and Fittings:

1. ASTM C76, Minimum Class II

#### B. Joints:

1. Tongue and groove or bell and spigot.

## 2.3 ELLIPTICAL REINFORCED CONCRETE PIPE

### A. Pipe:

1. ASTM C507, Minimum Class HE-A or VE-II.

## 2.4 CORRUGATED POLYETHYLENE PIPE

### A. Tubing and Fittings - 3" to 6"

1. AASHTO M252
2. ASTM F405

### B. Pipe and Fittings - 12" to 48"

1. Integrally formed smooth interior.
2. AASHTO M294 and MP6-95
3. ASTM F667

### C. Pavement Base Drains - 4", 6"

1. AASHTO M304

## 2.5 POLY (VINYL CHLORIDE) PIPE 3" TO 6"

### A. Pipe and Fittings

1. AASHTO M278
2. ASTM D3034

## 3PART - EXECUTION

### 3.1 PREPARATION

- A. Perform trench excavation and associated work as specified in Section 02221.
- B. Provide pipe bedding (Type III or IV) as specified in Section 02221, Paragraph 3-7. Place aggregate so that the pipe can be laid to the required tolerances.

### 3.2 LAYING PIPE IN TRENCHES

- A. Give ample notice to the ENGINEER in advance of pipe laying operations, minimum twenty-four hours.
- B. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to pipe. Do not drop pipe.
- C. Lay pipe proceeding upgrade with the bell or groove pointing upstream.

- D. Lay pipe to a true uniform line with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- E. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.
- F. Clean and inspect each pipe and fitting before joining. Align pipe with previously laid sections. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. Assemble joints in accordance with the pipe manufacturer's instructions.
- G. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. A deviation from the designed line or grade as shown on the Contract Drawings will be cause for rejection.
- H. Place and compact sufficient backfill to hold each section of pipe firmly in place as the pipe is laid.

### 3.3 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of pipe by the ENGINEER.
- B. Backfill and compact trenches as specified in Section 02221, Paragraph 3-10.

### 3.4 SURFACE RESTORATION

- A. Restore unpaved areas in accordance with Section 02221, Paragraph 3-13.
- B. Restore other areas in accordance with the Contract Drawings.

END OF SECTION

## SECTION 02640 - VALVES AND FIRE HYDRANTS

### 1PART - GENERAL

#### 1.1 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Water valves
2. Fire hydrants

B. Related work specified elsewhere:

1. Trenching, backfilling and compacting: Section 02221
2. Water mains: Section 02615

C. Definitions: NONE

D. Applicable Standard Details: NONE

#### 1.2 QUALITY ASSURANCE

A. Reference Standards:

1. American Water Works Association (AWWA):  
C500 Gate Valves, 3" through 48", for Water and Other Liquids  
C502 Dry-Barrel Fire Hydrants  
C504 Rubber-Seated Butterfly Valves  
C509 Resilient Seated Gate Valves for Water and Sewerage Systems  
C512 Air-Released, Air/Vacuum, and Combination Air Valves for Waterworks Service

#### 1.3 SUBMITTALS

A. Certificates:

1. Submit two copies of manufacturer's certification attesting that valves, hydrants, and accessories meet or exceed AWWA Standards and specification requirements.

B. Product Data:

1. Submit two copies of manufacturer's latest published literature including illustrations, installation instructions, maintenance instructions and parts lists.

1.4 JOB CONDITIONS: Section not utilized.

#### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Prepare valves, hydrants, and accessories for shipment according to AWWA Standards and:

1. Seal valve, hydrant, and meter ends to prevent entry of foreign matter into product body.
2. Box, crate, completely enclose, and protect products from accumulations of foreign

matter.

- B. Store products in areas protected from weather, moisture, or possible damage.
- C. Do not store products directly on ground.
- D. Handle products to prevent damage to interior or exterior surfaces.

## 2PART - PRODUCTS

### 2.1 GATE VALVES

- A. AWWA C509
- B. Iron body, bronze trim.
- C. Resilient wedge.
- D. Non-rising stem; O-ring stem seals.
- E. 2" square operating nut; open counterclockwise unless otherwise indicated.
- F. Flanged, mechanical joint or bell end connections.
- G. Provide valves 16" and larger with bypass valves and gear operators.

### 2.2 BUTTERFLY VALVES

- A. AWWA C504, Class 150B.
- B. Iron body, stainless steel shaft, nylon bearings.
  - 1. Sizes 2" thru 20": 200 psi rated.
  - 2. Sizes 24" thru 48": 150 psi rated.
- C. Flanged, wafer, or mechanical joint end.
- D. Worm gear manual actuators, sealed and permanently lubricated.
  - 1. Vertical, right angle, or buried type; handwheel, crank handle, or square nut as indicated.
  - 2. Stem extension and valve box for buried valves.
  - 3. Open counterclockwise unless otherwise indicated.

### 2.3 VALVE BOXES

- A. 12" valves and smaller:
  - 1. Domestic cast iron, two-piece, screw type.

- B. Valves larger than 12" and blowoffs:
  - 1. Domestic cast iron, three-piece, screw type.
  - 2. Round base.

C. Cast iron lid.

## 2.4 AIR RELEASE VALVES

A. AWWA C512.

B. Cast iron body and cover; stainless steel float, orifice seat, linkage mechanism, mountings and trim. Buna-N orifice valve. 150 psi minimum rated working pressure.

C. Provide with orifice size indicated on the Contract Drawings.

## 2.5 FIRE HYDRANTS

A. Dry-barrel break-away type conforming to AWWA C502.

- 1. Bury depth: 4'-6", or as indicated on the Contract Drawings.
- 2. Inlet Connection: 6".
- 3. Valve Opening: 5-1/4".
- 4. Mechanical Joint or Ball End.
- 5. Corrosion resistant bolts and nuts.
- 6. One pumper, two hose nozzles.

- a. Attach nozzle caps by separate chains.

- 7. Threads as specified.

## 2.6 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves:

- 1. Mechanical joint, or as indicated on the Contract Drawings.
- 2. 200 psi working pressure, 2" - 12" size.
- 3. 150 psi working pressure, 14" - 24" size.
- 4. Outlet flange: ANSI B16.1, Class 125. See Table 1.

B. Tapping Valves:

- 1. AWWA C500.
- 2. Inlet flange, Class 125.

<b>TABLE 1 – CLASS 125 PLATE FLANGES (ASME B16.1 – 1989)</b>				
<b>Pipe Size</b>	<b>Outside Diameter</b>	<b>Number of Bolt Holes</b>	<b>Bolt Hole Diameter</b>	<b>Bolt Circle</b>
2"	6"	4	3/4"	4-3/4"
2-1/2"	7"	4	3/4"	5-1/2"
3"	7-1/2"	4	3/4"	6"
3-1/2"	8-1/2"	8	3/4"	7"
4"	9"	8	3/4"	7-1/2"
5"	10"	8	7/8"	8-1/2"
6"	11"	8	7/8"	9-1/2"
8"	13-1/2"	8	7/8"	11-3/4"
10"	16"	12	1"	14-1/4"
12"	19"	12	1"	17"
14"	21"	12	1-1/8"	18-3/4"
16"	23-1/2"	16	1-1/8"	21-1/4"

## 2.7 TIE RODS

1. Tie rod restraint system
2. Star National Products, 1323 Holly Avenue, P.O. Box 258, Columbus, Ohio 43316

## 3PART - EXECUTION

### 3.1 GENERAL

- A. Determine the exact location and size of valves and hydrants from the Contract Drawings.
- B. Perform trench excavation, backfilling and compaction in accordance with Section 02221.
- C. Install pipe and tubing in accordance with Sections 02615 and the applicable Standard Details.

### 3.2 GATE AND BUTTERFLY VALVES

- A. Install valves in conjunction with pipe laying. Set valves and valve boxes plumb.
- B. Provide buried valves with valve boxes installed flush with finished grade.
- C. Furnish one tee wrench to the OWNER.

### 3.3 AIR RELEASE VALVES

- A. Orient, locate and install air release valves including valve vault as shown on the Contract Drawings.
- B. Set air release valves and vault plumb.
- C. Verify there are no leaks and that the valve functions correctly.

### 3.4 FIRE HYDRANTS

- A. Install fire hydrants as shown on the Contract Drawings. Provide support blocking and drainage gravel as shown.
  - 1. Set hydrants plumb with pumper nozzle facing the curb or street.
  - 2. Set hydrants with nozzles at least 12 inches above the ground and the safety flange not more than 6 inches nor less than 2 inches above grade.
  - 3. Do not block drain hole.
  - 4. Paint hydrants in accordance with local color scheme.
- B. After hydrostatic testing, flush hydrants and check for proper drainage.

### 3.5 BLOWOFFS

- A. Install a blowoff on the dead ends of all water mains or where shown on the Contract Drawings.

### 3.6 SURFACE RESTORATION

- A. Restore unpaved areas in accordance with Section 02221.
- B. Restore other areas in accordance with the Contract Drawings.

END OF SECTION



## SECTION 02653 - TESTING AND DISINFECTING WATER MAINS

### 1PART - GENERAL

#### 1.1 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Testing Pressure Pipelines:

a. Hydrostatic leakage testing

B. Disinfecting Water Main Pipelines.

C. Related work specified elsewhere:

1. Water mains:

Section 02615

2. Valves and fire hydrants:

Section 02640

D. Definitions: NONE

E. Applicable Standard Details: NONE

#### 1.2 QUALITY ASSURANCE

A. Testing Agency:

1. Bacteriological testing shall be performed by a testing laboratory engaged and paid for by the CONTRACTOR and approved by the ENGINEER.

B. Reference Standards:

1. American Water Works Association (AWWA):

B300 Standard for Hypochlorites

B301 Standard for Liquid Chlorine

C651 Disinfecting Water Mains

C. Test Acceptance:

1. No test will be accepted until the results are within the specified limits.

2. The CONTRACTOR shall, at his own expense, determine and correct the sources of leakage and retest until successful test results are achieved.

### 1.3 SUBMITTALS

#### A. Test Procedures:

1. Submit a testing sequence schedule including a list of testing equipment to be used.

#### B. Certificates:

1. Submit, prior to starting testing, certification attesting that the pressure gauges to be used have been calibrated and are accurate to the degree specified herein.
2. Submit certification attesting that the chlorine form composition is as specified.

#### C. Test Reports:

1. Submit two copies each of test reports of chlorine residual and bacteriological tests.

### 1.4 JOB CONDITIONS: Section not utilized.

## 2PART - PRODUCTS

### 2.1 HYDROSTATIC TEST EQUIPMENT

High pressure water pump  
Pressure hose  
Test connections  
Water meter  
Pressure gauge, calibrated to 0.1 lbs./sq. in.  
Pressure relief valve

### 2.2 DISINFECTING CHEMICALS

- #### A.
- Liquid chlorine, calcium hypochlorite tablets or granules, or sodium hypochlorite (liquid) conforming to AWWA Standards B300 and B301.

### 2.3 ADHESIVE

- #### A.
- Food-grade adhesive such as Permatex Form-A-Gasket No. 2 and Permatex Clear RTV Silicone Adhesive Sealant manufactured by Loctite Corporation, Kansas City, KS, or approved equal.

## 3PART - EXECUTION

### 3.1 PREPARATION

- #### A.
- Backfill trenches in accordance with Section 02221, Paragraph 3-10.

- B. Provide the water line under test with reaction thrust blocking. Hydrostatic testing shall not begin until the concrete thrust blocking has set. Allow 3,000 psi 28-day strength concrete to cure for a minimum of 7 days prior to testing. If 3,000 psi 3-day high early strength concrete is used, hydrostatic testing may not begin until the concrete has cured for a minimum of 2 days.
- C. Provide water, pumps, piping, tanks, connections, plugs, and appurtenances at no additional expense to the OWNER.

### 3.2 TESTING PRESSURE PIPELINES

#### A. Hydrostatic Leakage Test:

1. Test each newly laid pressure pipeline, including any valved section thereof, hydrostatically at 1.5 times the working pressure of the pipeline based on the elevation of the lowest point in the pipeline corrected to the elevation of the test gauge. Obtain test pressure from the ENGINEER.
2. Slowly fill the section to be tested with water, expelling air from the pipeline at the high points. Install corporation stops at high points if necessary. After all air is expelled, close air vents and corporation stops and raise the pressure to the specified test pressure.
3. Observe joints, fittings and valves under test. Remove and replace cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
4. After visible deficiencies are corrected, continue testing at the same test pressure for an additional two hours to determine the leakage rate. Maintain pressure within plus or minus 5.0 psi of test pressure. Leakage is defined as the quantity of water supplied to the pipeline necessary to maintain test pressure during the period of the test.
5. Compute the maximum allowable leakage by the following formula:

$$L = \frac{ND(P)^{0.5}}{7,400}$$

Where: L is the allowable leakage in gallons/hour  
 N is the number of joints in the section tested  
 D is the nominal diameter of the pipe in inches  
 P is the average test pressure in psig

If the line under test contains sections of various diameters, the allowable leakage shall be the sum of the computed leakage for each size.

6. If the test of the pipe indicated leakage greater than that allowed, locate the source of the leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regard-less of the amount of leakage.

3.3 DISINFECTION

A. General:

1. After completion of satisfactory hydrostatic leakage testing, disinfect the water pipelines in accordance with the recommended practice established in AWWA Standard C651. Conduct water line disinfection in the following steps:

- a. Preliminary flushing
- b. Chlorine application
- c. Chlorine residual testing
- d. Final flushing
- e. Bacteriologic tests

- B. During construction, place calcium hypochlorite granules at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500 ft. intervals:

**Table 02653-1**

Ounces of Calcium Hypochlorite Granules to be Placed at Beginning of Main and at Each 500-ft. Interval

<u>Pipe Diameter (in.)</u>	<u>Calcium Hypochlorite Granules (oz.)</u>
4	1.7
6	3.8
8	6.7
12	15.1
14 and larger	$D^2 \times 15.1$

Where D is pipe diameter in feet.

C. Preliminary Flushing:

1. Prior to disinfection, except when the tablet method is used, fill the line to eliminate air pockets and flush the line at a rate of flow of 2.5 feet per second to remove particulates:

**Table 02653-2**

Flow Required To Produce 2.5 fps (Approx.) Velocity in Main

<u>Pipe Diameter (in.)</u>	<u>Required Flow (gpm)</u>	<u>Size of Tap (in.)</u>			<u>Number of 2½-inch Hydrant Outlets</u>
		<u>1</u>	<u>1½</u>	<u>2</u>	
		<u>Number of Taps on Pipe</u>			
4	100	1	-	-	1
6	200	-	1	-	1
8	400	-	2	1	1
10	600	-	3	2	1
12	900	-	-	2	2
16	1,600	-	-	4	2

2. Dispose of flushing water. Conform with Federal, State, and local laws when discharging the chlorinated solution.

D. Chlorine Form:

1. The chlorine form to be applied to the system shall be either chlorine gas solution, calcium hypochlorite or sodium hypochlorite.

E. Chlorine Application:

1. Continuous Feed Method:

- a. The continuous feed method consists of placing calcium hypochlorite granules in the main during construction, completely filling the main to remove air pockets, flushing to remove particulates, and filling the main with potable water chlorinated so that after a 24-hour holding period in the main, there will be a free chlorine residual of not less than 10 mg/L.
- b. Feed water and chlorine to the line at a constant rate such that the water will have not less than 25 mg/L free chlorine. Chlorine application shall not cease until the entire line is filled with heavily chlorinated water.

**Table 02653-3**

Chlorine Required to Produce 25-mg/L Concentration in 100 feet of Pipe-by Diameter

<u>Pipe Diameter (in.)</u>	<u>100-percent Chlorine (lb.)</u>	<u>1-percent Chlorine Solution (gal.)</u>
4	.013	.16
6	.030	.36
8	.054	.65
10	.085	1.02
12	.120	1.44
16	.217	2.60

- c. During chlorine application, take precautionary measures to prevent the concentrated treatment solution from flowing back into the existing distribution system and/or supply source.

2. Tablet Method:

- a. The tablet method consists of placing calcium hypochlorite granules and tablets in the water main as it is being installed and then filling the main with potable water when installation is completed.

NOTE: Since the preliminary flushing step must be eliminated, this method may be used only when scrupulous cleanliness has been exercised and only with approval of the ENGINEER. It shall not be used if trench water or foreign material has entered the main, or if the water temperature is below 41° F.

- b. During construction, place sufficient number of 5 gram calcium hypochlorite tablets in each section of pipe, in hydrants, hydrant branches, and other appurtenances to obtain a minimum of 25 mg/L available chlorine. Attach tablets to the invert of pipe sections with adhesive. Apply adhesive only to the broad side of the tablet next to the pipe surface.

**Table 02653-4**

Number of 5-gram Calcium Hypochlorite Tablets Required for Dose of 25 mg/L

<u>Pipe Diameter (in).</u>	<u>Length of Pipe Section (ft.)</u>				
	<u>13 or less</u>	<u>18</u>	<u>20</u>	<u>30</u>	<u>40</u>
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13

- c. When pipeline installation is completed, fill the main with water at a maximum velocity of one foot per second. This water shall remain in the pipe for at least 24-hours. Manipulate valves so that the chlorine solution does not flow back into the line supplying the water.
3. During the 24-hour treatment, operate all valves, curb stops, and hydrants in the section treated.
  4. At the completion of the 24-hour treatment, the treated water in all portions of the main shall have a residual of not less than 10 mg/L free chlorine.
  5. Repeat the disinfection process until the minimum free chlorine is present at the end of the treatment sequence. The tablet method cannot be used in these subsequent disinfections. No additional compensation will be provided the CONTRACTOR for repeat treatment or testing.

F. Final Flushing:

After completion of the required disinfection, flush the line at a minimum rate of 2.5 fps until the free chlorine residual reduces to the level of the existing water supply or 1 mg/L, whichever is lower. Dispose of flushing water in conformance with Federal, State, and local laws. A neutralizing chemical shall be applied to the water to be wasted to neutralize residual chlorine.

G. Bacteriological Testing:

1. After final flushing is completed and before the water main is placed in service, test the line for bacteriologic quality. Perform two tests, 24-hours between tests.
2. Collect a minimum of one sample at the end of each line for each test, and one sample of the incoming water from the existing water system for comparison.

3. Collect samples in sterile bottles treated with sodium thiosulphate.
4. Sampling tap shall consist of corporation stop installed in the main with copper tube gooseneck assembly. No hose or fire hydrant shall be used to collect samples.
5. Provide bacteriological test reports to the OWNER and the ENGINEER. Presence of bacteriological contamination will be cause to require the CONTRACTOR to rechlorinate and retest the system, at no additional cost to the OWNER.

END OF SECTION



## SECTION 03100 - CONCRETE FORMS AND ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Formwork for cast-in place concrete.
  - 2. Shoring and bracing.
- B. Extent of cast-in-place concrete work is shown on the drawings. Provide all materials, labor, hardware, equipment, transportation, and services required to form all cast-in-place concrete.
- C. Cooperation with Work of Other Sections:
  - 1. Check Contract Drawings and Specifications for requirements of other Sections which affect construction of formwork.
  - 2. Examine the Drawings and Specifications for all Contracts to determine nature of proposed construction. Perform work in a manner which will not interfere or delay work of other Contractors. Cooperate with other trades regarding installation of embedded items. Templates and instructions will be provided for setting items placed in forms.
  - 3. Inform those performing Work of other Sections, in writing or by schedules, of requirements for services, materials and built-in terms prepared or supplied by other Sections which affect Work of this Section.
- D. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section "Submittal Procedures" for submittal requirements.
  - 2. Division 1 Section "Quality Requirements" for quality assurance and quality control requirements.
  - 3. Division 3 Sections for cast-in-place concrete and reinforcement requirements.
  - 4. All Divisions for sleeves, anchors, inserts, etc. that will be furnished by others for installation under this Section.
- E. Responsibility of Contractor:
  - 1. The design, strength, safety, and adequacy of all formwork, shoring, bracing, and all methods of construction are the responsibility of the Contractor. No action by the Architect/Engineer will eliminate, lessen, or restrict this responsibility in any manner.
  - 2. The design of all concrete formwork, formwork removal, shoring, reshoring, and backshoring requirements shall be performed by a licensed professional engineer registered in the state where the project is located, and experienced in the design of concrete formwork and shoring. The Contractor shall employ the formwork/shoring engineer. Calculations, sealed by the licensed professional engineer, shall be issued for Owner's record.

## 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. Form Release Agent.
  - 2. Proprietary forming systems.
  - 3. Proprietary embedments and accessories.
- B. Construction Joints: Submit drawing of proposed construction joint locations in concrete for slab on grade, structural floors, roofs, and walls. Submit any additional or changed reinforcing that is required at construction joints that differs from that indicated on the drawings.
- C. Guarantee: Submit copies of the manufacturer's written guarantee that the Form Release Agent will not stain the concrete surfaces and will not adversely affect the bond of subsequent surface coatings.

## 1.3 QUALITY ASSURANCE

- A. Codes and Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the latest editions of the following:
  - 1. ASTM C 1074: Standard Practice for Estimating Concrete Strength by the Maturity Method.
  - 2. ACI 117: Specifications for Tolerances for Concrete Construction and Materials.
  - 3. ACI 301: Specifications for Structural Concrete.
  - 4. ACI 347: Guide to Formwork for Concrete.
  - 5. ACI 347.2: Guide for Shoring/Reshoring of Concrete Multistory Buildings.
  - 6. CRSI: Manual of Standard Practice.
- B. In case of conflict between specified codes and standards, the most stringent requirements shall govern. In case of conflict between specified codes and standards and project Specifications, project Specifications shall govern. In case of conflicts between Contract Documents, immediately notify the Architect/Engineer for resolution.
- C. Pre-Construction Conference: The Formwork subcontractor shall attend the Pre-Construction Conference conducted by the Concrete Contractor as described in Specification Section "Cast-in-Place Concrete."

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## 2.2 FORM MATERIALS

- A. Plywood: Plywood complying with U.S. Product Standard PS-1, Exterior Type, edge sealed and mill oiled of the grade listed below. Minimum thickness of 3/4 inch or as required for spans and pressures. Furnish in largest practicable sizes to minimize number of joints.
1. APA High Density Overlaid PLYFORM Class I for concrete exposed to view.
  2. APA B-B PLYFORM Class I for concrete not exposed to view.
  3. APA Structural I PLYFORM where high fluid pressures are expected, with HDO surfaces where exposed to view.
    - a. Where indicated on the Architectural Drawings as "architectural concrete," use forms with a special plastic liner to achieve a desired very smooth surface, free of any joints, cracks, etc., unless specifically indicated.
- B. Metal Forms: Proprietary metal or lined panelized wall and column forms capable of producing finished surfaces equal to those produced by the above specified plywood forms.

## 2.3 FORM RELEASE AGENT

- A. Provide a non-staining, non-emulsifiable chemically active type form release agent guaranteed not to adversely affect the bond of subsequently applied surface coatings. Form release agents containing fuel oil as a carrier are not permitted. Acceptable products are:
1. Euco Super Slip by The Euclid Chemical Co.
  2. Rich-Cote by Richmond Construction Chemicals.
  3. Debond Form Coating by L&M Construction Chemicals, Inc.
  4. Nox-crete Form Coating by Nox-Crete Products Group.
  5. Enviroform by Conspec Marketing and Manufacturing Co., Inc.

## 2.4 FORM TIES

- A. Provide ties of an approved design with a minimum working strength of 3,000 lbs. each, and adjustable to permit complete tightening of forms. After removal of the protruding part of the tie, no metal may be nearer than 1-1/2" to face of concrete.
- B. That part of the tie which is to be removed shall be at least 1/2" diameter or, if smaller, provided with a wood, plastic or metal cone placed tightly against the inside of the forms.

- C. Provide galvanized ties for walls below grade which incorporate a water seal washer.

## 2.5 FORM INSERTS AND EMBEDMENTS

- A. Blockouts, Keyways: Wood or styrofoam.
- B. Chamfer Strips: Wood, polyvinylchloride, or neoprene. Compatible with Finish.
- C. Nails and Fasteners: Use only galvanized nails and fasteners for securing formwork in structures exposed to weather or unconditioned spaces.
- D. Nailing Strips: Pressure treated wood.
- E. Anchoring Inserts: Provide proprietary type inserts where indicated in the Architectural and Structural Drawings.
- F. Fabricated Embedments: Install only as shown in the Architectural and Structural Drawings and as specified in Division 5.

## PART 3 - EXECUTION

### 3.1 FABRICATION AND CONSTRUCTION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Design and fabricate the forms to permit easy removal. Prying against the face of the concrete is not allowed. Only wooden wedges may be used for form removal. Provide forms which are rigid and strong enough to withstand, without leakage, the high hydraulic pressures which result from rapid filling and heavy high-frequency vibration. Limit the deflection of each formwork component to 1/360 of the component span.
- C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- D. Construct formwork mortar-tight with edges sealed to prevent loss of concrete matrix. Edges of form panels, in contact with previously cast concrete, are to be flush within 1/16 inch. Continually adjust forms for line and elevation during concrete placement as required.
- E. Construct formwork so as to limit the offset between adjacent pieces of formwork facing material in accordance with the following classifications as defined in ACI 117. The offset limits shall apply to both abrupt and gradual variations in the surface.
  - 1. Class A, 1/8 inch, for surfaces prominently exposed to public view in the completed structure.
  - 2. Class B, 1/4 inch, for surfaces scheduled to receive plaster, stucco, or wainscoting.
  - 3. Class C, 1/2 inch, for all other surfaces.

- F. Tolerances: Set and maintain concrete formwork to insure completed work is within the tolerance limits listed in ACI 347, with the following additional requirements:
1. Variation From Plumb: In lines and surfaces of columns, piers, walls, and in arises: 1/4 inch in 10 feet but not more than 1/2 inch total.
  2. Vertical surface of columns, piers and walls adjacent to elevator shafts: Do not vary from the dimensions shown on the Drawings by more than +/- 1 inch.
  3. Variations of the linear building lines from established position in plan and related position of columns, walls and partitions:
    - a. In any bay or 20 feet maximum: 1/4 inch.
    - b. In 40 feet or more: 1/2 inch.
- G. Provide removable panels in the bottom of wall and column forms to facilitate cleaning, inspection. Place temporary openings at inconspicuous locations.
- H. Do not place concrete through holes in the sides of forms unless specific permission is given by the Architect.
- I. Chamfer all corners unless noted otherwise.
- J. 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.
- K. Install all embedded items furnished by other trades follow directions and setting information furnished with such items.

### 3.2 CLEANING AND REUSE

- A. Before form materials are re-used, thoroughly clean surfaces, repair damaged areas and withdraw all projecting nails from formwork that will be in contact with freshly cast concrete.
- B. 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-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.
- D. Re-use of form material is subject to the approval of the Architect who has the right to reject any material for re-use which he feels may not produce the required aesthetic results.

### 3.3 REMOVAL OF FORMS AND SUPPORTS

- A. Determining in situ Strength of Concrete: The Contractor shall be responsible for making and curing concrete cylinders, cured under field conditions, for the purpose of determining concrete

strength in time of form and shore removal. Such cylinders shall be made by the Contractor and tested by his testing laboratory. Alternatively, the in situ strength of concrete may be determined by the Maturity Method following the requirements of ASTM C 1074. An acceptable system for this method is the “intelliRock” system manufactured and supplied by Enguis Constructive Intelligence of Stillwater, OK.

- B. Remove forms in a manner which insures building safety. Do not remove supporting forms or shoring until members have acquired sufficient strength to safely support their weight and all subsequent construction loads without deflections exceeding 1/360. Avoid spalling concrete surfaces. Leave forms in place for the full curing period or, if removed, continue curing by specified method. Refer to ACI 347, Chapter 3, for further discussion of form removal.
- C. Records of Weather Conditions: The Contractor shall be responsible for keeping records of weather conditions to be used in the decision on when to remove forms.
- D. Formwork Not Supporting Concrete: Formwork not supporting concrete such as sides of beams, walls, columns and similar parts of the structure, may be removed after cumulatively (not necessarily consecutively) curing at not less than 50°F for 12 hours after placing concrete, provided the concrete is sufficiently hard so as not to be damaged by form removal operations and provided curing and protection operations are maintained. If ambient air temperatures remain below 50°F, if retarding agents are used, or if Type II and Type V portland cement is used, then this specified minimum period should be increased as required to safely remove the forms without damage to the concrete. Where such forms also support formwork for slab or beam soffits, the removal times of the latter shall govern.

### 3.4 CONSTRUCTION JOINTS

- A. Locate joints which are not indicated on Plans where they will least impair the strength and appearance of the concrete work.
- B. Place construction joints in supported slabs in the middle 1/3 of the slab span, keyed and/or doweled, as indicated on the Drawings.
- C. Build bulkheads with keys as required for construction and expansion joints. Install all embedded items furnished by other trades. Follow the directions and setting information furnished with such items.
- D. Coordinate construction joint locations with the structural engineer.

### 3.5 FIELD QUALITY CONTROL

- A. Owner’s Testing Agency: Refer to Division 3 Section “Cast-in-Place Concrete” for formwork inspection and test requirements.

END OF SECTION 03100

## **SECTION 03200 - CONCRETE REINFORCEMENT**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Reinforcement for cast-in-place concrete.
- B. Extent of cast-in-place concrete Work is shown on the Drawings. Provide all materials, labor, hardware, equipment, transportation, and services required to fabricate and place all reinforcement for cast-in-place concrete.
- C. Cooperation with Work of other Sections:
  - 1. Check Contract Drawings and Specifications for requirements of other sections which affect the installation of reinforcement.
  - 2. Examine the Drawings and Specifications for all Contracts to determine nature of proposed construction. Perform work in a manner which will not interfere or delay work of other Contractors. Cooperate with other trades regarding installation of embedded items. Templates and instructions will be provided for setting items placed in forms.
  - 3. Inform those performing Work of other Sections, in writing or by schedules, of requirements for services, materials, and built-in terms prepared or supplied by other Sections which affect Work of this Section.
- D. Related Sections: The following sections contain requirements that relate to this Section:
  - 1. Division 1 Section "Submittal Procedures" for submittal requirements.
  - 2. Division 1 Section "Quality Requirements" for testing requirements.
  - 3. Division 3 Section "Cast-in-Place Concrete."

#### **1.2 SUBMITTALS**

- A. Shop Drawings - Submit shop drawings and product data to include all information necessary for fabrication and placement of reinforcement as follows:
  - 1. Detail and placement Drawings shall be prepared in accordance with CRSI Standards to define and establish the location, size, spacing, length, and shape of reinforcing and all other pertinent information required. Indicate grades of reinforcing steel. Detail wall reinforcing on wall elevations. Clearly indicate the splice length for every size and type of bar used. Include all other project requirements affecting reinforcing details and placing, such as openings, curbs, and depressions.
  - 2. Drawings indicating the type, size, and location of all accessories required for the proper assembly, placement, and support of the reinforcement.
- B. Mill Test Reports

1. Submit certified copies of mill test reports for reinforcing steel, including statement of compliance with specified ASTM Standards.

### 1.3 QUALITY ASSURANCE

A. Codes and Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the latest editions of the following:

1. ASTM A 36: Standard Specification for Carbon Structural Steel.
2. ASTM A 82: Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
3. ASTM A185: Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
4. ASTM A 496: Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
5. ASTM A 497: Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
6. ASTM A 576: Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
7. ASTM A 615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
8. ASTM A 706: Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
9. ASTM A 767: Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
10. ASTM A 775: Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
11. ASTM A 780: Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
12. ASTM A 820: Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.
13. ASTM A 884: Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
14. ASTM A 934: Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
15. ASTM C 1116: Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
16. ASTM C 1399: Test Method for Obtaining Average Residual-Strength of Fiber-Reinforced Concrete.
17. ASTM D 3963: Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars.
18. ACI 117: Specifications for Tolerances for Concrete Construction and Materials and Commentary.
19. ACI 301: Specifications for Structural Concrete.
20. ACI 318: Building Code Requirements for Structural Concrete and Commentary.
21. ANSI/AWS D 1.4: Structural Welding Code – Reinforcing Steel.
22. CRSI: Manual of Standard Practice.
23. CRSI: Placing Reinforcement Bars.

B. In case of conflict between specified codes and standards, the most stringent requirements shall govern. In case of conflict between specified codes and standards and project specifications, project specifications shall govern. In case of conflicts between Contract Documents, immediately notify the Architect/Engineer for resolution.

- C. Pre-Construction Conference: The Reinforcing-Placing subcontractor shall attend the Pre-Construction Conference conducted by the Concrete Contractor as described in Division 3 Section “Cast-in-Place Concrete.”

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Bundle reinforcement and tag with suitable identification to facilitate sorting and placing.
- B. Sequence the shipments of material to the site to minimize field handling and storage.
- C. Store the reinforcing steel on premises in a neat and orderly manner under cover and off ground. Protect the reinforcement from damage, dirt and corrosion. Provide proper drainage.
- D. Transport and handle epoxy-coated reinforcement to maintain integrity of epoxy coating in accordance with ASTM D 3963. Use systems with padded contact areas, and use lifting devices which will not abrade the bar coating. Do not drop or drag reinforcing, and do not place other materials on top of stored bars.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Bar reinforcement - Newly rolled billet steel conforming to the following:
  - 1. All reinforcing bars: ASTM A 615-Grade 60 unless otherwise noted on the Drawings.
  - 2. All reinforcing bars to be welded: ASTM A 706-Grade 60.
  - 3. Galvanized reinforcing bars: ASTM A 767 Class I, hot dipped galvanized after fabrication and bending. Bars that are to be galvanized shall conform to paragraph 1 above.
  - 4. Epoxy-coated reinforcing bars: ASTM A 775. Bars that are to be epoxy-coated shall conform to paragraph 1 above.
  - 5. Epoxy-coated plain-steel wire: Smooth wire for spiral reinforcement ASTM A 884, Class A.
  - 6. Deformed bar anchors: ASTM A 496 with a yield strength of 75,000 psi.
- B. End bearing compression couplers: Acceptable are:
  - 1. Lenton Speed Sleeve by ERICO International Corporation.
  - 2. G-Loc by Barsplice Products, Inc.
- C. Dowel bar replacement: Acceptable are:
  - 1. Dowel Bar Splicer System by Dayton/Richmond.
  - 2. Lenton Form Saver by ERICO International Corporation.
  - 3. BPI Barsplicer System by Barsplice Products, Inc.
- D. Hooked anchorage replacement: ASTM A576, Acceptable are:
  - 1. Lenton Terminator by ERICO International Corporation.
  - 2. BPI DoughNUT termination System by Barsplice Products, Inc.

- E. Threaded bars: Acceptable are:
1. Dywidag Systems International - all bar sizes from No. 9 to No. 18: Grade 75. All other bars sizes: Grade 60 unless otherwise noted on drawings.
  2. Include Accessories (plate anchors, couplers, lock nuts, etc.) compatible with threaded bars to develop required capacities as indicated on the Drawings.
- F. Welded Wire Reinforcement: ASTM A 185 with a yield strength of 65,000 PSI. Deliver in sheets, not rolls.
- G. Galvanized Welded Wire Reinforcement: ASTM A 185. Fabricate from galvanized steel wire into sheets.
- H. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884, Class A.
- I. Smooth Round Steel Dowels: ASTM A 615-Grade 40 or ASTM A 36. Ends of dowels are to be sawn squared ends or grind each end to remove all projecting burrs. Dowels to be placed in dowel baskets to maintain alignment during concrete placement. Thoroughly coat at least half the length of each dowel with a bond breaking material such as grease.
- J. Smooth round epoxy-coated steel dowels: ASTM A 775 with ASTM A 615-Grade 40 or A36 plain-steel bars. Ends of dowels are to be sawn squared ends or grind each end to remove all projecting burrs. Dowels to be placed in dowel baskets to maintain alignment during concrete placement. Thoroughly coat at least half the length of each dowel with a bond breaking material such as grease.
- K. Reinforcement Accessories:
1. Provide all spacers, chairs, ties, slab bolsters, clips, chair bars, and other devices for properly assembling, placing, spacing, supporting, and fastening the reinforcement.
  2. Use annealed tie wire of not less than #18 gauge. Use epoxy coated tie wire with epoxy coated reinforcing bars.
  3. Use individual and continuous slab bolsters and chairs of a type to suit the various conditions encountered. The chairs and bolsters must be capable of supporting a 300-lb concentrated load without measurable permanent deformation of the reinforcement or supports or indentation of the supporting surface.
  4. Use accessories which conform to CRSI Bar Support Specifications, Class 1 or Class 2, in contact with surfaces exposed to view in the finished work.
  5. Support reinforcement for slabs on grade on plastic or steel supports designed for the purpose or precast concrete bricks of a type approved by the Architect/Engineer. Use sand plates or other means to support chairs at proper elevation on base material. Wood blocks, stones, brick chips, etc., are not acceptable.
  6. Support epoxy-coated reinforcement with epoxy-coated or other dielectric-polymer coated wire bar supports.
  7. Support galvanized reinforcement with galvanized wire bar supports.
- L. Coating repair materials:

1. Epoxy Repair Coating: ASTM A 775, liquid, two-part, epoxy repair coating compatible with epoxy coating on reinforcement.
2. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc shall be used to repair damaged areas of galvanized reinforcement.

### PART 3 - EXECUTION

#### 3.1 DETAILING OF REINFORCING STEEL

- A. Detail reinforcing bars in accordance with the requirements of the Standard Practice for Detailing Reinforced Concrete Structures (ACI 315).
- B. Avoid splicing reinforcement at points of maximum stress.
- C. Detail reinforcing to allow clearance for intersecting reinforcing bar layers with minimum specified cover.

#### 3.2 FABRICATION OF REINFORCEMENT

- A. Accurately form the reinforcement to dimensions on the approved shop drawings, details, and schedules.
- B. Do not commence fabrication until the shop drawings, details, and schedules have been reviewed by the Architect/Engineer.
- C. Cold bend all reinforcement. Do not heat reinforcing for any purpose except as specifically accepted by the Architect/Engineer.
- D. Do not form bars in a manner injurious to the bars. Bars with kinks or bends not shown on the Drawings and bars reduced in section will be rejected.
- E. Repair cut and damaged epoxy coatings on fabricated reinforcing before delivery with epoxy repair coating according to ASTM D 3963.

#### 3.3 INSTALLATION OF REINFORCEMENT

- A. Install reinforcing only from Shop Drawings which have been reviewed by the Architect/Engineer.
- B. Accurately place and rigidly secure reinforcing in position in accordance with the requirements of Recommended Practice for Placing Reinforcing Bars and requirements specified herein and on the Drawings.
- C. Tie reinforcing with specified tie wire and bend all wire back beyond general plane of reinforcing.
- D. Provide continuous welded wire reinforcement where shown in slabs with joints lapped at least one full mesh or two full mesh at construction joints, but not less than 6-inches (150 mm). Tie securely and support reinforcement at the proper elevation by accessories. Stagger laps of sheets

to avoid a continuous lap in either direction. Provide supports to maintain the reinforcement in its proper position during placement of the concrete.

- E. Bending, tack welding, cutting or substituting reinforcement in the field, other than that shown on the Contract Drawings, is prohibited unless specific approval for each case is given by the Architect/Engineer.
- F. Remove any excessive rust, scale, or other foreign substances from the reinforcement which might destroy or reduce bond prior to placing concrete.
- G. Avoid exposure of reinforcement to the weather for any considerable length of time before placing of concrete. Where this is unavoidable, paint reinforcement with a heavy coat of cement grout. Be responsible for protecting the exposed concrete and any other materials against staining from exposed reinforcement.
- H. Before the concrete is cast, check all reinforcement after it is placed to insure that reinforcement conforms to Contract Drawings, shop detail drawings, and Specification requirements. Use only qualified experienced personnel to check. Notify the Architect/Engineer's representative at least 36 hours (excluding weekends and holidays) prior to the concrete placement to give the opportunity to observe the completed reinforcement and formwork before concrete placement.
- I. Remove and replace damaged bars.
- J. Repair cut and damaged epoxy coatings on reinforcing with epoxy repair coating according to ASTM D3963.
- K. Splice the reinforcing only as shown on the Drawings or as approved by the Architect/Engineer. All lap splices shall be contact lap splice.
- L. Mechanical, Electrical, and Plumbing Requirements:
  - 1. Refer to mechanical, electrical, and plumbing drawings for formed concrete requiring reinforcement steel.

#### 3.4 FIELD QUALITY CONTROL

- A. Owner's Testing Agency: Refer to Division 3 Section "Cast-in-Place Concrete" for reinforcement inspection and test requirements.

END OF SECTION 03200

## SECTION 03300 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
1. Cast-in-place concrete.
  2. Testing and inspections for cast-in-place concrete.
  3. Curing compound.
  4. Sealer.
  5. Hardeners.
  6. Grouts.
  7. Vapor retarder
- B. Extent of cast-in-place concrete Work is shown on the drawings. Provide all materials, labor, services, equipment, transportation, and hardware required for all cast-in-place concrete. Include additional concrete required to compensate for deflection of steel framing by other trades.
- C. Cooperation with Work of other Sections:
1. Check Contract Drawings and Specifications for requirements of other Sections which affect the placement of cast-in-place concrete.
  2. Examine the Drawings and Specifications for all Contracts to determine nature of proposed construction. Perform work in a manner which will not interfere or delay work of other Contractors. Cooperate with other trades regarding installation of embedded items. Templates and instructions will be provided for setting items placed in forms.
  3. Inform those performing Work of other Sections, in writing or by schedules, of requirements for services, materials and built-in terms prepared or supplied by other Sections which affect Work of this Section.
- D. Related Sections: The following sections contain requirements that relate to this Section:
1. Division 1 Section "Submittal Procedures" for submittal requirements.
  2. Division 1 Section "Quality Requirements" for testing requirements.
  3. Division 2 sections for concrete work related to sitework.
  4. Division 3 sections for related concrete formwork and reinforcing.
  5. Division 5 sections for stay-in-place metal forms and for methods of attachment to hardened concrete.
  6. Division 7 sections for related insulation and waterproofing systems.
  7. Division 7 Section "Vapor Retarders" for vapor retarder.
  8. Division 9 sections for restrictions on concrete finishing and curing to assure compatibility with finish materials.
- E. Responsibility of the Contractor:

1. The design, strength, safety and adequacy of all methods of construction, and the strength, slump, consistency, finish and general quality of concrete are the responsibility of the Contractor. No action by the Architect/Engineer will eliminate, lessen or restrict this responsibility in any manner.

## 1.2 SUBMITTALS

- A. Manufacturer's Data: For standard factory manufactured materials, including specifications for application and installation of proprietary items and materials such as bonding agents, admixtures, curing and sealing compounds, patching compounds, grouts, hardeners, epoxies, and dryshake finish materials.
- B. Concrete design mixes and backup data: Refer to Part 2 Article "Concrete Mix Design" in this Section for requirements. Include test reports on the following:
  1. Gradation analysis and soundness tests for coarse and fine aggregate. Identify sources of aggregate.
  2. Mill test reports on cement, including brand, type and source of supply.
  3. Compression tests on trial cylinders.
  4. Slump and air content of trial batches.
  5. Admixture certification, including chloride ion content.
- C. Samples to Testing Agency: Concrete constituents including admixtures.
- D. Shop drawings showing locations of all sleeves, depressions, and curbs.
- E. Materials and methods for curing concrete.
- F. Methods proposed for hot weather and cold weather curing and protection of concrete - submit prior to commencement of any concrete work.
- G. Method of developing bond at joints.
- H. Pre-Construction Conference meeting minutes.

## 1.3 QUALITY ASSURANCE

- A. Codes and Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the latest editions of the following:
  1. ASTM C33: Standard Specification for Concrete Aggregates.
  2. ASTM C39: Test Method for Compressive Strength of Cylindrical Concrete Specimens.
  3. ASTM C94: Specification for Ready Mixed Concrete.
  4. ASTM C150: Specification for Portland Cement.
  5. ASTM C157: Test Method for Length Changes of Hardened Hydraulic – Cement Mortar and Concrete.
  6. ASTM C171: Standard Specification for Sheet Materials for Curing Concrete.
  7. ASTM C192: Practice for Making and Curing Concrete Test Specimens in the Laboratory.
  8. ASTM C295: Standard Guide for Petrographic Examination of Aggregates for Concrete.
  9. ASTM C260: Specification for Air-Entraining Admixtures for Concrete.

10. ASTM C330: Standard Specification for Lightweight Aggregates for Structural Concrete.
11. ASTM C494: Standard Specification for Chemical Admixtures for Concrete.
12. ASTM C595: Standard Specification for Blended Hydraulic Cements.
13. ASTM C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.”
14. ASTM C881: Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
15. ASTM C989: Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
16. ASTM C1059: Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.
17. ASTM C1107: Standard Specification for Packages Dry, Hydraulic-Cement Grout (Non-Shrink).
18. ASTM C1116: Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
19. ASTM C1218: Test Method for Water-Soluble Chloride in Mortar and Concrete.
20. ASTM C1240: Standard Specification for Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar, and Grout.
21. ASTM C1315: Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
22. ASTM D1751: Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
23. ASTM D1752: Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
24. ASTM D2240: Test Method for Rubber Property – Durometer Hardness.
25. ASTM D4397: Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
26. ASTM D4745: Specification for Filled Compounds of Polytetrafluoroethylene (PTFE) Molding and Extrusion Materials.
27. ASTM D6817: Standard Specification for Rigid, Cellular Polystyrene Geofoam.
28. ASTM E154: Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Wall, or as Ground Cover.
29. ASTM E1155: Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System.
30. ASTM E 1643: Standard Practice for Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slabs.
31. ASTM E1745: Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
32. ACI211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
33. ACI211.2: Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
34. ANSI/AWS D1.4: Structural Welding Code – Reinforcing Steel.
35. NRMCA: Concrete Plant Standards and Truck Mixer and Agitator Standards.
36. CRSI: Manual of Standard Practice.
37. CRSI: Placing Reinforcement Bars.

B. In case of conflict between specified codes and standards, the most stringent requirements shall govern. In case of conflict between specified codes and standards and project Specifications, project Specifications shall govern. In case of conflicts between Contract Documents, immediately notify the Architect/Engineer for resolution.

C. Pre-Construction Conference:

1. At least 30 days prior to submitting the concrete mix designs for approval, the Contractor shall conduct a meeting to review the detailed requirements for preparing the concrete mix designs and to determine the procedures for producing proper concrete construction within the specified tolerances and required quality.
2. Responsible representatives from all concerned parties are required to attend the conference including, but not limited to, the following:
  - a. Contractor's superintendent.
  - b. Architect/Engineer.
  - c. Laboratory responsible for concrete mix designs.
  - d. Owner's Testing Agency.
  - e. Concrete subcontractor.
  - f. Formwork subcontractor
  - g. Reinforcement-placement subcontractor
  - h. Ready-mix concrete supplier.
  - i. Admixture manufacturer(s).
  - j. Concrete pumping equipment operator.
3. The contractor shall send a pre-construction conference agenda to all attendees 7 days prior to the scheduled date of the conference.
4. Review requirements for submittals, status of coordinating work and availability of materials. Establish proposed work progress schedule and testing procedures.
5. Record and distribute legible meeting minutes within 5 days to all parties in attendance at the conference. Include a statement from the suppliers indicating that the proposed concrete mix design(s) and method(s) of placement will produce concrete(s) of the quality required by these Specifications. Transmit an additional copy to the Owner's Representative.

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Comply with ACI 301 and with ACI 304.

#### 1.5 QUALIFICATIONS

- A. The concrete supplier shall have a minimum of five years experience in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment. The supplier must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- B. The concrete contractor shall have a minimum of five years experience with installation of concrete similar in material, design and extent to that indicated for this Project and whose work has resulted in construction with a record of successful-service performance.
- C. Inspection and Testing of the Work: Materials and installed work may require testing and retesting, as directed by the Architect/Engineer, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests, not specifically indicated to be done at the Owner's expense, including retesting of rejected materials and installed work, shall be done at the Contractor's expense. See "Quality Requirements" section of the Specifications.

1. Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Documents.
- D. Acceptance Criteria for Concrete Strength: The strength level of an individual class of concrete shall be considered satisfactory if both the following requirements are met:
1. The average of all sets of three consecutive strength tests equal or exceed the required  $f'c$ .
  2. No individual strength test falls below the required  $f'c$  by more than 500 psi.
  3. A strength test shall be defined as the average strength of two cylinder breaks tested at the strength age indicated on the drawings for that class of concrete.
- E. Responsibility for Selection and Use of Concrete Admixtures and Chemical Treatments: The Contractor shall be responsible for selecting admixtures and surface treatments that are compatible with the intended use of the concrete including all final surface treatments called for within this or other specifications or on the structural or architectural drawings. The Contractor is responsible for following the manufacturer's instructions for the use of their product including abiding by any limitations placed by the manufacturer on the use of any of its products.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Use materials from the same source from the start to the finish of the project, unless a change is accepted in writing by the Architect/Engineer.

### 2.2 CONCRETE MIX MATERIALS

- A. Portland Cement: American made Portland Cement, ASTM C150 Type I or III. For concrete exposed to salt air or salt water, provide Type II or Type V cement.
1. Do not exceed an alkali content of 0.6% unless the manufacturer certifies that no alkali reactivity is produced with the proposed combination of materials when tested in accordance with ASTM C227.
- B. Fine aggregate (normal weight): Washed, inert, non-reactive natural sand conforming to ASTM C-33. Fineness modulus of 2.40 to 3.00. For pumped concrete, 15 to 30 percent passing Number 50 sieve, and 5 to 10 percent passing a Number 100 sieve. Comply with ACI 302 Table 5.4.1 for slab on grade fine aggregates.
- C. Calcium Chloride and Chloride Ion Content:
1. Calcium chloride or admixtures containing more than 0.5% chloride ions by weight of the admixture are not permitted.
  2. The maximum water soluble chloride ion concentration in hardened concrete at ages from 28 to 42 days contributed from all ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the limits specified in ACI 318-02 Table 4.4.1. Water-soluble chloride ion tests shall conform to ASTM C 1218.
  3. The Concrete Supplier shall certify that the chloride ion content in all concrete mix designs used on the project will not exceed limits stated above.

- D. Coarse aggregate (normal weight): Washed, non-reactive well graded crushed stone or gravel conforming to ASTM C-33. Refer to Section 2.4 "Concrete Mix Design" for additional requirements.
- E. Water: Potable, clean and free from deleterious substances.
- F. Air Entraining Agent: Comply with ASTM C260. Agent shall be fully compatible with all other concrete mix materials. Subject to project requirements, provide products from one of the following:
1. W.R. Grace Co.
  2. The Euclid Chemical Co.
  3. Sika Corp.
  4. BASF Construction Chemicals, LLC
- G. Water reducing and plasticizing admixtures: Comply with ASTM C494, Type A. Acceptable products are:
1. Eucon WR-75 by The Euclid Chemical Co.
  2. WRDA with Hycol by W.R. Grace Co.
  3. Pozzolith 322N or 200N by BASF Construction Chemicals, LLC
  4. Plastocrete 161 by Sika Corp.
- H. Mid range water reducing admixture: Comply with ASTM C494, Type A. Acceptable products are:
1. Eucon MR by The Euclid Chemical Co.
  2. Daracem 55 by W.R. Grace Co.
  3. Polyheed by BASF Construction Chemicals, LLC
- I. High range water reducing (HRWR) admixture (superplasticizer): Comply with ASTM C494, Type F or G. Use only with prior review and acceptance of Architect/ Engineer. Provide a qualified technical representative of the admixture supplier on-site during initial concrete placements to assist in proper usage. Acceptable products are:
1. Daracem 100 by W.R. Grace Co.
  2. Eucon 37 by The Euclid Chemical Co.
  3. Rheobuild 1000 by BASF Construction Chemicals, LLC
  4. Sikament 300 or 320 by Sika Corp.
- J. Accelerating Agent: Non-corrosive, containing no chloride; conform to ASTM C494, Type C or E. Acceptable products are:
1. Accelguard 80 by The Euclid Chemical Co.
  2. Polarset by W.R. Grace Co.
  3. Pozzutec 20 or Pozzolith NC534 by BASF Construction Chemicals, LLC
  4. Plastocrete 161FL by Sika Corp.

- K. Retarding admixtures: For use in hot weather concreting. Comply with ASTM C-494, Type D water-reducing and retarding. Acceptable products are:
1. Plastiment by Sika Chemical Corp.
  2. Pozzolith 100XR by BASF Construction Chemicals, LLC
  3. Eucon Retarder-75 by The Euclid Chemical Co.
- L. Fly Ash: ASTM C618, Type F. Maximum 3 percent loss on ignition with no soda ash content allowed. Use only with prior review and acceptance of Architect/Engineer. Provide minimum 15% of total cementitious material, not to exceed 20% of total cementitious materials nor 150 pounds per cubic yard.
- M. Ground Granulated Blast-Furnace Slab: ASTM C989, Grade 100 or 120. Use only with prior review and acceptance of Architect/Engineer. Not to exceed 30% total cementitious materials.
- N. Calcium Nitrite corrosion inhibitor: Comply with ASTM C494 Type C. Dosage rate 2 to 6 gallons per cubic yard.
1. Available Products: Subject to compliance with requirements, provide one of the following products:
    - a. DCI by W.R. Grace & Co
    - b. Eucon CIA by The Euclid Chemical Co.
    - c. Rheocrete CNI by BASF Construction Chemicals, LLC.

## 2.3 FIBER REINFORCEMENT

- A. Fibrous Reinforcement: ASTM C 1116, Type III Collated, fibrillated, polypropylene fibers for use as secondary reinforcement in concrete flatwork. Dispense in accordance with manufacturer's written instructions at minimum rate of 1.5 pounds per cubic yard. Acceptable products are:
1. Fibermesh by Fibermesh, Inc.
  2. Forta CR by Forta Corp.
  3. Grace Fibers, W.R. Grace & Co.
  4. Fiberstrand 100 by The Euclid Chemical Co.
- B. Steel Fiber Reinforcement: ASTM A820, Type I cold drawn, high tensile steel wire for use as primary reinforcing in slab-on grade. Minimum dosage rate of [\_\_\_\_\_] pounds per cubic yard of concrete. Refer to Contract Documents for additional requirements. Acceptable products are:
1. Novocon XR by Propex Concrete Systems.
  2. Dramix Steel Wire Fibers by Bekaert Corporation.
  3. Fibercon by Mitchell.

## 2.4 VAPOR RETARDERS

- A. Refer to Division 7 Section "Vapor Retarders."

- B. Vapor barrier: 10 mil polyethylene sheeting. Install where detailed under slabs on grade, using the widest possible width. Lap joints a minimum of 6 inches (150 mm), and seal laps along walls, and at all penetrations with a compatible trowel mastic or pressure sensitive tape.
- C. Plastic Vapor Retarder: ASTM E 1745, Class A and complying with the following:
  - 1. Tensile strength MD: Minimum 67 lb/in.
  - 2. Puncture ASTM D1709, Method B: Minimum 2440 grams.
  - 3. Permeance: 0.03; ASTM E 96.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Moistop Ultra "A"; Fortifiber Corporation.
  - 2. Vapor Block 15; Raven Industries Inc.
  - 3. Griffolyn Type-65G or 105; Griffolyn, Division of Reef Industries, Inc.
  - 4. Stego Wrap, 15 mils; Stego Industries, LLC.

## 2.5 FLOOR AND SLAB TREATMENTS

- A. Liquid Densifier/Sealer - 100% active colorless aqueous silicate solution. Apply to moist cured floors where indicated on the Contract Documents at the manufacturer's suggested rate and method of application. Acceptable products are:
  - 1. Seal Hard by L&M Construction Chemicals, Inc.
  - 2. Diamond Hard by The Euclid Chemical Co.
  - 3. Ashford Formula by Concrete Construction Chemicals.
  - 4. Mastertop CST by BASF Construction Chemicals, LLC
  - 5. Sonosil by Sonneborn.
- B. Mineral Aggregate Surface Hardener: Factory premixed blend of specially selected cement, properly graded natural aggregates, and water-reducing and plasticizing admixtures. Acceptable products are:
  - 1. Surfex by The Euclid Chemical Co.
  - 2. Quartzplate FF by L&M Construction Chemicals, Inc.
  - 3. Maximent HD by BASF Construction Chemicals, LLC.

## 2.6 CURING MATERIALS

- A. Concrete Curing Materials: Use where moist curing is indicated on Contract Documents. Use where bonded toppings, overlays, applied surface treatments or other applied finishes are incompatible with liquid membrane forming curing compounds.
  - 1. Waterproof Paper: ASTM C171.
  - 2. Polyethylene Film: ASTM C171.
  - 3. Burlap: Federal Spec CC-C-467A.

- B. Concrete Curing and Sealing Compound (Water Based): Liquid membrane forming type conforming to ASTM C1315. Clear non-yellowing acrylic; minimum solid content of 30%; moisture vapor transmission rate less than 0.40 kg/sq.M for 72 hours when applied at coverage of 300 sq. ft. per gallon. Manufacturer's certification required. Sodium silicate compounds and rubber based products are prohibited. Verify that material used is compatible with any finish material subsequently applied to the concrete surface. Acceptable products are:
1. Dress and Seal WB30 by L & M Construction Chemicals.
  2. Super Diamond Clear VOX by The Euclid Chemical Company.
  3. Highseal 30 by Conspec.
- C. Non-shrink, non-metallic standard cement grout: For use under steel base plates and bearing plates. Factory premixed grout with no drying, shrinkage or settlement at any age. Compressive strength per ASTM C-1107 of not less than 5,000 psi at 7 days and 8,000 psi at 28 days when placed in flowable consistency. Acceptable products are:
1. Masterflow 555 by BASF Construction Chemicals, LLC
  2. Hi-Flow Grout by The Euclid Chemical Co.
  3. Duragrout by L & M Construction Chemicals
  4. 10K Grout by Sonneborn.
  5. Conform to the requirements of CRD-621 "Corps of Engineers Specifications."

## 2.7 MISCELLANEOUS RELATED MATERIALS

- A. Non-shrink, non-metallic precision grout: For use under machine base plates and other applications with vibration and/or load reversals. Acceptable products are:
1. Crystex by L & M Construction Chemicals.
  2. Five Star Grout by U.S. Grout Corporation.
  3. Masterflow 928 by BASF Construction Chemicals, LLC
  4. 14K Grout by Sonneborn.
- B. Epoxy Joint Filler: Moisture insensitive, flexible epoxy resin material. Minimum Shore A hardness of 80 where measured in accordance with ASTM D2240. Use in control and construction joints for areas indicated on Contract Documents. Acceptable products are:
1. Euco Epoxy #700 by The Euclid Chemical Co.
  2. Sikadur 51 SL by Sika Corporation.
  3. MM80 by Metzger-McGuire
  4. Epoflex SL by L&M Construction Chemicals, Inc.
  5. Masterfill 300I by BASF Construction Chemicals, LLC
- C. Non-Slip Aggregate: Chemically inert natural or man-made non-slip aggregate with MOH hardness of seven or higher; #4 to #16 mesh size. Acceptable products are:
1. Euco Non-Slip Aggregate by The Euclid Chemical Co.
  2. Grip-It by L & M Construction Chemicals.
  3. Frictex by Sonneborn.

- D. Non-Reemulsifiable Latex: Not less than 48 percent solids. Acceptable products are:
1. SBR Latex by The Euclid Chemical Co.
  2. SikalateX by Sika Corp.
  3. Everbond by L & M Construction Chemicals
- E. Epoxy Resin Bonding Agent: ASTM C-881 two component 100 percent solids mineral filled epoxy-polysulfide polymer. Acceptable products are:
1. Sikadur 32 Hi-Mod by Sika Corporation.
  2. Euco Epoxy No. 452MV or No. 620 by The Euclid Chemical Company.
  3. Sonobond by Sonneborn.
  4. Epobond by L&M Construction Chemicals, Inc.
  5. Concsive 1090 by BASF Construction Chemicals, LLC
- F. Non-shrink patching mixture: Specially formulated high bond package mixture. Acceptable products are:
1. Euco Speed Patch by The Euclid Chemical Co.
  2. Durapatch by L & M Construction Chemicals.
  3. Sonopatch by Sonneborn.
  4. Sika Set Roadway Patching by Sika Corp.
- G. Polymer Patching Mortar: Free flowing, polymer modified cementitious mortar. Acceptable products are:
1. Sikatop 121 or 122 (horizontal repairs) or Sikatop 123 (vertical and overhead repairs) by Sika Corporation.
  2. Thin Top Supreme or Concrete Top Supreme (horizontal repairs) or Verticoat/Verticoat Supreme (vertical and overhead repairs) by The Euclid Chemical Company.

## 2.8 CONCRETE MIX DESIGN

- A. Engage a Technical Agency familiar with local construction conditions and materials to design concrete mixes. Use a Technical Agency other than the Testing Agency engaged by the Owner for field quality control.
- B. Prior to the formulation of design mixes, review with the Technical Agency the concrete mix requirements relative to strength, slump, air content, seasonal adjustments required due to temperatures and anticipated job use and placement conditions.
- C. Provide separate design mixes for each anticipated and/or actual changes in type of mix materials including changes in admixtures, in proportion of basic materials, in slump limits and in placement methods, especially pumping. Identify the proposed use for each mix.
- D. Prepare the mix designs with sufficient lead time to allow testing and adjustment of the mix. Establish the concrete mix design proportions to provide the required average strength using the procedures defined in Section 5 of ACI 318. Whenever possible, use appropriate field test data (30 consecutive tests) to establish a standard deviation for the mixes. When an acceptable record of field test results is not available, establish the concrete proportions based on 3 point curves from

laboratory trial batch mixtures. When a standard deviation cannot be properly established for the mix design, proportion concrete to provide an average strength of  $f'_c$  plus 1200 psi. For concrete strengths above 5,000 psi, increase the safety factor to 1400 psi.

- E. Submit the complete proposed design mix along with the appropriate test data and technical data to the Architect/Engineer for review at least 15 days prior to job use. For each mix design, identify the cement type, proportions of each constituent, water-cement ratio and brand, type and proportion of each admixture. Include the measured slump, air content, unit weight, and compressive strength test results for each mix.
- F. Concrete mix design submittals that are incomplete or do not satisfy the requirements of the Specifications will be rejected. Additional testing and/or revisions to the mix design may be required to achieve compliance. Do not place any concrete in the Work until design mix submittal(s) satisfactory to the Architect/Engineer have been reviewed and accepted. Keep a copy of the reviewed mix designs on file in the field office.
- G. For slab on grade concrete, formulate the concrete mix design to minimize the amount of cement and water necessary to produce the required slump and workability. Utilize properly graded aggregates of cubical shape to minimize water and cement demand.
- H. In addition to the concrete mix design requirements listed above, limit the water/cement ratio to the following maximums:
  - 1. 0.40 for reinforced concrete exposed to deicing salts, brackish water or salt spray.
  - 2. 0.45 for concrete required to be watertight and/or subject to cycles of freezing and thawing (including foundation walls).
  - 3. 0.50 for all concrete not otherwise specified.
  - 4. Concrete containing microsilica and/or High Range Water Reducers etc. may have the above requirements waived if evidence of acceptable performance in-service is provided.
  - 5. For interior slab on grade concrete, limit the cement content to a maximum of 540 pounds per cubic yard.
- I. Provide air entrainment for all lightweight concrete, and for all exterior concrete or concrete otherwise exposed to cycles of freezing and thawing. Comply with ACI 318, Table 4.1.1 "Severe Exposure" for amount of air entrainment in concrete at point of deposit. Adjust admixture dosages as necessary to account for climatic conditions, method of placement and other constituents of mix. Do not use air entraining admixtures for interior normal weight concrete flatwork requiring a smooth troweled finish.
- J. Provide a water reducing (plasticizing) or high range water-reducing (super plasticizer) admixture for all structural concrete. Use a specified super plasticizer for all pumped concrete, concrete with a water/cement ratio less than 0.50 and for "Architectural" concrete.
- K. All concrete containing a high range water reducing admixture (superplasticizer) shall have a maximum slump of 9 inches unless otherwise approved by the architect/engineer. The concrete shall arrive at the job site at a slump of 3 inches +/- 1 inch, be verified, then the high range water reducing admixture added to increase the slump to the approved level. Proportion design mixes of all other concrete to result in concrete with the following slumps measured at the point of placement:

1. Pavement and slabs on grade 4 inches +/- 1 inch.
  2. Footings, massive sections 3 inches +/- 1 inch.
  3. All other concrete 3 inches +/- 1 inch.
- L. Use the following maximum coarse aggregate sizes, per ASTM C33:
1. Size 57 for beams, slabs and walls.
  2. Size 7 for tight pours and thin sections.
  3. Size 67 for all other concrete.
  4. Size 467 for standard slabs on grade and foundations.
- M. Specifically identify those concrete mixes which are intended to be placed by pumping. Indicate the modifications made to the basic mix to aid in pumping, including changes in slump, air content, fly ash content, cement paste vs. aggregate content, and admixtures such as superplasticizers. Pre-soak all lightweight aggregates in pumped concrete per the lightweight aggregate manufacturer's recommendations. Carefully control the gradation of the coarse and fine aggregates, keeping the grading as close to the middle of the ASTM C33 or C-330 range as possible. Review pumping techniques with the Architect/Engineer prior to placement.
1. Make one test of each concrete design mix to verify that the total chloride ion (Cl-) content is less than 0.10% of the weight of the cement, that the total sulfate (as SO<sub>3</sub>) content of the mix is less than 0.05% of the weight of the mix, per ASTM C-114, and that the thiocyanate ion (as SCN-) content is less than 0.15% of the weight of the cement.
- N. Adjust mix designs that do not prove to be satisfactory in use, subject to the Architect/Engineer's review. Concrete that does not consistently exhibit the specified control characteristics will be considered unsatisfactory. Any additional costs incurred due to changes required in the mix are to be borne by the Contractor.
- O. Provide additional mix designs and appropriate test data for any revisions to the approved concrete mix designs requested by the Contractor during the course of work. Do not use the revised mix until reviewed and accepted by the Architect/Engineer.

## 2.9 MIXING AND DELIVERY OF CONCRETE

- A. Supply all concrete from a ready-mix plant acceptable to the Architect/Engineer. Batch all constituents, including admixtures, at the central batch plant, except for HRWR's which may be added at the job site.
- B. Comply with ACI 304 recommendations. Accurately weigh all materials. Mix, dispense and use admixtures in accordance with the specific manufacturer's written instructions.
- C. Conform with Truck Mixer and Agitator Standard of the Truck Mixer Manufacturer's Bureau of the National Ready-Mixed Concrete Association, as well as ASTM C94. Do not load trucks in excess of NRMCA ratings for normal weight aggregate concrete.
- D. Water may be added initially to concrete which arrives at the site with a slump below the specified slump if, after the addition of water, neither the maximum permissible water/cement ratio nor the maximum slump is exceeded. Provide thorough additional mixing. The Owner's Testing Agency will observe the adding of water and mixing. Retempering after initial slump adjustment is not

permitted. Redosage with the specified super-plasticizer may be done with the prior approval of the Architect/Engineer.

- E. Discharge of Materials: Discharge concrete without segregation of the ingredients. Incorporate all concrete in the work in its final shape and location within 90 minutes after the introduction of water to the mix or within a shorter time period as the testing agency may direct during hot weather. Immediately remove all concrete materials from the construction site not incorporated into the Work within the specified time limits.
- F. Cold Weather Requirements: Comply with ACI 306 whenever ambient air temperatures are below 40 degrees F. Heat the mixing water and, if necessary, the aggregates to produce concrete at the temperature specified in ACI 306, Table 1.4.1 when placed. If the mixing water is heated, do not exceed a temperature of 140 degrees F. at the time it is added to the cement and aggregates.
- G. Hot Weather Requirements: Comply with ACI 305 whenever conditions of high air temperature, low relative humidity and/or wind exist. Provide crushed ice in lieu of equal weight of mixing water if necessary to provide concrete of the proper temperature. Ice must be completely dissolved before placing concrete. At the Contractor's option, liquid nitrogen may be used to cool the concrete.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF EMBEDDED ITEMS AND COORDINATION WITH OTHER TRADES

- A. Install all embedded items to conform to the requirements of ACI 318, Chapter 6, Paragraph 6.3, "Conduits and Pipes Embedded in Concrete," and as specified below. Do not install any accessories until their type and location have been verified by the affected trades.
- B. Coordinate the installation of all inserts required by other trades prior to the placing of reinforcing steel.
- C. Install anchor rods, etc., furnished by other Sections. Use line and transit to locate anchor rods and secure with templates to prevent displacement during concreting operations.
- D. Provide steel sleeves for pipes passing through concrete.
- E. Non-aluminum electrical conduit is the only piping which may be embedded in structural concrete. Place conduit by the following guidelines:
  - 1. Do not cut or displace any reinforcement.
  - 2. Do not place conduit between concrete surfaces and reinforcement.
  - 3. Solid slabs - restrict O.D. of conduit to 1/4 of slab thickness. Keep within the middle half of that thickness.
  - 4. Place conduit larger than 1/6 of the slab thickness approximately parallel to or at right angles to the slab reinforcing, not diagonally.
  - 5. Place nearly parallel conduits apart at least 6 times the outside diameter of conduit being used.

### 3.2 PLACING CONCRETE

- A. Comply with ACI 301, Chapter 8 and as modified below.
- B. Transport concrete mixes to place of final deposit as rapidly as practical by methods which prevent segregation of the ingredients and displacement of reinforcement. Avoid rehandling. Do not deposit any partially hardened concrete. Provide a baffle plate or spout at the discharge end of the chute to prevent segregation. Use a downpipe, elephant trunk, spout or other appropriate method to prevent concrete from falling freely through a height of more than 3 feet (.9 m). When the operation is intermittent, discharge the chute into a hopper. Do not allow concrete to flow horizontally within forms over a distance exceeding 5 feet. Do not move concrete horizontally with vibrators. Provide runways to allow wheeled equipment to move over reinforcement. Do not support runways on reinforcement.
- C. Schedule the work so that a section begun on any one day is completed in daylight on the same day.
- D. Protect exposed to view walls and columns from concrete spatter when placing slabs.
- E. Remove water and all foreign matter from place of deposit. Do not place any concrete into any form or excavation containing trash, free water, frost, ice or frozen ground. Provide adequate protection against frost action during freezing weather. Do not place concrete flatwork in the rain. Protect exposed concrete surfaces from rain until final set occurs.
- F. Do not use calcium chloride in any concrete.
- G. Thoroughly clean foreign materials and laitance from all construction joints including vertical and inclined surfaces. Where necessary, roughen the joint with suitable tools such as chipping hammers, wire brushes, etc., and re-clean with a stream of water or compressed air. Saturate the joints with water. After free or glistening water disappears, thoroughly coat the joints with a neat cement grout mixed to the consistency of very heavy paste. Provide a coating of at least 1/8 inch (3.2 mm) thickness, wherever possible, scrubbed in by means of stiff bristle brushes. Deposit the new concrete before the neat cement grout hardens. Use an epoxy resin bonding agent in lieu of neat cement grout when bonding fresh concrete to fully cured existing concrete. Follow manufacturer's printed instructions. Place new concrete while the bonding agent is still tacky.
- H. Deposit concrete continuously in layers of a thickness that will prevent new concrete from being deposited on partially hardened concrete. Limit height of vertical lifts to 24-inches (609 mm). Do not allow formation of seams and planes of weakness within the section. Vibrate through successive lifts to avoid pour lines, stone pockets, honeycombing and segregation. Immediately notify the Architect/Engineer, if due to emergency conditions, a section cannot be placed continuously between planned construction joints. If approved, create a field joint and provide additional reinforcement as necessary to preserve the structural continuity of the member.
- I. Thoroughly compact concrete by means of internal mechanical vibrators to produce required quality of finish. Use experienced operators under close supervision to produce homogeneity and optimum consolidation in the concrete without permitting segregation of the constituents or "pumping" of air. Comply with ACI 309 "Standard Practice for Consolidation of Concrete."
- J. When placing exposed concrete vertical surfaces, strike corners of forms rapidly and repeatedly from the outside along the full height while depositing concrete and vibrating.

- K. Thoroughly clean chutes, hoppers, spouts, adjacent work, etc., before and after each run. Discharge the water and debris outside the form.
- L. Finish all structural slabs and slabs on grade to the elevations shown on the Contract Documents. Provide additional concrete as necessary to compensate for all settlements and deflection due to the weight of the wet concrete.

### 3.3 FINISHING OF FORMED CONCRETE SURFACES

- A. Comply with ACI 301 and as modified below.
- B. Finish formed concrete surfaces as follows:
  - 1. Knock off fins and grind if necessary. Provide rough form finish for surfaces not exposed to public view and smooth form finish for all concrete surfaces exposed to public view.
  - 2. Smooth rubbed finish - Where noted on Contract Documents, provide smooth formed finish treatment no later than 1 day after form removal. Moisten concrete surface and rub with carborundum brick to produce uniform color and texture on surface.

### 3.4 FINISHING FLATWORK

- A. Preliminary Slab Finishing: For all slabs regardless of final finish:
  - 1. Rough Finishing: Accurately strike off the top surface of the flatwork to provide a true and level surface within the required tolerances. After concrete has been placed, consolidated, and struck off, highway straightedge and/or highway bull float the surface. Remove all water and foreign material which may work to the surface as soon as the condition of the slab permits, and before it has hardened appreciably. When water sheen has disappeared, use power driven float blades to compact the surface. Recheck the surface for trueness and levelness; restraighten, fill, or cut down with a 10-foot (3 m) highway straightedge to achieve the specified Ff numbers.
  - 2. Power Troweling: Wait until the water sheen has disappeared or the mix has stiffened sufficiently to permit the proper operation of a power driven trowel. Power trowel the surface to produce a smooth surface which is relatively free of defects but which may still contain some trowel marks. Hand float locations inaccessible to the power driven machine with wood, aluminum, or magnesium floats. Recheck trueness of surface with a 10-foot (3 m) highway straightedge applied at no fewer than two different angles. Cut down high spots and fill in low spots to produce a finished surface within the specified tolerances.
- B. Floated Finish: After power troweling, float the slab immediately at least twice using a wood float to produce uniform smooth granular texture. Provide on the following surfaces:
  - 1. Slabs to receive membrane or elastomeric roofing or membrane waterproofing.
  - 2. Slabs to receive sand bed terrazzo.
  - 3. Top surfaces of walls, curbs, or other surfaces not requiring a steel troweled surface.
  - 4. Exterior slabs not specified to receive broom finish.
- C. Steel Troweled Finish: Perform additional hand troweling as soon as the surface has hardened sufficiently to produce a ringing sound as the trowel is moved over the surface. Produce a uniform,

smooth, glossy surface free of trowel marks or other defects. Grind smooth any defects which would telegraph through the applied floor covering. Equipment pads shall receive a dense, hard, but not burnished surface. Provide steel troweled finish on the following surfaces:

1. Slabs to receive carpeting.
  2. Slabs to receive seamless floor finish.
  3. Slabs to receive resilient flooring, quarry tile or ceramic tile. Lightly scarify surface with fine broom if finish material is installed with thin set mortar.
  4. Slabs to be left exposed and not specified to receive another finish.
  5. Top surfaces of equipment pads.
- D. Sealed Finish: Just prior to the completion of the project, apply a second coat of the specified concrete curing and sealing compound where indicated on the Drawings to the following surfaces:
1. All exposed concrete floors within the building not receiving another finished material and subject only to pedestrian traffic as called for in the Contract Documents.
- E. Floors with polypropylene fibers: After curing period, remove all protruding fibers in a manner which will not harm the parent concrete, leaving unblemished floor surface ready for application of subsequent finishes.
- F. Non-slip aggregate application: Apply to concrete stairs, ramps and to concrete floors where indicated on the Contract Documents.
1. Soak non-slip aggregate in water and allow to drain thoroughly.
  2. Finish the floor as for a steel trowel finish except that immediately prior to final troweling, apply the non-slip aggregate uniformly over the surface at the rate of 25 lbs./100 sq. ft. Embed the non-slip aggregate into the concrete surface by the final light troweling operation.
  3. After curing, lightly work surface with steel wire brush to exposed non-slip aggregate.
- G. Mineral aggregate surface hardener application: Apply to concrete floors where indicated on the Contract Documents.
- H. Apply mineral aggregate hardener at the rate of 1.2 psf to all slabs in areas noted on the drawings. Apply the hardener in two applications by mechanical spreader. The first shake shall comprise 2/3 of the specified amount of hardener. Make this application after the initial floating operation unless climatic conditions dictate earlier application. Float the hardener in and make the second application. Float the surface again to properly bond the hardener to the base concrete slab. Trowel the surface at least twice to a smooth, dense finish.
- I. Broomed Finish: After rough finishing as specified above, and just prior to final set, broom the entire surface uniformly with a stiff broom to remove all scum, laitance, etc. without muddying the surface. Prepare a sample panel and obtain approval from the Architect before finishing broom finish slabs to be exposed to view. Provide broomed finish on the following surfaces:
1. Slabs to receive floor fill concrete or monolithic topping.
  2. Traffic paving, parking areas and ramp traffic surfaces not to receive "traffic topping." Apply broom in the direction perpendicular to the main traffic route.
  3. Exterior walkways and paving - Refer to Division 2.

- J. Sawcutting: Begin sawcutting as soon as the saw will not dislodge the aggregate or ravel the edge of the sawcut. If a "Soff-Cut" saw is used, begin immediately after final finishing. If a conventional saw is used, begin no later than 12 hours after the slab is placed. Provide sufficient personnel and equipment to complete sawcutting operations within 18 hours after the slab is placed. Sawcut a minimum of one quarter of the slab depth leaving a clean, sharp edge in the pattern shown on the Contract Documents. If no pattern is shown, space joints a maximum of 15-feet (4.6 m) on center in each direction and located to conform to column spacing (half-bays etc.).
- K. Semi-rigid epoxy application: Pack the sawcut with backer rod immediately after sawcutting is completed to keep the joint clean and free of debris. Delay the installation of semi-rigid epoxy for as long as is practical - at least 28 days after slabs are cast, preferably 90 days. Remove the backer rod and promptly prepare and fill the sawcut full depth with semi-rigid epoxy according to the manufacturer's printed instructions.
- L. Maintaining floor flatness: For slabs-on-grade that initially meet the specified floor flatness and levelness requirements but become out of tolerance due to curling, grind the surface to adjust flatwork to within tolerance requirements.

### 3.5 ALLOWABLE TOLERANCES

- A. Formed surfaces: Refer to Division 3 Section "Concrete Formwork" for tolerances related to formwork, shoring and cambering, including Architectural concrete.
- B. Flatwork: Finish concrete flatwork to the following surface profile tolerances when measured in accordance with ASTM E 1155:
  - 1. Ff = Face floor flatness number.
  - 2. Fl = Face floor levelness number.
  - 3. All slabs on grade not otherwise specified:
    - a. Overall Ff 25/Fl 20.
    - b. Local Ff 17/Fl 13.
  - 4. For the purposes of flatness and levelness control, the minimum floor section boundaries are defined as one bay of \_\_\_\_\_ x \_\_\_\_\_.
  - 5. Refer to Part 3 Article "Repair of Defective Concrete Surfaces" - for repair of any floor section which measures below the Minimum Local Value for either Ff or Fl.
  - 6. If either the Actual Overall Ff number or the Actual Overall Fl number calculated for the entire slab installation measures less than the value specified, repair the slab in accordance with the requirements set forth in Section 3.
  - 7. Provide floor surfaces with an average elevation within +/- 3/4 inch of the finished floor elevations indicated on the Contract Documents.

### 3.6 CURING, PROTECTION AND FORM REMOVAL

- A. General:
  - 1. Comply with ACI 301, and as modified below.

2. Protect freshly placed concrete from premature drying, mechanical damage and excessively cold or hot temperatures and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of the cement and proper hardening of the concrete.
  3. Start initial curing as soon as free moisture has disappeared from the concrete surface after placing and finishing.
- B. Curing-Moisture Retention: Maintain the concrete in a continually moist condition for a minimum of 7 days. Avoid rapid drying at end of curing period.
1. Formed surfaces - Keep the forms continuously wet by periodic spraying with water. After the forms are removed, continue moist curing by one of the methods described for unformed surfaces.
  2. Unformed surfaces - Where moist curing is indicated on the Contract Documents, use only methods a, b, or c below. Retain moisture in the concrete by immediate application of one of the following methods:
    - a. Ponding or continuous fog spray (mist) of water - periodic sprinkling is not acceptable.
    - b. Apply an absorptive cover and keep continuously wet.
    - c. Apply continuous waterproof sheets - lap and seal seams and repair any holes or tears.
    - d. Apply a specified liquid membrane forming curing and sealing compound at the manufacturer's specified rate and method of application to comply with specified water retention. Apply as soon as possible after final finishing operations are complete. Apply in two (2) directions, the second application perpendicular to the first. Do not use if liquid membrane is incompatible with future applied finishes or if a bonded concrete overlay will be placed over slab. Dissipating liquid membrane resin cures may be used if they are completely removed after curing.
- C. Curing - Temperature: Maintain the temperature of the concrete at 50 degrees F or above during the curing period. Keep the concrete temperature as uniform as possible and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete which exceeds 5 degrees F in any one hour and 50 degrees F in any 24-hour period.
1. Cold Weather Concreting:
    - a. Comply with ACI 306R whenever the average daily temperature is less than 40 degrees F.
    - b. Heat the formwork, reinforcing and underlying subgrades with live steam or hot air jets to raise the temperature of each well above freezing prior to placing concrete. Provide concrete of at least the temperature shown in Table 1.4.1 of ACI 306. Heat, insulate, cover, enclose and protect the concrete as necessary to continuously maintain the concrete temperature between 50 degrees F and 60 degrees F for the entire curing period. Do not allow temporary heaters to exhaust combustion gases into the enclosed space containing the slab surface.
    - c. Only non-corrosive, non-chloride accelerators may be used in cold weather after review and acceptance by the Architect/Engineer. Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.

2. Hot Weather Concreting:

- a. Comply with ACI 305R whenever the atmospheric temperature or the form surface temperature is at or above 90 degrees F., or climatic conditions of wind and/or low humidity will cause premature drying of the concrete.
  - b. Cool the formwork and underlying subgrades to a maximum of 80 degrees F. and keep moist. Cool reinforcing by covering with water soaked burlap if it is too hot. Cool the temperature of the concrete to 75 degrees F. by substituting ice for mixing water or other methods.
  - c. Take precautions before placing concrete to prevent rapid moisture loss from the concrete surface. Erect sunshades and windbreaks, provide continuous fog spray of water and/or other protection as necessary to prevent premature drying of the concrete surface.
  - d. Schedule placements of concrete flatwork to begin in the late afternoon if daytime temperatures and drying conditions are critical.
  - e. Suitable retarders may be added to the concrete mix if the retarder mix design has been reviewed and accepted by the Architect/Engineer prior to use on the project.
- D. Protection from Mechanical Injury: During the curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and from damage caused by rain or flowing water. Protect finished concrete surfaces from damage by subsequent construction operations.
- E. Wait a minimum of 48 hours after finishing slab before allowing foot traffic on slab. Do not allow construction traffic or loads to be applied to slab on grade until the concrete is 7 days old.
- F. Temperature Records: Maintain a set of record drawings on site on which the progress of work is shown. Indicate the day, time, and ambient temperature at time of placement for each concrete pour. Keep a permanent log showing the date and the outside and concrete temperatures during all concreting operations (including curing). Take thermometer readings at the start of work in the morning, at noon, and again late in the afternoon. Record the locations of all concrete placed and cured during these periods, in a manner which will show any effect the temperature may have had on the construction.
- G. Removal of Forms: Refer to Division 3 Section "Concrete Formwork."

3.7 REPAIR OF DEFECTIVE CONCRETE SURFACES

- A. Comply with ACI 301, and as modified below.
- B. Identify those areas requiring repair, and review locations with Architect/Engineer and Owner's Testing Agency on a case by case basis. Refer to Section "Corrective Work" where it is determined by the Architect/Engineer that the load carrying capacity of the concrete may be jeopardized. If it is determined that only surface repairs are necessary, submit a proposed repair procedure, outlining a description of materials, sequencing, preparation, etc. for review.
  1. Where concrete is indicated as Architectural Concrete, exercise care to avoid damaging virgin skin of surrounding parent concrete.
  2. Cut out defective concrete down to sound concrete leaving neat, square cut edges.

3. Where reinforcement is exposed by removal of defective concrete, cut around reinforcement to provide a clear space not less than 3/8 inch wide on all sides of the bar.
  4. If so directed by the Architect/Engineer, provide 2 by 2 inch (50 by 50 mm) stainless steel mesh reinforcement securely attached to existing reinforcement with stainless steel wire.
  5. Thoroughly saturate the concrete surface to receive the patch for several hours prior to application of patching materials. Remove excess water to obtain saturated, surface dry substrate. Apply primer or scrubcoat of bonding agent according to the manufacturer's instructions.
  6. Use the specified polymer patching mortar where a color match to the adjacent concrete is not required.
  7. Do not mix more mortar than can be placed in 20 minutes. Apply in layers according to the manufacturer's instructions. Leave all layers except the final layer in a rough condition to receive the succeeding layer.
  8. Finish the final layer to match the existing concrete surface in color and texture. Where the concrete surface is to be visible in finished work, add colored aggregates and/or cements as required to provide a mixture which will exactly match the color of the parent concrete after hardening and curing. Provide test patches in an inconspicuous location to verify the color and texture match before proceeding with remainder of patching. If necessary, rub the surface lightly with a fine Carborundum stone at 1 to 5 days age.
- C. Provide repairs with the strength, elasticity and durability equal to the parent material being repaired. Remove and replace patches which become crazed, cracked, sound hollow upon tapping, or, which in the opinion of the Architect/ Engineer do not exactly match the surrounding concrete surfaces or otherwise do not satisfy the requirements of the Contract Documents.
- D. When flatness and levelness testing indicates concrete flatwork that does not comply with the specified tolerances, grind the surface to adjust flatwork to within tolerance requirements. Perform grinding as soon as possible after the concrete is strong enough to prevent dislodging of the coarse aggregate, preferably within three (3) days.
- E. All patching and repairs shall be performed at the Contractor's expense.

### 3.8 CORRECTIVE WORK

- A. Concrete in place will be considered defective if cylinder strength test results do not meet the requirements of ACI 318 Section 5.6. Additional causes for rejecting concrete include, but are not limited to, concrete placed with excessive slump, insufficient air content, beyond specified time limits, with unauthorized retempering, without proper supervision or inspection, improper curing or protection, or if there is visible evidence of scaling, cracking, voids or excessive deflection.
- B. If, in the Architect/Engineer's opinion, the strength, stiffness or durability of the structure may be compromised, test specimens may be taken from the structure at locations designated by the Architect/Engineer. Obtain and test the specimens in accordance with ASTM C42 and/or perform petrographic analysis in accordance with ASTM C856. Test results which indicate non-compliance with the Specifications are cause for rejection. Alternatively, at the Architect/Engineer's discretion, load tests may be performed and evaluated in accordance with ACI 318, Chapter 20.

- C. Remove and replace concrete that, in the Architect/Engineer's opinion, does not satisfy the performance requirements of this Specification if repairs cannot be accomplished to the Architect/Engineer's satisfaction.
- D. Where it is determined that repairs may be attempted, submit a complete repair procedure to the Architect/Engineer for review. Include all necessary information on proposed products, preparation, and sequence of repair including manufacturer's specifications and installation instructions. Do not proceed with repairs until this procedure has been reviewed and accepted by the Architect/Engineer. The repair must account for the strength, stiffness and long term durability of the entire structural element under repair.
- E. The costs of all tests, additional services required of the Architect/Engineer, and for repair or removal and replacement are at the expense of the Contractor.

### 3.9 GROUTING OF AND BASE PLATES

- A. Grout Mixture: Use the specified grout mix with the minimum amount of water required to produce a flowable grout. Extend grout with 3/8-inch (3.2 mm) coarse aggregate for grout placements over 2-inches (50 mm) thick. The proposed grout mix with the 3/8-inch (3.2 mm) aggregate must be reviewed and approved by the grout manufacturer and the engineer prior to use.
- B. Mixing: Per approved grout manufacturer's printed instructions. Do not mix more grout than can be placed within 20 minutes.
- C. Preparation:
  - 1. Remove all defective concrete, laitance, dirt, etc. from the concrete surface. Saturate the surface of the concrete thoroughly with clean water for at least 24 hours. Remove free water just prior to placing the grout.
  - 2. Clean, align, and level the base plate into final position and maintain that position during grouting. Bring the concrete and plate to be grouted to a temperature of 65 degrees to 90 degrees F. just prior to grouting.
- D. Grouting:
  - 1. Place the grout quickly and continuously to provide complete bearing and avoid air entrapment.
  - 2. After the grout has acquired its initial set, cut off all unconfined, exposed edges, leaving sloping "shoulders". Cure the grout for a minimum of 3 days by application of a curing compound applied to the exposed shoulders. Maintain temperature above 50 degrees Fahrenheit for this time period.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: The Owner will engage a Testing Agency at his own expense, acceptable to the Architect/Engineer, to perform detailed concrete quality control, testing and inspection. Provide the Testing Agency with the following:
  - 1. Materials, samples, and access to materials as required for testing.
  - 2. Minimum one day's advance notice when concrete is to be placed.

3. Incidental labor required to facilitate testing.
4. Approved on-site storage facilities for concrete test cylinders.
5. Copies of the delivery ticket of each load of concrete as it arrives at the jobsite. Identify the concrete strength, water/cement ratio, type and size of coarse aggregate, batch plant of origin and time cement was discharged into the delivery truck.
6. Copy of the most current reinforcing steel shop drawings which have been reviewed by the Architect/Engineer, and access to the Contract Documents.

B. Reimbursement of costs for testing and inspection resulting as a consequence of the following:

1. Work not in compliance with the Contract Documents.
2. Testing requested by the Contractor or Subcontractor such as additional cylinders for early breaks, form removal, etc.
3. Testing to verify the adequacy of work done without prior notice, without proper supervision, or contrary to standard construction practice.
4. Changes in source, quality or characteristics of materials.
5. Wasted time of inspectors because of cancellations or delays of concrete placement or other work.

C. Do not place concrete until the Owner's Testing Agency has reviewed and approved the work, and all reported deficiencies have been corrected. Concrete placed prior to approval is subject to removal.

D. Testing Agency Responsibilities:

1. Conduct the tests and inspections required herein, interpret and evaluate the results for compliance with the Contract Documents, and promptly furnish reports of the results to the Owner, Architect/Engineer, Contractor, and Local Building Authority.
2. At the start of the project, check the concrete constituents, including admixtures, for compliance with the Contract Documents. Test the dry rodded weight of the coarse aggregate whenever a sieve analysis is made, and when it appears there has been a change in the aggregate.
3. At the start of the job and periodically, as determined by the Architect/Engineer, perform inspections of the Batch Plant and its operation. Observe the batching equipment, the condition of materials used, and check for conformance with the design mix proportions.
4. Perform concrete compression strength testing in accordance with ASTM C31 and C39. Sample concrete for test specimens at the point of deposit in accordance with ASTM C172. General concrete testing will consist of one (1) set of four (4) cylinders made from a single sampling for each 50 cubic yards or fraction thereof of each class of concrete placed each day. All test specimens are to be laboratory-cured. Test as follows:
  - a. One (1) 7 - day break.
  - b. Two (2) 28 - day breaks.
  - c. One (1) 56 - day break. Hold in reserve for testing if 28 - day breaks do not comply.
  - d. Immediately notify the Contractor and Architect/Engineer if 7 day strengths are less than 70% of design strength.
5. If the total volume of concrete is such that the frequency of testing as specified above would provide less than five strength tests for a given class of concrete, tests shall be made from

at least five randomly selected batches or from each batch if fewer than five batches are used.

6. If the total volume of concrete is such that the frequency of testing as specified above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.
  7. The above frequencies assume that one batch plant will be used for each pour. If more than one batch plant is used, the frequencies cited above shall apply for each plant used.
  8. Determine the air content of concrete per ASTM C173 or ASTM C231 (normal weight concrete only). For concrete required to be air-entrained, test the first truck and every 25 cu. yards thereafter each day. For concrete not required to be air-entrained, test every 100 cu. yards at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
- E. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day's pumping operations to determine change in slump. Provide a slump cone, plate, rod and measuring device for use on the project at all times.
- F. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test first truck and each time cylinders are made.
- G. Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations.
- H. Observe the placement of all concrete. Inspect the formwork and the reinforcing steel placement, including bar size, spacing and grade of steel prior to concrete placement. Submit detailed report of observations.
- I. Immediately notify the Contractor of any items which do not comply with the requirements of the Contract Documents. If satisfactory corrections are not made, contact the Architect/Engineer for direction before the concrete is placed.
- J. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads which do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor's expense. Any rejected concrete that is placed will be subject to removal. Refer to Part 3 - Corrective Work.
- K. Measure concrete flatwork for levelness and flatness as follows:
1. Perform Floor Tolerance Measurements Ff and Fl in accordance with ASTM E-1155. Calculate the actual overall F- numbers using the inferior/superior area method.
  2. Perform all floor tolerance measurements within 48 hours after slab installation and prior to removal of shoring and formwork.
  3. Provide the Contractor and the Architect with the results of all profile tests - including a running tabulation of the overall Ff and Fl values for all slabs installed to date - within 72 hours after each slab installation.

L. Standard of Strength Control

1. Strength Requirements and Compliance Therewith: Concrete will be considered to meet strength requirements of the Specifications when in compliance with ACI 318 Section 5.6

M. Enforcement:

1. When actual non-compliance and/or ominous trends are observed by the testing laboratory, promptly notify the Contractor and the concrete supplier who shall take immediate appropriate action to correct the deficiency.
2. If non-compliance occurs, the producer will be warned to take immediate corrective action. Test results of concrete furnished subsequent to such a warning must comply. Test results indicating non-compliance after one warning will be sufficient cause for the Architect/Engineer to refuse to permit any additional concrete to be furnished by the non-complying producer.
3. Refer to Part 3 - Corrective Work - for concrete in place that does not comply with the strength requirements of the Contract Documents.

END OF SECTION 03300

## **SECTION 04805 - PARGING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes parging of exterior concrete surfaces.

#### **1.2 SUBMITTALS**

- A. Product Data: For ingredients.

#### **1.3 QUALITY ASSURANCE**

- A. Source Limitations 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.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

#### **1.5 PROJECT CONDITIONS**

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates.
- B. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Comply with cold-weather construction requirements contained in Part 1.8 D. of ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and wind breaks and use cooled materials as required.

### **PART 2 - PRODUCTS**

#### **2.1 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 as selected by Architect.
- B. Hydrated Lime: ASTM C 207, Type S.

- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
- D. Masonry Cement: Not permitted.
- E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- F. Aggregate for Grout: ASTM C 404.
- G. Water: Potable.

## 2.2 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
  - 1. Limit cementitious materials in mortar to portland cement and lime.
  - 2. For parging, use Type N.

## PART 3 - EXECUTION

### 3.1 PARGING

- A. Parge concrete surfaces where indicated, in 2 uniform coats to a total thickness of 3/4 inch (19 mm). Dampen wall before applying first coat and scarify first 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 (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

END OF SECTION

## SECTION 06105 - MISCELLANEOUS CARPENTRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes the following:

1. Wood blocking, cants, and nailers.
2. Plywood sheathing.
3. Plywood backing panels.

#### 1.2 DEFINITIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. SPIB - Southern Pine Inspection Bureau.
4. WCLIB - West Coast Lumber Inspection Bureau.
5. WWPA - Western Wood Products Association.

#### 1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.

3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

### PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

- B. Wood Structural Panels:

1. Plywood: DOC PS 1.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
3. Comply with "Code Plus" provisions in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial."
4. Factory mark panels according to indicated standard.

#### 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWA C2 (lumber) and AWWA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWWA C31 with inorganic boron (SBX).

1. Provide one of the following borate (SBX) preservative products with a retention level of .42 pcf DOT, or equal:
  - a. Frame Guard by Arch Wood Protection, Inc.
  - b. Advance Guard Borate PTW by Osmose.
2. The use of CCA preservative treated wood is prohibited.

- B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material
- C. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, sheathing, 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 (460 mm) above grade.
  - 4. Wood floor plates that are installed over concrete slabs directly in contact with earth.

### 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWWA C20 (lumber) and AWWA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
  - 2. Use treatment that does not promote corrosion of metal fasteners.
  - 3. Use Exterior type for exterior locations and where indicated.
  - 4. Use Interior Type A High Temperature (HT), unless otherwise indicated.

### 2.4 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Cants.
  - 3. Nailers.
  - 4. Grounds.
- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:
  - 1. Mixed southern pine; SPIB.
  - 2. Eastern softwoods; NELMA.
  - 3. Northern species; NLGA.
  - 4. Western woods; WCLIB or WWPA.

C. For concealed boards, provide fire-treated lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Eastern softwoods, No. 2 Common grade; NELMA.
3. Northern species, No. 2 Common grade; NLGA.
4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

## 2.5 PANEL PRODUCTS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch (12.7 mm) thick.
- B. Plywood Roof Sheathing: Exposure 1, Structural I sheathing; span rating to suit framing in each location and in thickness indicated.
- C. Plywood Wall Sheathing: Exposure 1, Structural I sheathing; span rating to suit framing in each location and in thickness indicated.
- D. Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch (13 mm).
1. Provide preservative-treated panels for exterior locations unless indicated.

## 2.6 ACCESSORY MATERIALS

- A. Weather Resistant Barrier: Asphalt-saturated organic felt, ASTM D 226, Type 1 (No. 15 asphalt felt), unperforated.
- B. Termite Shield: Stainless steel flashing 26 gage, mill finish, shaped to configuration indicated.

## 2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).

- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- 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 assemblies 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 and inspecting agency.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

## 2.8 TAPES AND ADHESIVES

- A. 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 manufacturers of both adhesives and panels.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Apply field treatment complying with AWWA M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- E. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.
- F. Use fasteners of appropriate type and length. Pre-drill members when necessary to avoid splitting wood.

### 3.2 PANEL PRODUCT INSTALLATION

- A. Wood Structural Panels: Comply with applicable recommendations contained in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Miscellaneous Concealed Plywood Panels: Nail to wood supports.

2. Plywood Backing Panels: Nail to wood supports
3. Roof and Wall Sheathing: Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels. Space panels 1/8 inch (3 mm) apart at edges and ends.

### 3.3 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION

## **SECTION 06401 - EXTERIOR ARCHITECTURAL WOODWORK**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Exterior wood shutters

#### **1.2 SUBMITTALS**

- A. Product Data: For each type of product and process specified and incorporated into items of exterior architectural woodwork during fabrication, finishing, and installation.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  - 1. Show details full size.
  - 2. Show locations and sizes of blocking and nailers, including concealed blocking and reinforcement specified in other Sections.
- C. Qualification Data: For firms and persons specified in "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.

#### **1.3 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of exterior architectural woodwork, construction, finishes, and other requirements.

#### **1.4 PROJECT CONDITIONS**

- A. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

## 1.5 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, reinforcements, and other related units of Work specified in other Sections to ensure that exterior architectural woodwork can be supported and installed as indicated.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of exterior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:
- B. Wood for Shutters: Western Red Cedar.

### 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Nonpressure Process: Comply with AWPA N1 using the following preservative for woodwork items indicated to receive water-repellent preservative treatment:
  - 1. Water-Repellent Preservative: Formulation containing 3-iodo-2-propynyl butyl carbamate (IPBC) complying with AWPA P8 as its active ingredient.
  - 2. Water-Repellent Preservative/Insecticide: Formulation containing 3-iodo-2-propynyl butyl carbamate (IPBC) as its active ingredient, combined with an insecticide containing chlorpyrifos as its active ingredient, both complying with AWPA P8.
- B. Preservative Treatment by Pressure Process: Comply with AWPA C2 (lumber) and AWPA C9 (plywood) and the following for woodwork items indicated to receive pressure-preservative treatment. Mark each treated item with the quality mark requirements of an inspection agency approved by ALSC's Board of Review.
  - 1. Preservative Chemicals: Pressure-impregnate woodwork with preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.

2. Pressure-treat aboveground items with preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent.

- C. Extent of Treatment: Treat blocking and nailers by pressure process and treat shutters by nonpressure process.

## 2.3 INSTALLATION MATERIALS

- A. Blocking, Shims, and Nailers: Softwood or hardwood lumber, pressure-preservative treated, kiln-dried to less than 15 percent moisture content.
- B. Nails: Stainless steel.
- C. Screws: Stainless steel.
- D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts, unless otherwise indicated. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

## 2.4 FABRICATION, GENERAL

- A. Wood Moisture Content: 9 to 15 percent.
- B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
  1. Edges of Solid-Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.5 mm).
  2. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).
- C. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Shop-cut openings, to maximum extent possible, to receive hardware, 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 seal with a water-resistant coating suitable for exterior applications.

## 2.5 EXTERIOR WOOD SHUTTERS

- A. Quality Standard: Comply with AWI Section 1200.
- B. Grade: Custom.

- C. Wood Species: Refer to specifications in 2.1 above.
  - 1. Do not use plain-sawn lumber with exposed, flat surfaces more than 3 inches (75 mm) wide.
- D. Finishing: Prime paint in the shop with one coat of primer specified in Section 09910.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.
- 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 removal of packing and backpriming.

### 3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork true and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Preservative-Treated Wood: Where cut or drilled in field, treat cut ends and drilled holes according to AWPA M4.
- 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. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork.
- F. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail and screw holes with matching filler where exposed.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

- B. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION



## SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Plastic-laminate cabinets and casework.
  - 2. Plastic-laminate countertops.
  - 3. Interior wood trim and rails
  - 4. Wood window stools.

#### 1.2 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories, and finishing materials and processes.
  - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  - 1. Show details full size.
  - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
  - 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.
- C. Samples for Verification: For the following:
  - 1. Plastic-laminate-clad panel products, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
  - 2. Corner pieces as follows:
    - a. Cabinet front frame joints between stiles and rail, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
- D. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.

- 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 names and addresses, names and addresses of Contracting Officers and owners, and other information specified.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork.
- D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.
  - 1. Provide AWI Quality Certification Program certificate indicating that woodwork complies with requirements of grades specified.
- E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

## 1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Opaque Finish: Clear Pine or Poplar, Select Grade, no fingerjoints.
- C. Wood Products: Comply with the following:
  - 1. Recycled Content of Medium-Density Fiberboard and Particleboard: Provide products with an average recycled content so postconsumer recycled content plus preconsumer recycled content is not less than 10 percent.
  - 2. Hardboard: Tempered, S1S, Class 1 minimum 1/4 inch and conforming to PS 58-73.
  - 3. Particleboard: Minimum 48 lb. density, straw-based particleboard complying with requirements in ANSI A208.1, Grade M - 2, except for density.
  - 4. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde
  - 5. Softwood Plywood: DOC PS 1, Medium Density Overlay.
  - 6. Hardwood Plywood and Face Veneers: HPVA HP-1.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
    - a. Formica Corporation.
    - b. International Paper; Decorative Products Div.
    - c. Laminart.
    - d. Nevamar
    - e. Pioneer Plastics Corp.

- f. Westinghouse Electric Corp.; Specialty Products Div.
  - g. Wilsonart International; Div. of Premark International, Inc.
- E. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- F. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - 1. Wood Glues: 30 g/L.
  - 2. Contact Adhesive: 250 g/L.
- G. Adhesive for Bonding Plastic Laminate: Resorcinol.

## 2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where indicated, use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified.
  - 1. Do not use treated material that does not comply with requirements of referenced woodworking standard or that is warped, discolored, or otherwise defective.
  - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with AWPA C20 (lumber) and AWPA C27 (plywood), for woodwork items indicated as fire-retardant treated. Use the following treatment type:
  - 1. Interior Type A: Low-hygroscopic formulation.
  - 2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
  - 3. Kiln-dry material before and after treatment to levels required for untreated material.
- C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread rating of 25 or less and smoke-developed rating of 25 or less per ASTM E 84.
  - 1. For panels 3/4 inch (19 mm) thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: density, 45-lb/cu. ft (720-kg/cu. m); modulus of rupture, 1600 psi (11 MPa); modulus of elasticity, 300,000 psi (2000 MPa); internal bond, 80 psi (550 kPa); and screw-holding capacity on face and edge, 250 lbf (1100 N) and 225 lbf (1000 N), respectively.
  - 2. For panels 13/16 to 1-1/4 inches (20 to 32 mm) thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: density, 44-lb/cu. ft (705-kg/cu. m);

modulus of rupture, 1300 psi (9 MPa); modulus of elasticity, 250,000 psi (1700 MPa); linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 lbf (1100 N) and 175 lbf (780 N), respectively.

3. Product: Subject to compliance with requirements, provide "Duraflake FR" by Willamette Industries, Inc.

- D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread rating of 25 or less and smoke-developed rating of 200 or less per ASTM E 84.

1. Product: Subject to compliance with requirements, provide "Medite FR" by SierraPine Ltd; Medite Div.

### 2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."

- B. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

- C. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

- D. Bumpers: Clear pressure sensitive non-skid vinyl bumpers 1/2 inch diameter by 5/32 inches thick; Grass #GF-BP-C, or equivalent.

- E. Frameless Concealed Hinges (European Type): 180 degrees of opening, self-closing, three-way adjustable; Grass #GF-1200VX-8, or equivalent.

- F. Wraparound Hinges: 2-3/4-inch (70-mm), 5-knuckle heavy-duty institutional type wraparound steel hinges made from 0.095-inch- (2.4-mm-) thick metal, with tight pin, and as follows:

1. Semiconcealed Hinges for Flush Overlay Doors: IH-848 Rockford, or equivalent.

- G. Catches: Magnetic catches, 5 lb. holding power; Ives 324-P69, or equivalent. Provide 1 top mounted at each door.

- H. Wire Pulls: Back mounted, 4 inches (100 mm) long, 5/16 inches (8 mm) in diameter

- I. Drawer Slides: 3/4 extension type, constructed from zinc plated cold-rolled steel, with ball-bearing rollers, 75 lbf (330 N) load rated; Accuride 214 Series, or equivalent.

- J. Adjustable Shelf Supports: Peg type, steel, 5/16" stem length, 1/4" bore, spoon width 25/64"; Progressive IF-739NP, or equivalent.
- K. Locks: Door locks - NL-C8173-26D; drawer locks - NL-C8178-26D; strike - NL-C2004-14A; National Cabinet Lock, or equivalent. Keyed as requested by Contracting Officer.
- L. Levelers: Plastic leveling system, including socket, leveler, toe kick clip, and toe kick handle; Camar model CM-835-E1-00, CM-345-10-P2, CM-202-V1-T2, and CM-230-01-DE, or equivalent.

## 2.4 INSTALLATION MATERIALS

- A. Anchors: Select material, type, size, and finish required for 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 sleeves for drilled-in-place anchors

## 2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide grade of interior woodwork complying with the referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- D. 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 and Rails: 1/16 inch (1.5 mm)
- E. Complete fabrication, including assembly, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- F. Shop 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. Sand edges of cutouts to remove splinters and burrs.
  - 1. Seal edges of openings in countertops with a coat of varnish.

## 2.6 WOOD STANDING AND RUNNING TRIM AND RAILS AND WINDOW STOOLS

- A. Quality Standard: Comply with AWI Section 300.
- B. Grade: Custom, for opaque finish items.
- C. Wood Species and Cut: Refer to 2.1 above.
- D. For trim items wider than available lumber, use veneered construction. Do not glue for width.
- E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work
- F. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- G. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

## 2.7 PLASTIC-LAMINATE CABINETS AND CASEWORK

- A. Quality Standard: Comply with AWI Section 1600 requirements for modular laminate cabinets.
- B. Grade: Custom
- C. AWI Type of Cabinet Construction: Flush overlay.
- D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
  - 1. Horizontal Surfaces Other Than Tops: HGS.
  - 2. Postformed Surfaces: HGP.
  - 3. Vertical Surfaces: HGS.
  - 4. Edges: HGS
- E. Materials for Semiexposed Surfaces Other Than Drawer Bodies:
  - 1. Drawer Sides and Backs: Thermoset decorative overlay.
  - 2. Drawer Bottoms: Thermoset decorative overlay.
- F. Colors, Patterns, and Finishes: As indicated on drawings, or if not indicated, as selected by Contracting Officer.
- G. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

## 2.8 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure decorative laminate countertops.
- B. Grade: Premium.
- C. High-Pressure Decorative Laminate Grade: HGS; use HGP for postformed countertops.
- D. Colors, Patterns, and Finishes: As indicated on drawings, or if not indicated, as selected by Contracting Officer.
- E. Edge Treatment: Same as laminate cladding on horizontal surfaces. Provide postformed edges as indicated.
- F. Core Material: Particleboard or medium-density fiberboard.
- G. Core Material at Sinks: Particleboard made with exterior glue, or medium-density fiberboard made with exterior glue
- H. Provide backsplashes and endsplashes of 4" height unless otherwise indicated

## 2.9 SHOP FINISHING

- A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.
  - 1. Grade: Provide finishes of same grades as items to be finished.
- B. General: Shop prime and backprime all items of opaque finished architectural woodwork at fabrication shop before shipment to site; comply with requirements of Section 09900 for preparation and priming of wood.
- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
  - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.
  - 2. Sheen: Satin.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.

- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

### 3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- D. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with recommendations of chemical treatment manufacturer, including those for adhesives used to install woodwork.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Wood Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches (900 mm) long, except where shorter single-length pieces are necessary.
  - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.
  - 2. Install trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).
- G. Cabinets: Install without distortion so 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 installation of hardware and accessory items as indicated.
  - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  - 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- H. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c.
3. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

- I. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in shop..

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; 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 shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

## SECTION 07210 - BUILDING INSULATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Foundation wall insulation
  - 2. Concealed building insulation
- B. Related Sections include the following:
  - 1. Division 3 Section "Cast In-Place Concrete" for underslab insulation.
  - 2. Division 9 Section "Gypsum Board Assemblies" for installation in wood-framed assemblies of insulation specified by reference to this Section.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.
- C. Research/Evaluation Reports: For foam-plastic insulation.

#### 1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: ASTM E 84.
  - 2. Fire-Resistance Ratings: ASTM E 119.
  - 3. Combustion Characteristics: ASTM E 136.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Extruded-Polystyrene Board Insulation:
  - a. Dow Chemical Company.
  - b. Owens Corning.
  - c. Tenneco Building Products.
2. Glass-Fiber Insulation:
  - a. CertainTeed Corporation.
  - b. Johns Manville Corporation.
  - c. Knauf Fiber Glass.
  - d. Owens Corning.

### 2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:

1. Type IV, 1.60 lb/cu. ft. (26 kg/cu. m).
2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively.
3. Thermal Resistivity (R-value): 5.0 deg F x h x sq. ft./Btu, at 75 deg F (.88 K x m/W at 24 deg C), per 1-inch (25-mm).
4. Thickness: As indicated on drawings.
5. Application: Provide for below-grade locations.

- C. Unfaced Mineral-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from glass; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics; formaldehyde-free formulation.
  - 1. Thermal Resistivity (R-value)
    - a. 3-1/2-inch - R-13
    - b. 6-1/2-inch - R-19
  - 2. Thickness: As indicated on drawings.
  - 3. Application: Provide for concealed building insulation in exterior walls, ceiling/roof spaces and other locations as indicated.

## 2.3 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

### 3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

#### 3.4 INSTALLATION OF PERIMETER INSULATION

- A. Install perimeter insulation on vertical surfaces by setting units in adhesive.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line

#### 3.5 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
  - 1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
  - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
  - 4. Install rigid eave vents between roof framing members on top of blocking in insulated attic spaces at vented eaves.
- C. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320 and as follows:
  - 1. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members. Apply poly vapor retarder over kraft faced insulation.
- D. Stuff glass-fiber insulation into miscellaneous voids and cavity spaces where shown and to fill voids in the building envelope. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

#### 3.6 PROTECTION

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION



## **SECTION 07260 - VAPOR RETARDERS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Vapor retarder for under slabs-on-grade.
  - 2. Vapor retarder for exterior wall and ceiling locations.

#### **1.2 SUBMITTALS**

- A. Product Data for each type of vapor retarder specified.
- B. Samples for verification of each type of vapor retarder, minimum 8 by 11 inches.

#### **1.3 QUALITY ASSURANCE**

- A. Single-Source Responsibility for Vapor Retarder Products: Obtain each type of vapor retarder from a single source with resources to provide products complying with requirements indicated without delaying the Work.
- B. Fire-Test-Response Characteristics: Provide materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: ASTM E 84.
  - 2. Combustion Characteristics: ASTM E 136.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Protect vapor retarder materials from physical damage and from deterioration by soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

### **PART 2 - PRODUCTS**

#### **2.1 VAPOR RETARDER MATERIALS**

- A. General: Provide vapor retarder that comply with requirements and with referenced standards.

## 2.2 VAPOR RETARDER FOR CEILINGS

- A. Fire-Retardant, Reinforced-Polyethylene Vapor Retarders: Two (2) outer layers of fire retardant polyethylene film laminated to an inner reinforcing layer consisting of either a nonwoven grid of nylon cord or polyester scrim and weighing not less than 20 lb/1000 sq. ft., with maximum permeance rating of 0.13 perm and flame-spread and smoke-developed indices of not more than 25 and 75, respectively.
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. DURA-SKRIM 2FR; Raven Industries, Inc.
    - b. Griffolyn T-55 FR; Griffolyn, Division of Reef Industries, Inc.
    - c. Or equivalent.

## 2.3 VAPOR RETARDER FOR WALLS

- A. Foil-Polyester-Film Vapor Retarders: 2 layers of 0.5-mil- (0.013-mm-) thick polyester film laminated to an inner layer of 1-mil- (0.025-mm-) thick aluminum foil, with maximum water-vapor transmission rate in flat condition of 0.0 g/h x sq. m and with maximum flame-spread and smoke-developed indexes of 5.
  - 1. Product: Subject to compliance with requirements, provide "Zero Perm" by Alumiseal Corporation

## 2.4 VAPOR RETARDER FOR UNDER SLAB

- A. Provide vapor retarder cover over prepared base material where indicated below slabs on grade.
- B. Plastic Vapor Retarder: ASTM E 1745, Class A and complying with the following:
  - 1. Tensile strength MD: Minimum 67 lb/in
  - 2. Puncture ASTM D1709, Method B: Minimum 2440 grams.
  - 3. Permeance: 0.03; ASTM E 96.
- C. Subject to compliance with requirements, provide one of the following:
  - 1. Fortifiber Corporation; Moistop Ultra "A".
  - 2. Raven Industries Inc.; Vapor Block 15.
  - 3. Reef Industries, Inc.; Griffolyn Type- 105.
  - 4. Stego Industries, LLC; Stego Wrap, 15 mils

## 2.5 AUXILIARY MATERIALS

- A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.
  - 1. Provide self-adhering flashing and seam tape in 1-1/2" width to seal all penetrations in Zero Perm vapor barrier; Vycor.by WR Grace or equal.

- B. Mechanical Fasteners: Wire supporting units of type recommended by vapor-retarder manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of the vapor retarder are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of substances harmful to vapor retarder, including removing projections capable of puncturing vapor retarders.

### 3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

### 3.4 INSTALLATION OF VAPOR RETARDERS IN WALLS AND CEILINGS

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Install vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
- C. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs or 16 inches . 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.
- D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.
- E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
- F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

### 3.5 UNDER SLAB VAPOR RETARDER INSTALLATION

- A. Following leveling and tamping of the subbase, place vapor retarder sheeting below the slab.

- B. Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape by splicing and extending vapor retarder to top of concrete floor slab.
- D. Lap joints 6 inches and seal with pressure-sensitive tape.

### 3.6 PROTECTION

- A. General: Protect installed vapor retarder from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION

## **SECTION 07411 - METAL ROOF PANELS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A. This Section includes the following:

1. Factory-formed and field-assembled, standing-seam metal roof panels.
2. High temperature underlayment
3. Metal roof panel accessories including closures, fasteners and clips, fascia, sills, corners, flashings, and other components of roof panel system.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

#### **1.2 PERFORMANCE REQUIREMENTS**

A. General: Provide metal panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

B. Thermal Movements: Provide metal panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on 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.

#### **1.3 SUBMITTALS**

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
1. Metal Panels: 12 inches (300 mm) long by actual panel width. Include fasteners, clips, closures, and other metal panel accessories.
  2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
- E. Qualification Data: For Installer.
- F. Maintenance Data: For metal panels to include in maintenance manuals.
- G. Warranties: Special warranties specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of metal panels through one source from a single manufacturer.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal panels from exposure to sunlight and high humidity, except to extent necessary for period of metal panel installation.

#### 1.6 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of framing dimensions by field measurements before metal panel fabrication and indicate measurements on Shop Drawings.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel assemblies that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Structural failures, including rupturing, cracking, or puncturing.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
  2. Surface: Smooth, flat finish
- B. Exposed Panel Finishes:
1. High-Performance Organic Finish (2--Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer, and fluoropolymer color topcoat, containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
    - a. Color and Gloss: As selected by Contracting Officer.

## 2.2 MISCELLANEOUS MATERIALS

### A. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape ½ inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

### B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating.

1. Fasteners for Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM or neoprene sealing washer.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

## 2.3 STANDING-SEAM METAL ROOF PANELS

### A. General: Provide factory-formed metal roof panels designed to be field assembled by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight and watertight installation.

### B. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

### C. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Basis-of-Design Product: FieldLok Panel by ATAS International, Inc., or an approved equivalent product of one of the following:
  - a. AEP-Span.
  - b. MBCI
  - c. CENTRIA Architectural Systems.
  - d. Merchant & Evans, Inc.
2. Material: Zinc-coated steel sheet, 22-gage thick.
  - a. Exterior Finish: Fluoropolymer, 2-coat.
3. Joint Type: Mechanically seamed, double locked.
4. Panel Coverage: 312 mm (12-1/2").

5. Plank Ribs: Manufacturer's standard.
6. Panel Height: 37 mm (1-1/2") standing seam.

## 2.4 ACCESSORIES

- A. Panel Accessories: Provide components required for a complete metal roof panel assembly including trim, fascae, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels, unless otherwise indicated.
  1. Closures: At eaves and rakes, fabricated of same metal as metal roof panels.
  2. Backing Plates: At panel end splices, fabricated from material recommended by manufacturer.
  3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch (25 mm) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Formed from 0.0179-inch (0.45 mm) thick, zinc-coated (galvanized) steel sheet prepainted with coil coating to match roofing.

## 2.5 UNDERLAYMENT

- A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils (0.76 to 1.0 mm) thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
  1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
  2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
  3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Carlisle Coatings & Waterproofing Inc., Div. of Carlisle Companies Inc.; CCW WIP 300HT.
    - b. Grace Construction Products; a unit of Grace, W. R. & Co.; Ultra.
    - c. Henry Company; Blueskin PE200 HT.
    - d. Metal-Fab Manufacturing, LLC; MetShield.
    - e. Owens Corning; WeatherLock Metal High Temperature Underlayment

## 2.6 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

- B. Where indicated, fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.
- C. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
  - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  - 2. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
  - 3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  - 4. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal panel manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application but not less than thickness of metal being secured.

## 2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half 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 are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of work.
- B. Examine primary and secondary framing to verify that structural panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
  - 1. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before metal panel installation

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous panel support members and anchorage according to metal panel manufacturer's written recommendations.

### 3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof sheathing under metal roof panels. Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6-inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within fourteen (14) days. Apply underlayment perpendicular to the roof slope for entire roof area.
- B. Cover entire roof area with building paper slip sheet, unless otherwise recommended by manufacturer.
- C. Install flashings to cover underlayment to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim".

### 3.4 METAL PANEL INSTALLATION, GENERAL

- A. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 2. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  - 3. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal panel manufacturer.
- C. Joint Sealers: Install sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal panel manufacturer.
  - 1. Seal side joints where recommended by metal panel manufacturer.

- D. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

### 3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

## **SECTION 07620 - SHEET METAL FLASHING AND TRIM**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes sheet metal flashing and trim in the following categories:
  - 1. Exposed trim.
  - 2. Metal flashing.
  - 3. Reglets.
  - 4. Gutters and downspouts.

#### **1.2 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.

#### **1.3 SUBMITTALS**

- A. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.
- B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
  - 1. Identify material, thickness, weight, and finish for each item and location in Project.
  - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  - 3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work..
- C. 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.
- D. 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.

#### 1.4 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.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

#### 1.6 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

### 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. Aluminum Sheet: ASTM B 209, Alclad 3003-H14, with a minimum thickness as indicated in fabricated.
  - 2. Extruded Aluminum: ASTM B 221, alloy 6063-T52, with a minimum thickness of 0.080 inch for primary legs of extrusions, unless otherwise indicated.

#### 2.2 MANUFACTURED PRODUCTS

- A. General: Provide items designed and fabricated to fit applications indicated and to perform optimally with respect to weather resistance, water tightness, durability, strength, and uniform appearance.
- B. Expansion Provisions: Fabricate running lengths to allow controlled expansion not only for movement of metal components in relationship to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner sufficient to prevent water leakage, deformation or damage..
- C. Hanging Gutters: Provide gutters complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 10-foot- long sections. Furnish gutter bar hangers fabricated from

same metal as gutters. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.

1. Metal Material: Aluminum.
2. Metal Thickness: 0.032"
3. Size: 6" diameter.
4. Design/Profile: As indicated on drawings
5. Finish: Manufacturer's painted finish in brown.

D. Downspouts: Fabricate round downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Metal Material: Aluminum.
2. Metal Thickness: 0.024"
3. Size: 4" diameter.
4. Finish: Manufacturer's painted finish in brown.

E. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.

1. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
2. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
3. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
4. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.
5. Material: Fabricate reglets from the following metal in thickness indicated:
  - a. Aluminum, 0.024 inch (0.6 mm) thick.
6. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Fry Reglet Corporation.
  - b. Hickman: W.P. Hickman Co.
  - c. Keystone Flashing Company.
  - d. MM Systems.

### 2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. 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.
- B. 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.
- C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

- D. 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."
- E. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.
- F. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.
- G. Slip Sheet: 5-lb. rosin-sized building paper or Tyvek by DuPont.
- H. 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.
- I. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based..

#### 2.4 FABRICATION, GENERAL

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- C. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches (600 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 (25.4 mm) deep, filled with mastic sealant (concealed within joints.)
- D. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- E. 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.
- F. Conceal fasteners and expansion provisions unless noted otherwise. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.
- G. 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. Exposed Trim: Fabricate from the following material:
  1. Aluminum: 0.050 inch (1.27 mm) thick.
- C. Drip Edge, Base Flashing, Valley Flashing, Step Flashing: Fabricate from the following material:
  1. Aluminum: 0.024 inch (0.61 mm) thick.
- D. Counterflashing, Flashing Receivers: Fabricate from the following material:
  1. Aluminum: 0.0320 inch (0.813 mm) thick.

## 2.6 ALUMINUM FINISHES

- A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.
- B. High-Performance Organic 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 manufacturers' written instructions.
  1. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
  2. Color: Brown.

## 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 "Architectural 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 with no joints allowed within 24 inches 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 deep, filled with mastic sealant (concealed within joints).
- E. 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.
- F. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- G. 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.
  - 1. 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.
  - 2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.
- H. 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."
- I. 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.

### 3.3 MANUFACTURED PRODUCTS

- A. General: Comply with manufacturer's written installation instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive work of this Section, with vapor retarders, roof insulation, roofing membrane, flashing, and wall construction; as required to

ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor products included in this Section securely to structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

#### 3.4 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



## **SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
  - 1. Ceilings.
  - 2. Walls and partitions.
  - 3. Construction enclosing compartmentalized areas.
  
- B. Related Sections include the following:
  - 1. Division 3 Section "Cast-in-Place Concrete" for construction of openings in concrete slabs and walls.
  - 2. Division 15 Sections specifying duct and piping penetrations.
  - 3. Division 16 Sections specifying cable and conduit penetrations.
  
- C. Locations of rated walls, roof and floors are indicated on the Drawings.

#### **1.2 DEFINITIONS**

- A. Firestopping: The use of a material or combination of materials in a fire-rated wall or floor where it has been breached, so as to restore the integrity of the fire rated assembly.
  
- B. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction assembly and a specific penetrant(s) or gap condition, constitutes a system.
  
- C. Barrier: A wall or floor assembly that has an hourly fire or smoke rating.
  
- D. Through-Penetration: Any penetration of a fire-rated or smoke rated wall or floor that completely breaches the barrier.
  
- E. Membrane-Penetration: Any penetration of a fire-rated or smoke rated wall or floor that breaches only one side of the barrier.
  
- F. Construction Gaps: Any gap, joint, or opening, weather static or dynamic, where the top of a wall may meet a floor; wall to wall applications; edge to edge floor configurations; floor to exterior wall; or any linear breach in a rated barrier.

#### **1.3 PERFORMANCE REQUIREMENTS**

- A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
  - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
  - 2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
  - 3. Fire-resistance-rated ceiling assemblies.
- B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
- C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
  - 1. Penetrations located outside wall cavities.
  - 2. Penetrations located outside fire-resistive shaft enclosures.
  - 3. Penetrations located in construction containing fire-protection-rated openings.
  - 4. Penetrating items larger than 4-inch- (100-mm-) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.
- D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
  - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
  - 2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
  - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- E. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of through-penetration firestop system product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
- C. Firestopping Submittal Form attached at the end of this section, indicating the U.L. design test for each condition that exists.
  1. Attach UL test reports or test reports from a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on the condition indicated for each penetrant and condition.
- D. Qualification Data: For firms and persons specified in "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.
- E. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.
- F. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed through-penetration firestop systems similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:
  1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL.
  2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:
    - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
    - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the UL in "Fire Resistance Directory."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date

of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

## 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

## 1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Schedule firestopping after installation of roofing and the building is enclosed.
- D. Complete firestopping prior to finishing of gypsum drywall.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application in the Through-Penetration Firestop System Schedule at the end of Part 3.
  - 1. Through-Penetration Firestop Systems specified in the Schedule in Part - 3 include:
    - a. Fire Barrier Products, 3M Fire Protection Products
    - b. International Protective Coatings Corp.
  - 2. Subject to compliance with specified requirements, provide Through-Penetration Firestop Systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory (BXRH), by one of the following:
    - a. Fire Barrier Products, 3M Fire Protection Products
    - b. International Protective Coatings Corp.

- c. Hilti Firestop Systems
- d. Bio Fireshield, The RectorSeal Corporation.
- e. SpecSeal Products, Specified Technologies, Inc.

## 2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
  - 1. Permanent forming/damming/backing materials, including the following:
    - a. Slag-/rock-wool-fiber insulation.
    - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    - c. Fire-rated form board.
    - d. Fillers for sealants.
  - 2. Temporary forming materials.
  - 3. Substrate primers.
  - 4. Collars.
  - 5. Steel sleeves.

## 2.3 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

- F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- I. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
  - 1. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
  - 2. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

## 2.4 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
  2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
  3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

### 3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article, Through-Penetration Firestop Systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory (BXRH), and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

### 3.5 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

### 3.6 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. Where alpha-alpha-numeric designations are indicated, provide system described in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Schedule of construction components, type of penetrant, and U.L. Through-penetration Firestop Systems include, but are not limited to the following:

	P E N E T R A N T						
	Metal Conduit	Cable Tray <sup>4</sup>	Cables	Non-Insul. Metal Pipe	Insul. Pipe	FR Polypropylene Pipe	Insul. Metal Duct
<b>GWB Stud Wall, or Shaft Wall up to 2 Hr Rating</b>	W-L 1001	W-L 4004	W-L 3001	W-L 1001	W-L 5011	W-L 2002	see note 3
<b>CMU Wall up to 2 Hr Rating</b>	C-AJ 1044	C-AJ 4003	C-AJ 3030	C-AJ 1044	C-AJ 5001	CAJ 2001	CAJ 7003 <sup>3,7</sup> 016 <sup>3</sup>

	P E N E T R A N T						
	Metal Conduit	Cable Tray <sup>4</sup>	Cables	Non-Insul. Metal Pipe	Insul. Pipe	FR Polypropylene Pipe	Insul. Metal Duct
<b>Concrete Floor / Metal Deck 1 Hr Rated F and T-Rating<sup>2</sup></b>	C-AJ 1008	N/A	C-AJ 3029	C-AJ 1008	C-AJ 5002	F-A 2002	CAJ 7009 <sup>5</sup>
<b>Concrete Floor / Metal Deck 2 Hr Rated F and T-Rating<sup>2</sup></b>	C-AJ 1008	N/A	C-AJ 3029	C-AJ 1008	C-AJ 5060	F-A 2002	N/A
<b>Concrete Floor / Metal Deck up to 2 Hr F Rated<sup>1</sup></b>	F-A 1002	N/A	C-AJ 3030	C-AJ 1044	C-AJ 5001	F-A 2002	N/A

KEY TO NOTES

1. Penetration within wall cavity.
2. Penetration that does not fall within wall cavity, T-Rating required.
3. Up to 1 hour rating, submit engineered judgement firestopping system for this combination of penetrant, wall/floor assembly, and fire rating. Install fire dampers in 2-hour walls in accordance with manufacturer's instructions and testing agency requirements.
4. Where cable tray extends through wall.
5. For floor penetrations not enclosed above and below the floor with shaft wall.

C. Membrane Penetrations:

1. Firestop membrane penetrations by cables, pipes and conduit similar to through wall penetrations.
2. Provide putty pad box wrap firestopping for membrane penetrations in rated walls for electrical back boxes over 16 sq. inches, where any back boxes are located within 24 inches horizontal of another back box, or when total area of back boxes exceeds 100 sq. in. in 100 sq. ft. of wall area.

- D. Where another type of construction or penetrant is encountered, or if field conditions vary from those described in the U.L. System listed (i.e. annular space is greater/smaller, insulation type varies, etc.), provide firestopping systems which are appropriate, and U.L. tested, for that condition.

END OF SECTION

FIRESTOPPING SUBMITTAL FORM ATTACHED

# FIRESTOPPING SUBMITTAL FORM

A. **THROUGH WALL PENETRANT FIRESTOPPING:** Fill in the U.L. Design number and attach copy of U.L. test. Insert N/A if condition is not applicable. **Indicate penetrant size limitations for each condition,** copy and submit 2 tables for differing penetrant sizes.

	P E N E T R A N T						
	Metal Conduit	Cable Tray	Cables	Non- Insul. Metal Pipe	Insul. Pipe	FR Polypro- pylene Pipe	Insul. Metal Duct
<b>GWB/Stud Wall up to 2 Hr Rating</b>	Max. Size:	Max. Size:	Max. Size & Quantity:	Max. Size:	Max. Size:	Max. Size:	Max. Size:
<b>CMU Wall up to 2 Hr Rating</b>	Max. Size:	Max. Size:	Max. Size & Quantity:	Max. Size:	Max. Size:	Max. Size:	Max. Size:
<b>Concrete Floor 1 Hr Rated T-Rating</b>	Max. Size:	N/A	Max. Size & Quantity:	Max. Size:	Max. Size:	Max. Size:	Max. Size:
<b>Concrete Floor 2 Hr Rated T-Rating</b>	Max. Size:	N/A	Max. Size & Quantity:	Max. Size:	Max. Size:	Max. Size:	N/A
<b>Concrete Floor up to 2 Hr Rated</b>	Max. Size:	N/A	Max. Size & Quantity:	Max. Size:	Max. Size:	Max. Size:	N/A
	Max. Size:	Max. Size:	Max. Size & Quantity:	Max. Size:	Max. Size:	Max. Size:	Max. Size:

B. **OTHER:** Where another type of construction or penetrant is encountered, attach a separate sheet listing each condition and attach copy of the U.L. Test.



## SECTION 07920 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes joint sealants for the following locations:
1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
    - a. Control and expansion joints in cast-in-place concrete
    - b. Joints in stucco wall system.
    - c. Perimeter joints between materials listed above and frames of doors and windows.
    - d. Joints between different materials listed above
    - e. Control and expansion joints in ceiling and overhead surfaces.
    - f. Other joints as indicated.
  2. Exterior joints in the following horizontal traffic surfaces:
    - a. Control, expansion, and isolation joints in cast-in-place concrete slabs
    - b. Other joints as indicated.
  3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
    - 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. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - e. Tile control and expansion joints.
    - f. Other joints as indicated.
  4. Interior joints in the following horizontal traffic surfaces:
    - a. Control and expansion joints in cast-in-place concrete slabs.
    - b. Control and expansion joints in tile flooring.
    - c. Other joints as indicated.
- B. Related Sections include the following:
1. Sealants used in glazing are specified in Division 8 "Glazing."
  2. Coordinate work of this section with all sections referencing it.

#### 1.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

### 1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
  - 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.
- B. 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.
- 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 Officers 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.
- H. Warranties: Special warranties specified in this Section.

### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an installer who has successfully completed at least three (3) joint sealer applications similar in type and size to that of this project within the last five (5) years. All workers used for work of this Section shall be experienced in the techniques of sealant application and shall be completely familiar with the published recommendations of the manufacturer of the joint sealant materials being used.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

### 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 or below 40 deg F (4 deg C).
  - 2. 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.

#### 1.7 COORDINATION

- A. Coordinate the work with all sections referencing this section.

#### 1.8 EXTRA MATERIALS

- A. Extra Materials: Furnished from same production run as sealants installed. Package materials with protective covering and identify with labels describing contents. Deliver extra materials to Contracting Officer.
  - 1. Furnish 2 cases of each color of sealant provided in the Work

#### 1.9 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

### 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. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
  - 1. Architectural Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors: Provide color of exposed joint sealants to comply with the following:
  - 1. Provide colors selected by Contracting Officer from industry available colors.
- D. Additional Movement Capability: Where additional movement capability is specified, 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.

## 2.2 LATEX JOINT SEALANT

- A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part, nonsag, mildew-resistant, paintable latex acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent.
  - 1. 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:
    - a. Chem-Calk 600; Bostik Inc.
    - b. AC-20; Pecora Corporation.
    - c. Tremflex 834; Tremco.
    - d. Sonolac; Sonneborn Building Products Div., ChemRex, Inc.
- B. Uses: General interior use, paintable..

## 2.3 MILDEW-RESISTANT SILICONE JOINT SEALANT

- A. Single-Component Mildew-Resistant Silicone Sealant: Manufacturer's standard, non-modified, one-part, silicone sealant; complying with ASTM C 920, Type S, Grade NS, Class 25, Uses NT, G, A, and, as applicable to non-porous joint substrates indicated, O. Formulate sealant with fungicide and specifically intended for sealing interior joints with nonporous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.
  - 1. Available Products: Subject to compliance with requirements, silicone joint sealants that may be incorporated in the Work include, but are not limited to, the following:

- a. 786 Mildew Resistant; Dow Corning.
- b. Sanitary 1700; GE Silicones.
- c. 898 Silicone Sanitary Sealant; Pecora Corporation.
- d. Tremsil 600 White; Tremco.

B. Uses: Interior use in wet locations, and all toilet and shower rooms.

#### 2.4 NONSAG URETHANE JOINT SEALANT

A. Multicomponent Nonsag Urethane Sealant: Manufacturer's standard, non-modified, multi-part, nonsag urethane sealant; complying with ASTM C 920, Type M, Grade NS, Class 25, Uses NT, M, G, A, and as applicable to joint substrates indicated, O.

1. Available Products: Subject to compliance with requirements, urethane joint sealants that may be incorporated in the Work include, but are not limited to, the following:

- a. Chem-Calk 2641; Bostik Inc.
- b. Dynatrol II, Pecora Corporation
- c. Sikaflex-2c NS, Sika Corporation
- d. DYmeric 511; Tremco.
- e. NP 2; Sonneborn Building Products Div., ChemRex Inc.

B. Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement.

C. Uses: General exterior use and interior use for exposed concrete or masonry wall control joints

#### 2.5 POURABLE URETHANE JOINT SEALANT

A. Multicomponent Pourable Urethane Sealant: Manufacturer's standard, non-modified, two-part, urethane sealant; complying with ASTM C 920, Type M, Grade P, Class 25, Uses T, M, A and, as applicable to joint substrates indicated, O.

1. Available Products: Subject to compliance with requirements, urethane joint sealants that may be incorporated in the Work include, but are not limited to, the following:

- a. Chem-Calk 550; Bostik Inc.
- b. NR-200 Urexpan, Pecora Corporation
- c. Sikaflex 2c SL, Sika Corporation
- d. SL 2; Sonneborn Building Products Div., ChemRex Inc.

B. Uses: Interior or exterior use for level pavement or slab joints.

#### 2.6 NONSAG URETHANE JOINT SEALANT

A. Multi-Part Non-Sag Urethane Sealant: Except as otherwise indicated, provide manufacturer's standard, non-modified, two-part, urethane sealant; complying with ASTM C 920, Type M, Grade NS, Class 25, Uses T, M, A and, as applicable to joint substrates indicated, O.

1. Available Products: Subject to compliance with requirements, urethane joint sealants that may be incorporated in the Work include, but are not limited to, the following:
  - a. Chem-Calk 2641; Bostik Inc.
  - b. Dynatred, Pecora Corporation
  - c. NP 2; Sonneborn Building Products Div., ChemRex Inc.

B. Uses: Interior or exterior use for pavement or slab joints where slope exceeds one percent.

## 2.7 ACOUSTICAL JOINT SEALANTS

- A. 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. Available Products: Subject to compliance with requirements, acoustical joint sealants that may be incorporated in the Work include, but are not limited to, the following:
    - a. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corporation.
    - b. SHEETROCK Acoustical Sealant; USG Corp., United States Gypsum Co.

B. Uses: Interior acoustically sealed joints exposed or exposed above ceilings.

## 2.8 ACOUSTICAL JOINT SEALANTS

- A. 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.
  1. Available Products: Subject to compliance with requirements, acoustical joint sealants that may be incorporated in the Work include, but are not limited to, the following:
    - a. BA-98; Pecora Corporation.
    - b. Tremco Acoustical Sealant; Tremco.

B. Uses: Concealed interior acoustically sealed joints at metal stud tracks.

## 2.9 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: Chemically stabilized acrylic.
  3. Density: Manufacturer's standard.
  4. Backing: None.

5. Available Products: Subject to compliance with requirements, preformed foam sealants that may be incorporated in the Work include, but are not limited to, the following:
  - a. "Emseal," Emseal Corp.
  - b. "Emseal Greyflex," Emseal Corp.
  - c. "Wil-Seal 150," Wil-Seal Construction Foams Div., Illbruck.
  - d. "Wil-Seal 250," Wil-Seal Construction Foams Div., Illbruck.

## 2.10 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, 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, nonoutgassing in unruptured state.
  2. Manufacturer: Provide Cera-Rod manufactured by W.R. Meadows, Inc., or equivalent.
- 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.

## 2.11 JOINT FILLERS FOR EXTERIOR CONCRETE SLABS

- A. General: Provide joint fillers of thickness and depth indicated, or if not indicated 1/2" thick by depth of joint.
- B. Bituminous Fiber Joint Filler: Provide preformed strips of with asphalt binder encased between two layers of saturated felt or glass-fiber felt, complying with ASTM D 1751.
  1. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint and seal with sealant.

## 2.12 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: Nonstaining, 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. 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.
  - 1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
    - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.
  - 2. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.
- F. 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

## **SECTION 08110 - STEEL DOORS AND FRAMES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A. This Section includes the following:

1. Steel doors.
2. Steel door frames.
3. Borrowed-light frames.

#### **1.2 SUBMITTALS**

- A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, and finishes for each type of steel door and frame specified.
- B. Shop Drawings: Show the following: elevations and details of doors; frame details including dimensioned profiles; details and locations of reinforcement and preparations for hardware; details of wall opening conditions; details of anchorages, accessories, joints, and connections; coordination of glazing frames and stops with glass and glazing requirements.
- C. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

#### **1.3 QUALITY ASSURANCE**

- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

### **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. Ceco Door Products; a United Dominion Company.
2. Curries Company.
3. Steelcraft; a division of Ingersoll-Rand.
4. Republic Builders Inc.

## 2.2 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- C. Galvannealed-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A4 (ZF120) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

## 2.3 DOORS

- A. General: Provide doors of sizes, thicknesses, and designs indicated.
- B. Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
  1. Provide Level 4 and Physical Performance Level A (Maximum Duty), 14ga., 0.067-inch- (1.7-mm-) thick faces, Model 2 (Seamless).
- C. Vision Lite Systems: Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.

## 2.4 STEEL FRAMES

- A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
- B. Level 3 frames of 16ga., 0.053-inch- (1.3-mm-) thick steel sheet for:
  1. Wood doors, unless otherwise indicated.
- C. Level 3 frames of 14ga., 0.067-inch- (1.7-mm-) thick steel sheet for:
  1. Wood doors at all leafs wider than 36-inches (914-mm), and all electrical rooms, storage rooms, machine rooms, mechanical rooms, and maintenance areas.
- D. Level 4 frames of 12ga., 0.093-inch- (2.3-mm-) thick steel sheet for:
  1. Level 4 steel doors.

- E. Jamb Anchors: Formed from not less than 0.0598-inch- ( 1.5-mm-) thick sheet steel (galvannealed steel where used with galvannealed steel frames), and in accordance with UL tests for fire-rated assemblies
- F. Floor Anchors: Formed from galvannealed sheet , not less than 0.0747-inch- (1.9-mm-) thick.
- G. Door Silencers: Except on weather-stripped and fire-rated frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames
- H. Plaster Guards: Formed from same material as frames, not less than 0.016-inch (0.4-mm) thick
- I. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.
- J. Rain Drips: Provide 12 ga., 0.108-inch- ( 2.8-mm-) thick galvannealed steel drip secured to frame with stainless steel fasteners and set in sealant, at exterior doors that are not covered by canopies.

## 2.5 FABRICATION

- A. General: : Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, 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
- B. Exterior Door and Frame Construction: Fabricate doors, panels, and frames from galvannealed-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 16ga., 0.053-inch- (1.3-mm-) thick, galvannealed-coated steel channels with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.
  - 1. Provide 14 gage (1.7mm) top and bottom channels on stile and rail doors.
- C. Interior Door Frames and Borrowed Lite Frames: Fabricate exposed faces of frames from the following material:
  - 1. Cold-rolled steel sheet.
- D. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:
  - 1. Exterior Doors: Polyurethane or polystyrene.
- E. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between pairs of doors. Not more than 3/4 inch (19 mm) at bottom.

- F. Single-Acting, Door-Edge Profile: Beveled square edge for doors with mortise lockset and beveled edge for non mortised locksets.
- G. Exposed Fasteners: Countersunk flat or oval heads for exposed screws and bolts.
- H. Thermal-Rated (Insulating) Assemblies: At exterior locations and other locations shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
  - 1. Unless otherwise indicated, provide thermal-rated assemblies with U-value of 0.10 Btu/sq. ft. x h x deg F (57 W/sq. m x K)] or better.
- I. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
- J. Frame Construction: Fabricate frames to shape shown.
  - 1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
  - 2. Knock-down frames are not permitted.
  - 3. Provide welded frames with temporary spreader bars..
- K. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- L. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- (0.8-mm-) thick steel sheet.
  - 1. Provide nonremovable stops on outside of exterior doors and on secure side of interior frames for glass, louvers, and other panels in doors and frames.
  - 2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

## 2.6 FINISHES

- A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Remove welded-in shipping spreaders installed at factory.

- B. Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- C. Steel Frames: Install standard steel frames for doors of size and profile indicated. Comply with SDI 105.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.
    - b. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreezing agents.
  - 2. Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
  - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 4 Section "Unit Masonry Assemblies."
  - 4. Concrete Walls: Solidly fill space between frames and concrete with grout. Install grout in lifts and take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
- D. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G..
- E. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.
- F. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

END OF SECTION



## **SECTION 08211 - FLUSH WOOD DOORS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A. This Section includes the following:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing doors with wood-veneer faces.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections include the following:

1. Division 8 Section "Steel Doors and Frames" for steel door frames.
2. Division 8 Section "Glazing" for glass vision panels in flush wood doors.

#### **1.2 SUBMITTALS**

A. Product Data: For each type of door. Include details of core and edge construction, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire ratings for fire doors.
6. Provide schedule of doors based on door schedule included in contract documents

C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:

1. Faces of Factory-Finished Doors: Show the full range of colors available for stained finishes.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.

3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

E. Product Certificates: Provide certificate of suitability from manufacturer of flush wood doors, signed by President or Chief Officer of company, stating that all flush wood doors provided for this Project are suitable for their intended use, and may be installed without limitation to warranty within the existing and designed environmental conditions of the Project's building."

### 1.3 QUALITY ASSURANCE

A. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated," including Section 1300 "Architectural Flush Doors", for grade of door, core construction, finish and other requirements, unless more stringent requirements are indicated in this Section.

B. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

D. All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, medium density fiberboard) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI)

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

1. Break seal on site to permit ventilation.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

### 1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

### 1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
  - a. Solid-Core Interior Doors: Life of installation.
- B. Contractor's Responsibilities: Replace doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Flush Wood Doors:
    - a. Algoma Hardwoods Inc.
    - b. Eggers Industries; Architectural Door Division.
    - c. Marshfield Door Systems, Inc. (Formerly Weyerhaeuser door division)
    - d. Oshkosh Architectural Door Co.

### 2.2 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Finish:
  1. Grade: Custom, with Grade A faces, and optional selections indicated below.
  2. Species and Cut: Red Oak, plain sliced, 1/50 inch minimum after sanding, with edge glued joints.
  3. Match between Veneer Leaves: Book match.
  4. Assembly of Veneer Leaves on Door Faces: Balance match.
  5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
  6. Stiles: Same species as faces.
- B. Facing Adhesive: Type I , waterproof.
  1. VOC Limits for Installation Adhesives and Glues: Use installation adhesives with max. VOC content of 30g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### 2.3 SOLID-CORE DOORS

- A. Interior Veneer-Faced Solid-Core Doors:
  1. Core: Particleboard: ANSI A208.1, Grade LD-2.
  2. Construction: Hot press five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering; PC-5 ME (Particleboard core, hot press 5-ply, vertical edges same species as face, lumber or veneer).
  3. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware, and as follows:
    - a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
    - b. 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.

- c. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
- d. Additional blocking required for installation of specified door hardware.

## 2.4 LOUVERS AND LIGHT FRAMES

- A. Wood Beads for Light Openings in Non-Rated Wood Doors: Manufacturer's standard shape, wood species same as door faces.

## 2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

- 1. Comply with clearance requirements of referenced quality standard for fitting.

- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

- 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

- C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

- 1. Light Openings: Trim openings with moldings of material and profile indicated

- D. Provide flush doors with minimum 1-3/8 inch edge stiles of wood species to match face veneer.

- E. Bond stiles and rails to cores. Sand bonded core prior to applying crossbanding and face veneers.

## 2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing.

- B. Finish doors for transparent finish at factory.

- C. Transparent Finish:

- 1. Grade: Custom, with two top coats.

- 2. Finish: Manufacturer's standard finish with performance comparable to AWI System TR-6 catalyzed polyurethane.

- 3. Staining: As selected by Contracting Officer from manufacturer's full range.

- 4. Effect: Semifilled finish.

- 5. Sheen: Satin.

- 6. Edge Finish: Match door finish for both edges, and top and bottom.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
  - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

### 3.3 ADJUSTING

- A. Rehang or replace doors that do not swing or operate freely.
- B. Replace doors damaged during installation, field re-finishing will not be permitted.

END OF SECTION



## SECTION 08311 - ACCESS DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes access doors for installation in the following locations:
  - 1. Wall access doors and frames.
  - 2. Ceiling access doors and frames.
- B. Locations and Quantities of Access Doors: Not all access doors are shown on the Drawings. It is the intent of this section that access doors be provided wherever access is required for operation and maintenance of concealed equipment, dampers, valves, controls or similar devices.
- C. Requirements relating to contractor responsibility for providing access doors is indicated in Division 1 "Summary of Work."
- D. Cylinders for access doors are specified in Division 8 Section "Door Hardware."

#### 1.2 SUBMITTALS

- A. Product Data: For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.
- B. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.

#### 1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.
- B. Size Variations: Obtain Contracting Officer's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

#### 1.4 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Basis-of-Design Products: The design for the access doors and frames is based on products as manufactured by Karp Associates, Inc. Subject to compliance with requirements, provide the named products, or approved equivalent products by one of the following:
1. J.L. Industries.
  2. Larsen's Manufacturing Co.
  3. Milcor, Inc.

## 2.2 MATERIALS

- A. Steel Sheet: ASTM A 366/A 366M commercial-quality, cold-rolled steel sheet with baked-on, rust-inhibitive primer.
- B. Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Electrolytic zinc-coated steel sheet with Class C coating and phosphate treatment to prepare surface for painting.
- C. Stainless-Steel Sheet: ASTM A 167, Type 304 with No. 4 finish according to ASTM A 480/A 480M.
- D. Drywall Beads: Edge trim formed from 22 ga., 0.0299-inch (0.76-mm) zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

## 2.3 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in 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. Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

## 2.4 ACCESS DOORS AND FRAMES

- A. Trimless, Flush Access Doors for Gypsum Board Surfaces: Units consisting of frame, concealed edge trim, door, hardware, and complying with the following requirements:
1. Frame: 16 ga., 0.0598-inch- (1.52-mm-) thick steel sheet.
  2. Door: 14 ga., 0.0747-inch- (1.90-mm-) thick steel sheet.
  3. Concealed, Gypsum Board Edge Trim: 0.0299-inch (0.76-mm) zinc-coated or galvanized-steel sheet with face flange formed to receive joint compound.
  4. Hinge: Concealed continuous piano type.
  5. Latches: Self-latching key-operated bolt type, with interior release; for locking see Fabrication Article below.

6. Provide Type 304 stainless steel of same thickness for access doors in toilet rooms, shower rooms, and other wet areas.
7. Application: Provide at non-rated gypsum board walls and ceilings.
8. Available Product: Model KDW, Flush Drywall Access Doors, Karp Associates, Inc.

B. Recessed Doors for Acoustical Ceiling Tiles: Units consisting of frame with no exposed trim, recessed door to receive tile, hardware, and complying with the following requirements:

1. Frame: 14 ga., 0.0747-inch- (1.90-mm-) thick steel sheet.
2. Door: 16 ga., 0.0598-inch- (1.52-mm-) thick steel sheet; recessed 1-inch (25.4 mm).
3. Hinge: Concealed, pivoting-rod type.
4. Latches: Self-latching key-operated bolt type, with interior release; for locking see Fabrication Article below.
5. Provide Type 304 stainless steel of same thickness for access doors in toilet rooms, shower rooms, and other wet areas.
6. Application: Provide at non-rated acoustical ceilings tiles.
7. Available Product: Model DSC-210, Recessed Acoustical Ceiling Tile Access Doors, Karp Associates, Inc.

## 2.5 FABRICATION

A. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Exposed Flanges: As indicated.
2. For trimless frames with drywall bead for installation in gypsum board assembly, provide edge trim for gypsum board securely attached to perimeter of frames.
3. For trimless frames with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
4. Provide mounting holes in frames to attach frames to metal or wood framing in plaster and drywall construction and to attach masonry anchors in masonry construction. Furnish adjustable metal masonry anchors.

C. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

D. Locking Devices: Furnish one flush mortised prepped, key-operated cylinder lock without cylinder/core per door. Cylinders for access doors are provided under work of Division 8 Section "Door Hardware."

## 2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Apply primers finishes to access doors and frames after fabrication.

## 2.7 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply 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 to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).
- B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
- C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

## 2.8 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Bright, Directional Polish: No. 4 finish.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames .
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install access doors, with trimless frames, flush with adjacent finish surfaces or recessed to receive finish material.

### 3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION



## SECTION 08550 - WOOD WINDOWS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following vinyl-clad wood window product types:
  - 1. Fixed windows with the appearance of double-hung windows.
- B. Related Sections include the following:
  - 1. Division 8 Section "Glazing" for glazing requirements for wood windows, including those specified to be factory glazed
  - 2. Division 9 Section "Painting" for painting requirements for wood windows, including those specified to be factory finished.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide wood windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of test size indicated below:
  - 1. Minimum size 38" x 65" frame size.
- B. AAMA/NWWDA Performance Requirements: Provide wood windows of the performance Class and Grade indicated below, when tested in compliance with AAMA/NWWDA 101/I.S.2.
  - 1. F-R50
- C. Air Infiltration: Maximum rate not more than the following when tested at 1.57 psf in accordance with ASTM E 283:
  - 1. 0.24 cfm/lin. ft. of perimeter crack
- D. Water Resistance: No water penetration when tested at 7.5 psf in accordance with ASTM E 547.
- E. Structural Performance: Window units shall withstand a wind load of 75 psf without damage to the unit when tested in accordance with ASTM E 330
- F. Forced Entry Test: Window shall pass a forced entry test of at least Level 10 to meet requirements set forth in ASTM F 588.
- G. Average Thermal Conductance: Glazing and framing areas having average U-factor of not more than 0.35 Btu/sq. ft. x h x deg F.

### 1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of wood window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other Work, operational clearances, and the following:
  - 1. Mullion details, including reinforcement and stiffeners.
  - 2. Joinery details.
  - 3. Expansion provisions.
  - 4. Provisions for venting glazing pocket.
  - 5. Flashing and drainage details.
  - 6. Weather-stripping details.
  - 7. Glazing details..
- C. Samples for Verification: For wood window components required, prepared on Samples of size indicated below.
  - 1. Main Framing Member: 12-inch- (300-mm-) long, full-size sections of wood members with factory-applied color finish, glazing stop and weather stripping.
  - 2. Contracting Officer reserves the right to require additional samples that show fabrication techniques, workmanship, and design of hardware and accessories.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type, grade, and size of wood window, to demonstrate compliance with performance requirements. Test results based on use of down-sized test units will not be accepted.
- F. Warranties: Special warranties specified in this Section.

### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm with minimum ten (10) years experience in producing wood windows of comparable quality to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units within Project schedule.
- B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain wood windows through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of wood windows and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Contracting Officer, except with Contracting Officer's approval. If modifications are proposed, submit comprehensive explanatory data to Contracting Officer for review.

E. Performance Standard for Fenestration: Comply with AAMA/NWWDA 101/I.S.2, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors," for minimum standards of performance including air infiltration, water penetration, operating force and structural performance.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standards and manufacturer's written instructions.

B. Package windows individually in suitable protective materials.

C. Mark each window using temporary or concealed markings with opening number used on Shop Drawings.

#### 1.6 PROJECT CONDITIONS

A. Field Measurements: Verify wood window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating wood windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

#### 1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Failure to meet performance requirements.
2. Structural failures including excessive deflection.
3. Water leakage, air infiltration, or condensation.
4. Faulty operation of movable sash and hardware.
5. Deterioration of wood, metals, vinyl, other materials and finishes beyond normal weathering.
6. Insulating-glass failure.

B. Warranty Period: Ten years from date of Substantial Completion.

- C. Warranty Period for Glass: Twenty years from date of Substantial Completion

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide 400 Series Fixed windows manufactured by Andersen Commercial Group; Andersen Corporation or a comparable product by one of the following:
  - 1. Crestline; a brand of Peachtree Companies, Inc. (The); TPC Acquisition, Inc.
  - 2. Weather Shield Mfg., Inc.

### 2.2 MATERIALS, GENERAL

- A. Wood: Clear ponderosa pine or another suitable fine-grained lumber; kiln-dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch (0.8 mm) deep by 2 inches (51 mm) wide; water-repellent preservative treated.
- B. Vinyl for Cladding: Consisting of a rigid PVC sheath, made from PVC complying with ASTM D 4726, not less than 35-mil (0.9-mm) average thickness, in permanent, integral color, mechanically bonded to exterior wood sash and frame members.
  - 1. Color of Cladding: As selected by Contracting Officer.
- C. Clad Trim and Glazing Stops: Clad wood material; material and finish to match clad frame members.
- D. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with wood window members, cladding, trim, hardware, anchors, and other components.
  - 1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- E. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- F. Reinforcing Members: Aluminum, nonmagnetic stainless steel, nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- G. Weather-Stripping Material: Manufacturer's standard system and materials

- H. Grilles (False Muntins): Manufacturer's standard false muntins placed between the glass lites (in the airspace), finished to match adjacent window surfaces.
- I. Integral Fin at Frame: PVC or extruded- or rolled-aluminum nailing fins for securing frame to structure; provide sufficient strength to withstand design pressure indicated
- J. Wood Jamb Extensions: As required; unfinished pine, sizes as indicated.
- K. Exterior Clad Trim: As required; vinyl-clad wood finished to match frame, sizes and shapes as indicated.

### 2.3 GLAZING

- A. Glazing System and Glass: Manufacturer's standard factory-glazing system that produces a weathertight seal and is glazed with clear insulating-glass units with low-E coating applied to No. 2 surface and argon fill in airspace with UV filter on glass (Andersen's "High Performance Low-E, Argon Blend Filled with UV filter"), inboard lite clear heat-strengthened glass and outboard lite clear annealed glass, overall thickness 3/4", complying with requirements in Division 8 Section "Glazing."

### 2.4 FABRICATION

- A. General: Fabricate wood windows, in sizes indicated, that comply with AAMA/NWWDA 101/I.S.2 for performance class and performance grade indicated. Include a complete system for assembling components and anchoring windows
- B. Frame shall have standard jamb depth of 4-9/16".
- C. Fabricate wood windows that are reglazable from the interior without dismantling sash or ventilator framing.
- D. Preservative treat all wood members after milling, and before assembly.
- E. Factory machine windows for openings and hardware that is not surface applied.
- F. 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, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.
- G. Factory-Glazed Fabrication: Glaze wood windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/NWWDA 101/I.S.2.
- H. Glazing Stops: Provide snap-on or nailed glazing stops coordinated with Division 8 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

- I. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

## 2.5 WOOD FINISHES

- A. Interior Sash Surfaces: Unfinished wood.

1. Field painting is specified in Division 9 section "Painting"

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; and other conditions affecting performance of work.
  1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
  2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
  3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

### 3.3 PROTECTION AND CLEANING

- A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION



## SECTION 08710 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section Includes the Following:

1. Required Meeting with the Government's Representative to Review Hardware Functions and Overall Hardware Schedule.
2. Commercial Door Hardware for Swinging Doors.
3. Cylinders for Doors Specified in Other Sections.

B. Related Sections: The Following Sections Contain Requirements That Relate to this Section:

1. Division 8 Section "Standard Steel Doors and Frames" for factory prefitting and factory premachining of doors for door hardware.
2. Division 8 Section "Flush Wood Doors" for factory prefitting and factory premachining of doors for door hardware.
3. Division 8 Section "Access Doors and Frames" for access door hardware, except cylinders.
4. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for additional aluminum entrance door hardware.
5. Division 16 Sections for security system components, including electric strikes and card readers, electrical power, wiring and all final connections.

C. Products Furnished but Not Installed under this Section Include:

1. Cylinders and cores for locks on access doors.
2. Cylinder and cores, closers, and exit devices for aluminum entrance doors, and other doors as scheduled.

#### 1.2 SUBMITTALS

A. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements, and roughing-in diagrams for power operators.

B. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Prior to submission of Hardware Schedule, meet with Government's representative and Contracting Officer to review hardware functions. Obtain Government's approval prior to ordering hardware.
2. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

- a. Type, style, function, size, and finish of each hardware item.
  - b. Name and manufacturer of each item.
  - c. Fastenings and other pertinent information.
  - d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
  - e. Explanation of all abbreviations, symbols, and codes contained in schedule.
  - f. Mounting locations for hardware.
  - g. Door and frame sizes and materials.
  - h. Keying information.
3. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.
  4. Keying Schedule: Submit separate detailed schedule indicating clearly how the Government's final instructions on keying of locks has been fulfilled.
- C. Shop Drawings: Details of electrified door hardware, indicating the following:
1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Include the following:
    - a. System schematic.
    - b. Point-to-point wiring diagram.
    - c. Riser diagram.
    - d. Elevation of each door.
  2. Detail interface between electrified door hardware and fire alarm, access control and security system.
- D. Samples: For exposed door hardware of each type indicated below, in specified finish, full size. Tag with full description for coordination with the Door Hardware Schedule. Submit samples before, or concurrent with, submission of the final Door Hardware Schedule.
1. Hinges. (Each type)
  2. Locks and latches.
  3. Exit devices.
  4. Cylinders and keys.
  5. Operating trim.
  6. Closers.
  7. Stops and holders.
  8. Protective trim.
  9. Door gasketing.
  10. Thresholds.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

- F. Maintenance Data: For power door operators to include in the maintenance manuals specified in Division 1 Section "Closeout Procedures."
- G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

### 1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, unless specifically indicated otherwise
- B. Supplier Qualifications: A recognized architectural door hardware supplier, who is a direct factory authorized distributor with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced Door and Hardware Institute, Architectural Hardware Consultant (AHC) who will meet with the Government, Contracting Officer, and Contractor, at reasonable times during the course of the Work, for consultation and who shall review the schedule for overall coordination of hardware.
  - 1. Require supplier to meet with Government to finalize functions of locking devices, keying requirements and to obtain final instructions in writing.
  - 2. Hardware schedule shall be prepared and sealed by AHC.
- C. Regulatory Requirements: Comply with provisions of the following:
  - 1. Comply with Americans with Disabilities Act (ADA), "*Accessibility Guidelines for Buildings and Facilities (ADAAG)*," and ANSI A117.1-1998, as follows:
    - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
    - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
      - 1) Interior Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
      - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
    - c. Thresholds: Not more than ½ -inch (13 mm high). Bevel raised thresholds with a slope of not more than 1:2.
  - 2. NFPA 101: Comply with the following for means of egress doors:
    - a. Latches, Locks, and Exit Devices: Not more than 15 lbf (67 N) to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
    - b. Door Closers: Not more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
    - c. Thresholds: Not more than ½ inch (13 mm) high.

- D. Function and Keying Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Incorporate function and keying conference decisions into final hardware and keying schedule after reviewing door hardware functions and keying system including, but not limited to, the following:
1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
  2. Preliminary key system schematic diagram.
  3. Requirements for key control system.
  4. Address for delivery of keys.

#### 1.4 PRODUCT HANDLING

- A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).
- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

#### 1.5 PROJECT CONDITIONS

- A. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Upon request, check the Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

#### 1.6 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Government of other rights Government may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of operators and door hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  
- C. Warranty Period: From date of Substantial Completion, unless otherwise indicated:
  - 1. Closers: Ten (10) years.
  - 2. Electronic Closers: Two (2) years.
  - 3. Exit Devices & Locksets: Three (3) years
  - 4. All other Hardware: Two (2) years.

## 1.7 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Government's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Provide products and manufacturers as listed in "Schedule of Acceptable Manufacturers and Products" included at end of this section.
  
- B. Furnish all items of hardware required to complete the work in accordance with specifications and plans.
  
- C. Carefully inspect Project for the extent of the finish hardware required to complete the Work. Where there is a conflict between these Specification and the existing hardware furnish finish hardware to specification.

### 2.2 SCHEDULED HARDWARE

- A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:
  - 1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated, or equivalent product, unless no equivalent is listed.

### 2.3 MATERIALS AND FABRICATION

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with standards indicated below:
  - 1. Sheet: ASTM B 209 (ASTM B 209M).
  - 2. Extrusions: ASTM B 221 (ASTM B 221M, Alloy 6063-T5 or T-6).
- B. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
  - 1. Provide stainless steel fasteners for thresholds.
- C. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
- D. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.
  - 1. Thru-bolting of hardware will only be permitted for magnetic door holders and where required by fire code assembly testing. Fasteners for closer, exit devices and similar hardware that are exposed on opposite face of door from unit will not be permitted.

#### 2.4 HINGES, BUTTS AND PIVOTS

- A. Templates: Provide only template-produced units for hinges at new frames. Provide units to match existing frame mortises where frame is being re-used.
- B. Fasteners: Phillips flat-head screws complying with the following requirements:
  - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
  - 2. Wood Screws: For wood doors and frames.
  - 3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
  - 4. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors and wood screws for wood doors and frames. Finish screw heads to match surface of hinges.
- C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - 1. Steel Hinges: Steel pins.
  - 2. Non-Ferrous Hinges: Stainless steel pins.
  - 3. Out-Swing Exterior Doors: Nonremovable pins.
  - 4. Out-Swing Corridor Doors: Nonremovable pins.
  - 5. Interior Doors: Nonrising pins.
  - 6. Tips: Flat button and matching plug, finished to match leaves.

7. Number of Hinges: Provide number of hinges indicated, but not less than 3 hinges per door leaf for doors 90-inches or less in height, and one additional hinge for each 30-inches of additional height.

## 2.5 CONTINUOUS HINGES

- A. Continuous Hinges: Heavy-duty anodized aluminum non-handed pinless hinge assembly of three interlocking extrusions applied to full height of door and frame without mortising. Provide units with door leaf and jamb leaf geared together for the entire length of the hinge and joined by a channel. Provide hinge knuckle with monolithic appearance. Vertical door loads shall be carried on minimum 3/4 inch acetal bearings through a full 180 degrees. The door leaf and jamb leaf shall have templated screw hole locations for future replacement needs. All heavy duty hinges (HD) shall have a minimum of 32 bearings for a 7-foot length.

## 2.6 LOCKS, LATCHES, STRIKES, AND BOLTS

- A. Locksets and Latchsets: Extra-heavy-duty lever Best Lock Co. "93L Line" mortised lockset with 6-pin interchangeable core, to match Campus Grand Master keying system, with solid shank with no opening for access to keyed lever keeper, through-bolted lock chassis (outside of the lock chassis prep) to prevent rotation of chassis after installation. Lockset and cores shall be of the same manufacturer to maintain complete lockset warranty.
- B. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.
  1. Provide flat lip strikes for locks with 3-piece, antifriction latchbolts as recommended by manufacturer.
  2. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.
  3. Provide dust-proof strikes for foot bolts, except where special threshold construction provides nonrecessed strike for bolt.
  4. Provide roller type strikes where recommended by manufacturer of the latch and lock units.
  5. Strikes shall be 16-gage curved stainless steel with a 1-inch deep box construction, and have sufficient length to clear trim and protect clothing.
- C. Lock Throw: Provide 5/8-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
  1. Provide 1/2-inch minimum throw of latch for other bored and preassembled types of locks and 3/4-inch minimum throw of latch for mortise locks. Provide 1-inch minimum throw for all dead bolts.
- D. Flush Bolt Heads: Minimum of 1/2-inch-diameter rods of brass, bronze, or stainless steel with minimum 12-inch-long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

## 2.7 EXIT DEVICES

- A. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

- B. Outside Trim: Lever type of material and finish to match locksets, unless otherwise indicated. Match design for locksets and latchsets.
- C. Through Bolts: DO NOT through bolt exit devices and trim on doors. Prepare doors with reinforcing and blocking to receive hardware.

## 2.8 VERTICAL ROD EXIT DEVICES

- A. Surface Mounted/Concealed Vertical Rod Exit Devices, General: Devices shall be push through type touch pad design with a straight or horizontal motion to eliminate pinch points. Latch bolt shall have a self-lubricating coating which reduces friction and wear. Device housing shall be heavy-duty extruded aluminum.
- B. Mechanism Case or Housing: Provide minimum thickness of 0.140-inch extruded aluminum, with adaptability to convert from standard hex key dogging to a high security cylinder dog operation in the field.
  - 1. No exposed screws shall be seen from the back side (pull side) of the device through a glass lite.
  - 2. The use of plastic parts to retract the latchbolt is not acceptable.
- C. Springs: Provide minimum 1/16-inch diameter compression springs. All internal parts shall be zinc dichromate coated to prevent rusting.
- D. Quiet Feature: Provide hydraulic sound damper to all devices to decelerate the touch pad on its return stroke and eliminate noise associated with exit device operation.
- E. Touch Pad: Provide minimum height of 2-3/16 inches. Plastic is not acceptable.
- F. Outside Trim: Provide heavy-duty type fastened by means of concealed welded lugs and through-bolts from the inside. Lever trim shall be forged brass with a minimum average thickness on the escutcheon of 0.130-inches. Plate with pull shall be minimum average thickness of 0.90-inches and have forged pulls. Lever trim shall be furnished with "*Break-Away Levers*," (994L Trim).
- G. End Caps: Provide sloped end caps of heavy-duty metal alloy construction. Provide horizontal adjustment to provide flush alignment with device cover plate. Raised edges are not allowed. Plastic or metal stamping is not acceptable.
  - 1. Thickness: Minimum 0.250-inches.
- H. Available Floor Strike Manufacturers: Subject to compliance with requirements, manufacturers offering floor strikes on interior vertical rod panic devices that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Von Duprin 385A.
  - 2. Approved equivalent.
- I. Latchbolts: Provide deadlocking latchbolts with all exit devices.

## 2.9 LOCK CYLINDERS, CORES AND KEYING

- A. General: Review the keying system with the Government and provide the type required, either new or integrated with Government's existing system. If key pinning charts are required, Government will furnish charts to hardware supplier.
- B. Keying System: Unless otherwise indicated, provide a factory-registered keying system complying with existing Grand Master Key System, cylinders are operated by a change key, a master key, and a grand master key.
- C. Furnish Best removable core cylinders at all doors, unless otherwise indicated, keyed as directed by the Government.
  - 1. Stamping: Permanently inscribe each core with a visual key control number (key and core stamping), locate visible or concealed as directed by Government.
- D. Equip locks with cylinders for interchangeable-core pin tumbler inserts. Furnish only temporary inserts for the construction period, and remove these when directed. The construction cores remain the property of the supplier and shall be returned to the supplier when they are removed. Contractor shall install the permanent cores in the presence of the Government's representative.
- E. Metals: Construct lock cylinder and core parts from brass or bronze, stainless steel, or nickel silver.
- F. Comply with Government's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
  - 1. Stamping: Permanently inscribe each key with a visual key control number (key and core stamping) and include the following notation: "DO NOT DUPLICATE."
  - 2. Design master key system allowing for 300 percent expansion.
- G. Key Material: Provide keys of nickel silver only.
- H. Key Quantity: Furnish the following:
  - 1. Three (3) change keys for each lock.
  - 2. Five (5) master keys for each master system.
  - 3. Five (5) grandmaster keys for each grandmaster system.
  - 4. One extra blank for each lock.
  - 5. Three (3) control keys.
  - 6. Six (6) construction master keys.
- I. Deliver keys to Government.

## 2.10 KEY CONTROL SYSTEM

- A. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet,

all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for the Project.

1. Provide complete cross index system set up by key control manufacturer, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
2. Provide hinged-panel type cabinet for wall mounting.
3. Provide products by Key Control Systems, Inc., or approved equivalent.

#### 2.11 PUSH/PULL UNITS

- A. Concealed Fasteners: Provide manufacturer's special concealed fastener system for installation, thru-bolted for matched pairs but not for single units.

#### 2.12 CLOSERS AND DOOR CONTROL DEVICES

- A. Size of Units: Except as otherwise specifically indicated, provide non-sized closers for all units.
- B. Closers, General: All door closers shall be fully hydraulic and shall have full rack and pinion action with a shaft diameter of a minimum of 11/16-inch and a piston diameter of 1-1/2 inches.
  1. Closer shall utilize full complement bearings at shaft.
  2. Pinion and pistons shall be hardened.
  3. Closer shall incorporate tamper-resistant non-critical screw valves of V-slot design to reduce clogging.
  4. Closer shall have separate and independent screw valve adjustments for latch speed, general speed and hydraulic backcheck. Backcheck shall be located to effectively slow the swing of the door at a minimum of 10-degrees in advance of the dead stop location.
  5. Pressure relief valves are not acceptable.
- C. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ADA provisions for door opening force.
- D. Provide all parallel arm closers with one piece forged extra duty arms or 3/8-inch thick stamped solid steel main and one piece forged or 5/16-inch thick stamped solid steel forearm with bronze bushings.
  1. Provide spring cushion arms at all exterior doors, and where indicated.
  2. Provide standard stop arms at all parallel arm closers scheduled for interior doors where a wall or floor stop is not feasible, and where indicated.
  3. Provide only handed closers.
  4. Provide only heavy-duty closers recommended by manufacturer for instructional applications. Standard weight products are NOT acceptable.
- E. Provide all regular arm closers with forged or stamped steel main arm.
- F. Provide heavy-duty steel stud shoulder bolts (including main arm and forearm connection) at all regular arm, hold open arm, built-in stop arm, and hold open / built-in stop closers.

- G. Provide exterior closers with all weather hydraulic fluid, suitable from 120°F to -35°F without adjustment.
- H. Built-In Stops: Stops shall be of one-piece cast malleable iron material. Screw on stops are not acceptable. Where required, the hold-open assembly handle for these stops shall rotate on ball bearings.
- I. Provide closers with powder coat finish on body, arm and plate adapter, or corrosion inhibitor primer and sprayed finish coat.
- J. Provide all drop plates, shoe supports, templates to properly install closers according to manufacturer's recommendations.
- K. Provide grey resilient parts for exposed bumpers.
- L. Provide metal covers for all door closers.
- M. Available Door Closer 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. LCN Closers; *4010/4110 Series*.
  2. Sargent; *280 Series, less PRV*.
  3. Approved equivalent.

#### 2.13 DOOR TRIM UNITS

- A. Fabricate protection plates the width of single leaf doors less 1-1/2-inches, and width of door leaf less 1-inch for pairs of doors, to yield a uniform reveal. Provide on push side by height indicated. Countersink all kick plates and push/pull plates attachment holes to receive oval under-cut head screws.
  1. Metal Plates: Stainless steel , 0.050 inch (U.S. 18 gage).
- B. All pull plates and handles shall be through-bolted. Install pull plate prior to push plate to conceal through-bolts. Provide concealed fasteners for all push/pull applications.

#### 2.14 WEATHERSTRIPPING AND SEALS

- A. General: Provide continuous weatherstripping on exterior doors and interior doors where indicated or scheduled. Provide noncorrosive fasteners.
- B. Weatherstripping at Jambs and Heads: Provide brush type insert and extruded aluminum with anodized finish retainer strips, surface applied, of design and size scheduled.
- C. Weatherstripping Sweep: Provide sweep consisting of brush type insert and extruded aluminum with anodized finish housing, surface applied, of design and size scheduled.

#### 2.15 THRESHOLDS

- A. General: Except as otherwise indicated, provide standard thermally broken metal threshold unit of type, size, and profile as shown or scheduled.

## 2.16 DOOR SILENCERS

- A. General: Provide grey resilient type silencers on all hollow metal door frames.
  - 1. Provide three (3) silencers on single doors.
  - 2. Provide two (2) silencers on paired doors.

## 2.17 FABRICATION

- A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Contracting Officer.
  - 1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
- D. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed except for magnetic door holders, unless specifically approved by the Contracting Officer as the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
  - 1. Steel Machine or Wood Screws: For the following fire-rated applications:
    - a. Mortise hinges to doors.
    - b. Strike plates to frames.
    - c. Closers to doors and frames.
  - 2. Steel Through Bolts:
    - a. Surface hinges to doors.
    - b. Magnet door holders
  - 3. Spacers or Sex Bolts: For through bolting of hollow metal doors.

## 2.18 HARDWARE FINISHES

- A. Provide dull chrome, US26D, BHMA 626 and BHMA 652 finish for all hardware items to greatest extent possible or manufacturer's standard finish matching this finish, and as follows, unless noted otherwise.
  - 1. Protection Plates, Push, Pulls: BHMA 630.
  - 2. Door Closers: Factory paint to match other hardware, unless otherwise noted.
  - 3. Aluminum Items: Finish to match predominant adjacent material. Coordinate seal color with frame color.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame supports, and other conditions affecting performance of door hardware.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Contracting Officer.
  - 1. All doors with lever trim shall have hardware mounted at heights required by ADA (Americans with Disabilities Act) regulations.
  - 2. *"Recommended Locations for Builders Hardware for Standard Steel Doors and Frames"* by the Door and Hardware Institute.
  - 3. NWWDA Industry Standard I.S.1.7, *"Hardware Locations for Wood Flush Doors."*
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Pre-drill and countersink doors, frames and units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Hand tighten screws and fasteners, use of power driven tools must be limited to preliminary driving screws if permitted by door and hardware manufacturer.
- F. Replace doors damaged by improper hardware installation.

- G. Set thresholds for exterior doors in full bed of sealant specified in Division 7 Section "Joint Sealants."
- H. Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

### 3.3 FIELD QUALITY CONTROL

- A. Architectural Hardware Consultant: Contractor shall engage a qualified Architectural Hardware consultant and the manufacturer's Representative of closers, locksets, and exit devices to perform inspections and to prepare inspection reports.
  - 1. Inspect door hardware and state in report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

### 3.4 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
  - 1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- B. Adjust door closers in accordance with manufacturer's instructions for proper door closer adjustment for spring power, backcheck, closing and latching speed.
- C. Clean adjacent surfaces soiled by hardware installation.
- D. Engage a factory-authorized service representative to train Government's maintenance personnel in the proper adjustment, operation, and maintenance of door hardware and hardware finishes.
- E. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, accompanied by representatives of the manufacturers of latchsets and locksets and of door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:
  - 1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
  - 2. Consult with and instruct Government's personnel in recommended additions to the maintenance procedures.
  - 3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.

4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Government's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

### 3.6 HARDWARE SCHEDULE

- A. SCHEDULE OF ACCEPTABLE MANUFACTURERS AND PRODUCTS: Manufacturers and products are listed to establish the general product appearance, type and quality intended for use. Certain items have been specially selected for their appearance and function. Equal products of manufacturers other than those listed below may be acceptable where "or approved equivalent" is indicated, subject to the approval of the Contracting Officer. Substitutions proposed for hardware items must be equivalent in every way, as judged solely by Contracting Officer.
  1. Hinges (Interior Doors, unless otherwise indicated) : Hager BB 1279, standard Weight, BHMA 652 (US26D) finish; 4-1/2" x 4-1/2", 2-ball bearing 5-knuckle; or approved equivalent by Bommer or McKinney.
  2. Heavy Hinges (Interior Doors Noted): Hager BB 1168 (heavy weight), BHMA 652 (US26D) finish; 4-1/2" x 4-1/2", 4-ball bearing 5-knuckle; or approved equivalent by Bommer or McKinney.
  3. Hinges Exterior Doors: Hager BB 1199 (heavy weight), Stainless steel with stainless steel pin, BHMA 630 (US32D) finish; 4-1/2" x 4-1/2", 4-ball bearing 5-knuckle; or approved equivalent by Bommer or McKinney.
  4. Continuous Hinges: Pemko CFM-SLIHD full door length for hollow metal frames, (provide fire rated for labeled doors), or approved equivalent by Roton or Select Products.
  5. Flush Bolts : Rockwood No. 555 or 557 with 570 strike unless threshold is indicated, BHMA 626 , or approved equivalent by Ives.
  6. Surface Bolts: Rockwood No. 580, BHMA 626 , or approved equivalent by Ives.
  7. Combination Bolts: Rockwood No. 1845 or 1945, with 570 strike unless threshold is indicated BHMA 626 , or approved equivalent by Ives.
  8. Automatic: Rockwood: No. 1842 or 1942 with 1880 strike unless threshold is indicated, BHMA 626 , or approved equivalent by Ives.
  9. Locksets/Latchsets: Schlage bored "D Series" with #14 lever trim and D rose; BHMA 626 finish, with interchangeable / removable core. Provide Construction cores for 20-percent of locksets.
  10. Deadbolt: Schlage B663HD; BHMA 626 finish, with interchangeable / removable core. Provide with Construction keying.
  11. Exit Devices: Von Duprin 99 Series, trim as scheduled, with lever #17 trim less cylinders, BHMA 626 finish, cylinder dogging feature at non-fire exit devices.
  12. Interchangeable Cores: Best for insertion in locksets, exit devices, and elsewhere as scheduled; finish to match lockset, to match existing. Provide with key and concealed cylinder stamping.
  13. Cylinders for use with Interchangeable Core: Best Type required for hardware and cores specified, with temporary construction cores, finish to match lockset. No substitution. Provide Construction cores for all cylinders at exit devices

14. Coordinator: Rockwood 1600 Series, with mounting brackets, as required 576 series at doors with overhead stops, or where 1600 is not feasible; or approved equivalent by Ives.
15. Removable Mullion: Von Duprin No. KR4954, or approved equivalent..
16. Closers:
  - a. Exterior Doors: reduced opening force for handicapped; in aluminum painted finish BHMA 689 (except as noted):
    - 1) LCN 4111 AVB Cush "*Smoothee*" Series, with spring cush arm 3077SC-
    - 2) Norton CLP7560BF-EBC x CWF, with spring cush arm - UNI
    - 3) Yale SAP4420BF-EBC x CWF, with spring cush arm
  - b. Interior Doors: Provide parallel or standard arm closers as indicated in the General Notes below; reduced opening force for handicapped; in aluminum painted finish BHMA 689; Options: provide built-in stop arm, advanced back check and spring cush stop arm where indicated (order of options ) :
    - 1) Parallel Arm Closers:
      - a) LCN 4111; Options Cush arm, AVB, Spring cush arm 3077SC.
      - b) Norton PR7560BF; Options CLP arm, EBC, UNI arm.
      - c) Yale SAP4400BF.
    - 2) Standard Arm Closers:
      - a) LCN 4011; Options n/a, AVB, n/a.
      - b) Norton 7560BF; Options n/a, EBC, n/a.
      - c) Yale SAR4400BF; Options n/a, EBC, n/a.
17. Wall Stops: Ives WS406CCV OR WS407CCV as required by wall material, with grey bumper and BHMA 630 finish; or approved equivalent by Rockwood.
18. Overhead Stops: Glynn Johnson No. 90S Series, stop only, no hold open, BHMA 630 finish; or approved equivalent.
19. Silencers: Ives No. SR64 for hollow metal frames, or approved equivalent by Rockwood.
20. Push Plates: Ives No. 8200, 4 by 16-inches, stainless steel, BHMA 630 finish; or approved equivalent by Rockwood.
21. Pull Plates: Ives No. 8305-0, 4 by 16-inches, stainless steel, BHMA 630 finish; or approved equivalent by Rockwood.
22. Pulls: Ives No. 8105, stainless steel, BHMA 630 finish; or approved equivalent by Rockwood
23. Kickplates: Ives No. 8400 LDW, stainless steel, 10-inches high unless otherwise indicated, by door width, where indicated, or approved equivalent by Rockwood.
24. Thresholds for Exterior Doors: Pemko Aluminum No. 171A, 2005AV, or approved equivalent by National Guard Products or Zero, length as required, width as shown on details (Refer to Division 9 Section "Ceramic Tile" for marble thresholds)
25. Weather Astragal Seal: Pemko- 351C x 351CP; or approved equivalent by National Guard Products or Zero.
26. Weatherstripping: National Guard Products 670A brush type, or approved equivalent by Pemko or Zero.
27. Sweep: Pemko 315CN, or approved equivalent by National Guard Products or Zero.

28. Rain Drip: National Guard Products: 17, or approved equivalent by Pemko or Zero.

B. SCHEDULED HARDWARE SETS

**GENERAL NOTES:**

1. Doors hardware shall not prohibit exiting from spaces.
2. Provide hardware finishes above unless noted otherwise for a specific set or door.
3. Provide all required installation accessories and options necessary for complete installation of each hardware component, to ensure proper operation of the product.
4. Coordinate all hardware components for each door leaf for overall compatibility.
5. Through-bolting of hardware is not permitted, coordinate all blocking requirements with door manufacturer.
6. Provide all interior doors with wall stops, one per leaf; provide floor type as required when wall stop not feasible. Specific stops scheduled are exceptions to this. Provide at locations of magnetic door holders.
7. Provide thresholds where indicated on drawings.
8. Provide three (3) silencers per single door and two (2) silencers per pair doors except omit on weatherstripped and sound sealed doors.
9. Where door closers are scheduled below, provide parallel or stand arm closers placed on the least conspicuous side of the door, unless noted otherwise.
10. Provide cylinders with final cores for access doors as required; coordinate with Division 8 Section "Access Doors and Frames."
11. Provide rain drips at all exterior steel doors not under cover.
12. The Door Schedule specifies some products for Aluminum doors in this Section to ensure one manufacturer of exit devices, locksets, and closers throughout the Project. These items must match throughout the building regardless of who supplies them.
13. The lockset/exit device function specified is for BIDDING ONLY. Review all lock and exit device functions with Government's representative prior to submission of door schedule.
14. Coordinate and revise scheduled hardware as required to accommodate card readers and access control system provided under Division 16.

**SCHEDULE OF FINISH HARDWARE**

**SET #1 - SINGLE INTERIOR DOOR** (Doors 13, 14)

- 3 Hinges
- 1 Lockset, privacy function

**SET #2 - SINGLE INTERIOR DOOR** (Doors 3, 4, 8B, 5, 6, 7)

- 3 Hinges
- 1 Lockset, office function

**SET #3 - SINGLE INTERIOR DOOR** (Doors 11, 16)

- 3 Hinges
- 1 Lockset, storeroom function

**SET #4 - SINGLE INTERIOR DOOR (Doors 12, 1B )**

- 3 Hinges
- 1 Latchset, passage function

**SET #5 - PAIR EXTERIOR DOORS (Doors 02, 15)**

- 6 Hinges
- 1 Lockset, Storeroom function
- 1 Set Flush bolts
- 1 Threshold
- 1 Perimeter weatherstripping
- 1 Sweep

**SET #6 - SINGLE EXTERIOR DOOR (Doors 1A, 10)**

- 3 Hinges
- 1 Lockset, entrance
- 1 Threshold
- 1 Perimeter weatherstripping
- 1 Sweep

END OF SECTION

## SECTION 08800 - GLAZING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Windows.
  - 2. Doors

#### 1.2 DEFINITIONS

- A. **Manufacturer:** A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.
- B. **Interspace:** Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- C. **Deterioration of Coated Glass:** Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- D. **Deterioration of Insulating Glass:** Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. **General:** Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

#### 1.4 SUBMITTALS

- A. **Product Data:** For each glass product and glazing material indicated.
- B. **Glazing Schedule:** Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

- C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
  - 1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer
- D. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:
  - 1. Insulating glass.
  - 2. Coated float glass.
- E. Warranties: Special warranties specified in this Section.

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of glass from one primary-glass manufacturer.
- B. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer
- C. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
  - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines."
  - 2. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
  - 3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:
  - 1. Insulating Glass Certification Council.
  - 2. Associated Laboratories, Inc.
  - 3. National Accreditation and Management Institute.
- F. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201.

1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
2. Safety glass includes fully tempered glass.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

#### 1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  1. Warranty Period: 10 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PRIMARY FLOAT GLASS

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); Class 1(clear) unless otherwise indicated in schedules at the end of Part 3.

## 2.2 HEAT-TREATED FLOAT GLASS

- A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated in schedules at the end of Part 3.

## 2.3 COATED FLOAT GLASS

- A. General: Provide coated glass complying with requirements indicated in this Article and in schedules at the end of Part 3.
- B. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified in schedules at the end of Part 3.

## 2.4 INSULATING GLASS

- A. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.
- B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
- C. Sealing System: Dual seal, with primary and secondary sealants as follows:
  - 1. Manufacturer's standard sealants.
- D. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
  - 1. Aluminum with mill or clear-anodized finish.
  - 2. Desiccant: Molecular sieve or silica gel, or blend of both.
  - 3. Corner Construction: Manufacturer's standard corner construction.

## 2.5 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
  - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and

- glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  3. Colors of Exposed Glazing Sealants: As selected by Contracting Officer from manufacturer's full range for this characteristic.
- B. Single-Component Neutral-Curing Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 50; Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
1. Products:
    - a. Dow Corning Corporation; 791.
    - b. Dow Corning Corporation; 795.
    - c. GE Silicones; SilPruf NB SCS9000.
    - d. GE Silicones; UltraPruf II SCS2900.
    - e. Pecora Corporation; 865.
    - f. Pecora Corporation; 895.
    - g. Pecora Corporation; 898

## 2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
- B. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
1. Type 1, for glazing applications in which tape acts as the primary sealant.
  2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

- D. 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.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.8 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- 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 written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Grind smooth and polish exposed glass edges.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep system.
  - 3. Minimum required face or edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where the length plus width is larger than 50 inches (1270 mm) as follows:
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

#### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 PROTECTION AND CLEANING

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

### 3.8 GLASS SCHEDULE

- A. Doors:
  - 1. Nonfire-rated interior doors: 1/4 inch clear, fully tempered glass, Kind FT.
  - 2. Exterior Doors: 1-inch insulated glass as follows:
    - a. Outboard Lite: 1/4-inch thick clear, low-E coated, fully tempered float glass, Kind FT.
    - b. Air Space: 1/2-inch.
    - c. Inboard Lite: 1/4-inch thick clear, fully tempered float glass, Kind FT.
    - d. Low-Emissivity Coating: Sputter coated on second surface; Solarban 60; by PPG Industries, Inc.
- B. Wood Windows: 3/4 inch insulated glass units with two lites of clear annealed float glass, low-e coating, and argon gas fill in air space. Units shall have applied interior and exterior muntins and grilles in airspace as specified in Division 8 Section "Wood Windows".

END OF SECTION



## **SECTION 09220 - EXTERIOR PORTLAND CEMENT PLASTER (STUCCO)**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A. This Section includes the following:

1. Exterior portland cement plasterwork (stucco) with acrylic-based, elastomeric finish coat on wire lath.
2. Accessories and trim for stucco system including preformed, precoated foam shapes ("Canamould").
3. Weather-resistant barrier (fluid applied) under stucco system.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for acoustical sealants and sealants installed with exterior portland cement plaster (stucco).

#### **1.2 SUBMITTALS**

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.

C. Samples for Verification:

1. Each type of colored finish coat indicated; 12 by 12 inches (305 by 305 mm), prepared on rigid backing.
2. Each type of preformed, precoated foam shape indicated; full size.

#### **1.3 QUALITY ASSURANCE**

A. Single Source Responsibility: Provide waterproofing/air barrier, stucco, primer and finish from single source manufacturer

B. Installer Qualifications: Work must be performed by a firm having not less than five (5) years successful experience in comparable plasterwork, and approved by stucco manufacturer to apply their products.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

D. Mockups: Before installing system, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and

qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work:

1. Locate mockups in-place on building in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of the dates and times when mockups will be constructed.
3. Provide sample panel for each color and texture to be supplied on the Project. Demonstrate the proposed range of aesthetic effects and workmanship
4. Obtain Architect's approval of mockups before starting fabrication of work.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - a. Protect mockups from weather and from construction activities. Brace mockups to resist design wind loads and provide waterproof coverings for construction materials not intended to be permanently exposed to the weather.
  - b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

#### 1.5 PROJECT CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork:
  1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
  2. Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C).
  3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- C. Preformed Precoated Foam Shapes: Comply with manufacturer's weather and environmental limitations for adhesive application of foam shapes.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form Limited Labor and Material Warranty in which manufacturer agrees to repair or replace components of stucco system that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Stucco System: “Sto Powerwall NExT“ system by Sto Corp.; Sto Finish Systems Div., or equivalent by one of the following or equal:
  - 1. El Rey Stucco.
  - 2. California Stucco.
- B. Preformed Precoated Foam Shapes: Provide specified products of Canamould Extrusions, Inc., Concord, Ontario, Canada.

## 2.2 MATERIALS, GENERAL

- A. Compatibility: Provide substrates, adhesive, reinforcing meshes, base- and finish-coat materials, sealants, and accessories that are compatible with one another and approved for use by system manufacturer for Project.
- B. Colors, Textures, and Patterns of Finish Coat: Comply with the following requirements:
  - 1. Provide Architect's selections from system manufacturer's full range of colors, textures, and patterns for each type of finish coat indicated on drawings.

## 2.3 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II.
- B. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- C. Sand Aggregate: ASTM C 897.
- D. Factory-Mixed Finish-Coats: Factory-mixed formulation of highly flexible trowel-applied elastomeric exterior wall finish with integral color and silicone enhancement for improved algae, dirt pick-up and mildew resistance; Sto “Powerflex Silco” or equal in texture selected by Architect and color(s) as follows.
  - 1. Color: As selected by Contracting Officer

## 2.4 AIR/MOISTURE BARRIER

- A. Weather Barrier: System manufacturer's secondary air and weather barrier 100 percent acrylic barrier job mixed with portland cement complying with ASTM C 150, Type I designed to seal substrates from moisture penetration and to improve the bond between substrate of type indicated and adhesive used for application of insulation; “Sto Guard System,” or equivalent, comprised of the following:
  - 1. First Coat: Trowel-applied joint compound for rough opening protection, sheathing joints and inside and outside corners; “Sto Gold Fill” or equal.

2. Reinforcing Mesh: Open weave fiberglass mesh for use with first coat material; “Sto Guard Mesh” or equal.
3. Top Coat: Roller-applied waterproof coating for wall sheathing; “Sto Emerald Coat” or equal.

## 2.5 LATHING MATERIALS

- A. Metal Lath: ASTM C 847, cut from copper bearing sheet steel, of type indicated below, not lighter than 3.4 pounds per square yard and hot-dipped galvanized with a coating of G60 in accordance with ASTM A 525.
  1. Provide self-furring type expanded metal flat diamond mesh lath for plastering directly on masonry, concrete, gypsum sheathing and other flat surfaces.
- B. Lacing Wire: Steel, not less than .035 inch diameter.

## 2.6 ACCESSORIES

- A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
  1. Provide types of accessories required for plaster installed on solid backing, fabricated from zinc.
- B. Metal Accessories: Grounds and casing corner beads shall be zinc, 26 gauge or heavier, with expanded or perforated flanges or clips so shaped and fabricated as to permit complete embedment in the plaster.
- C. Foundation Weep Scream: Fabricated from hot-dip galvanized steel sheet, ASTM A 653/A 653M, G60 (Z180) zinc coating.
- D. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
- E. Cornerbeads: Fabricated from zinc.
  1. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
  2. Small nose cornerbead with perforated flanges; use on curved corners.
  3. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing masonry corners.
  4. Bull nose cornerbead, radius 3/4 inch (19.1 mm) minimum, with expanded flanges; use at locations indicated on Drawings.
  5. Casing Beads: Fabricated from zinc; square-edged style; with expanded flanges.
  6. Control Joints: Fabricated from zinc; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
  7. Expansion Joints: Fabricated from zinc; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

8. Two-Piece Expansion Joints: Fabricated from zinc; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4-to-5/8-inch (6.34-to-16-mm) wide; with perforated flanges.

F. Preformed, Precoated Foam Shapes: Premanufactured foam shapes consisting of a core of expanded polystyrene insulation, reinforcing glass-fiber mesh and a polymer-modified cementitious coating.

1. Product: Canamould's "C-Mold" products.
2. Styles and Profiles: As indicated on Drawings.

## 2.7 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in portland cement plaster.

C. Bonding Compound: ASTM C 932; product approved for use by manufacturer of stucco products.

D. Primer: System manufacturer's standard factory-mixed elastomeric-polymer primer for preparing base-coat surface for application of finish coat; "Sto Hot-Prime," or equal.

E. Adhesive and Mechanical Fasteners for Preformed Precoated Foam Shapes: Types recommended by manufacturer for applications indicated.

## 2.8 PLASTER MIXES

A. General: Comply with ASTM C 926 for applications indicated.

1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. ft. (16 kg of fiber/cu. m) of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.

B. Products: Provide pre-mixed, factory-proportioned, fiber-reinforced portland cement products; Sto Powerwall Stucco or equal.

C. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:

1. Portland Cement Mixes

- a. Scratch Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
- b. Brown Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 3 to 5 parts aggregate per part of cementitious material (sum of separate volumes of each component material).

- D. Factory-Mixed Finish-Coat Mixes: Mix water (at manufacturer's recommended rate) and pre-blended finish coat mix together as per manufacturer's directions.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Apply weather barrier over gypsum sheathing in compliance with manufacturer's direction for application techniques and spreading rate.

### 3.3 LATHING

- A. Apply metal lath as a base for conventional three-coat plaster work over wood or metal framing or furring and plywood, gypsum sheathing, masonry or concrete substrate as detailed on Drawings.
  - 1. Lap horizontal edges and ends of lath one inch. Lap horizontal edges spanning 16 inches or more a minimum of two (2) inches. Nail or wire securely and rigidly in place, as most appropriate for the condition. Stretch diamond mesh lath before fastening.

### 3.4 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External Corners:
  - 1. Install cornerbead at exterior locations.
- C. Control Joints: Install control joints in specific locations approved by Architect for visual effect as follows:
  - 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
    - a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
    - b. Horizontal and other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).
  - 2. At distances between control joints of not greater than 18 feet (5.5 m) o.c.
  - 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.

4. Where control joints occur in surface of construction directly behind plaster.
  5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.
  6. In lengths of preformed precoated foam shapes at maximum 40' intervals.
- D. Install casing beads between plaster and vertical dissimilar surfaces and where indicated on Drawings. Secure at ends and not more than 12" o.c. When placing casing bead allow 1/4" opening between bead and adjacent plaster.
- E. Break lath behind control joints and if channel framing is used, also break channels.
- F. At exterior locations, caulk all splices and intersections of control joints with sealant as specified in Section 07920.
- G. Preformed Precoated Foam Shapes:
1. Apply shapes to fully cured brown coat surfaces prior to application of plaster finish coat.
  2. Cut and remove mesh from back of shape.
  3. Attach shapes securely to substrate using adhesive and mechanical attachment methods in accordance with manufacturer's instructions and as indicated on drawings.
  4. Miter joints between shapes for a proper fit, at a 45 deg. angle, and edge glue together with approved adhesive.
  5. Cover joints with joint mesh embedded in the finish coat and feathered to a smooth flat surface.
  6. Terminate foam shapes system at building expansion joints.
  7. Caulk top edges as per manufacturer's directions prior to finishing.
  8. Allow to cure before applying finish coat.
  9. Comply with all other installation recommendations of manufacturer

### 3.5 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6.4 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.
  2. Grout hollow-metal frames, bases, and similar work occurring in plastered areas, with base-coat plaster material, before lathing where necessary. Except where full grouting is indicated or required for fire-resistance rating, grout at least 6 inches (152 mm) at each jamb anchor.
  3. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
  4. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
  5. Do not rework partially set material.
- B. Scratch and Brown Coat:

1. Apply 3/8" thick scratch coat over lath and 3/8" thick brown coat over scratch coat to provide a total 3/4" thick base for finish coat.
2. Double back with the brown coat as soon as the scratch coat is sufficiently set up to receive the second coat.
3. Moist cure the base coat for a minimum of 2 consecutive days.
4. Allow the base coat to cure for two weeks before applying the finish coat or the preformed precoated foam shapes.

C. Plaster Finish Coats: Apply over cured brown coat and preformed precoated foam shapes per manufacturer's directions. Provide finish coat texture to match approved mock-up.

### 3.6 CUTTING AND PATCHING

A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

### 3.7 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from doorframes, windows, and other surfaces not indicated to be plastered. Repair surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION

## SECTION 09260 - GYPSUM BOARD ASSEMBLIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Gypsum board assemblies attached to wood framing.
  - 2. Sound-attenuation blankets.
- B. Firestopping systems and fire-resistance-rated joint sealants are specified in Division 7 Section "Firestopping."
- C. Acoustical joint sealants are specified in Division 7 Section "Joint Sealants."
- D. Thermal insulation is specified in Division 7 Section "Building Insulation."

#### 1.2 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

#### 1.3 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated..

#### 1.4 SUBMITTALS

- A. Product Data for each type of product specified.
- B. Shop Drawings showing locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.
- C. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

#### 1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- B. 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.
- C. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:

1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory."
2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

#### 1.6 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.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- 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 before 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 to dry 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. Gypsum Board and Related Products:
    - a. National Gypsum Co.; Gold Bond Building Products Division.
    - b. G-P Gypsum.
    - c. United States Gypsum Co.

#### 2.2 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application. Provide gypsum board in widths of 48 inches ( 1219 mm).
- B. Gypsum Wallboard: ASTM C 1396, tapered edges, Type X for fire-resistance-rated assemblies, in 5/8" thickness unless otherwise indicated.

1. Type: Provide proprietary type as required for specific fire-resistance-rated assemblies.
- C. Moisture/Mold Resistant Gypsum Wallboard: ASTM C36/ASTM C1396 mold resistant type gypsum panels, in 5/8 inch thickness unless otherwise indicated, with tapered edges; panels shall be classified as Type X.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. National Gypsum Company; Type XP/PR.
    - b. United States Gypsum Co.; Mold Tough AR.
    - c. G-P Gypsum; Dens Armor Plus
- D. Gypsum Board Base Layer(s) for Multilayer Applications: Same as gypsum wallboard.

## 2.3 TRIM ACCESSORIES

- A. Accessories: Cornerbead, edge trim, and control joints formed from steel sheet zinc coated by hot-dip process or rolled zinc complying with ASTM C 1047, in shapes indicated below by reference to Fig. 1 designations in ASTM C 1047.
1. Cornerbead on outside corners, unless otherwise indicated. USG 'Durabead' or equivalent.
  2. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated, and where 'J-bead' is referenced. USG No. 200-A, or equivalent.
  3. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated. USG No. 200-B, or equivalent.
  4. One-piece control joint formed from rolled zinc with V-shaped slot and removable strip covering slot opening. USG No. 093, or equivalent.
- B. Aluminum Accessories: Where indicated, provide manufacturer's standard extruded-aluminum accessories of profile indicated 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. Primed Finish: Manufacturer's standard corrosion-resistant primer compatible with joint compound and finish materials specified.
  3. 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.
    - d. Pittcon Industries, Inc.

## 2.4 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 Cementitious Backer Units: As recommended by cementitious backer unit manufacturer.
- C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
  - 1. 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.
  - 2. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer.
  - 3. 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.
    - a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
    - b. All-purpose compound formulated for fill (second) coat.
    - c. Topping compound formulated for finish (third) coats.

## 2.5 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.
- C. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
- D. Sound-Attenuation Blankets: Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing). Provide units bearing U.L. classification marking and complying with assembly requirements for rated partitions.
  - 1. Mineral-Fiber Type: Fibers manufactured from glass, slag wool, or rock wool.

## 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 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840, GA-216, and the Gypsum Association 'Recommended Specification: Levels of Gypsum Board Finish' for wall finish scheduled.
- 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 to 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 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 ( 1.5 mm) of open space between panels. Do not force into place.
- E. 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. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
- F. Attach gypsum panels to framing provided at openings and cutouts.
- G. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches ( 813 mm) wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.
- H. Cover both faces of stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases 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. ( 0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits, conform to clearance requirements of firstopping system or fire dampers at rated wall assemblies.
- I. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch- ( 6.4- to 12.7-mm-) 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.
- J. Where acoustically sealed 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.

- K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

### 3.3 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.
    - a. At stairwells and other high walls, install panels horizontally.
- B. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers prior to applying base layers on walls/partitions; apply gypsum wallboard face layers in same sequence. Offset face-layer joints one framing member, 16 inches ( 400 mm) minimum, from parallel base-layer joints. Apply base layers at right angles to framing members, unless otherwise indicated.
- C. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and gypsum wallboard face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints. Stagger joints on opposite sides of partitions.
- D. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:
  - 1. Fasten with screws.
- E. Multilayer Fastening Methods: Apply base layers of gypsum panels and face layer to base layers as follows:
  - 1. Fasten both base layers and face layers separately to supports with screws.

### 3.4 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 cornerbead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. 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 trim can only be installed after gypsum panels are installed.

- D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Contracting Officer for visual effect.
  - 1. Install control joints on 30 foot maximum centers, for all partitions, at locations indicated, and as detailed. Align control joints with door frames wherever possible, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
  - 2. Install control joints at 50 foot maximum centers, with areas not to exceed 2,500 sq. ft. for all ceiling areas, at locations indicated, and as detailed.

### 3.5 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
- C. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.
- D. Levels of Gypsum Board Finish: Provide level of gypsum board finish per GA-214 'Recommended Specification: Levels of Gypsum Board Finish' for wall finish scheduled, and as follows:
  - 1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
  - 2. Level 2 where panels form substrates for tile.
  - 3. Level 4 for gypsum board surfaces, unless otherwise indicated.
  - 4. Level 5 for gypsum board surfaces where specifically indicated on schedules.
- E. Use the following joint compound to the finish levels specified, except as noted below:
  - 1. Embedding and First Coat: Ready-mixed, drying-type, taping compound.
  - 2. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose compound.
  - 3. Finish (Third) Coat: Ready-mixed, drying-type, topping compound.
- F. Use the following joint compound combination for for water-resistant gypsum backing board as applicable to the finish levels specified:
  - 1. Embedding and First Coat: Job mixed setting-type joint compound.
  - 2. Fill (Second) Coat: Job mixed setting-type joint compound.
  - 3. Finish (Third) Coat: Job mixed sandable, setting-type joint compound. Omit Finish Coat on for water-resistant gypsum backing board to receive ceramic tile finish.
- G. Where Level 5 gypsum board finish is indicated, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories; and apply a thin, uniform skim coat of joint compound over entire surface. For skim coat, use joint compound specified for third coat, or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Touch up and sand between coats and after last coat

as needed to produce a surface free of visual defects, tool marks, and ridges and ready for decoration.

1. Provide Level 5 finish at all areas where wall washed lighting is indicated and at surfaces scheduled to receive gloss paint.
- H. Provide Level 4 gypsum board finish unless noted otherwise, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.
- I. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.
- J. Where indicated as "Firetape" provide Level 1 gypsum board finish is indicated, embed tape in joint compound..

### 3.6 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

## SECTION 09310 - CERAMIC TILE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Unglazed ceramic mosaic tile.
  - 2. Glazed wall tile.
  - 3. Stone thresholds.
- B. Sealing of expansion, contraction, control, and isolation joints in tile surfaces is specified in Division 7 Section "Joint Sealant."

#### 1.2 SUBMITTALS

- A. Product data for each type of product specified.
- B. Samples of grout and tile demonstrating full range of colors available, for initial selection purposes.
- C. Samples for Verification: Samples of each color of tile, marble threshold, or accessory to be provided, for verification purposes. Where products involve normal color and texture variations, includes sample sets showing the full range of variations expected.
- D. 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 Officers and Owners, plus other information specified.

#### 1.3 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.

#### 1.4 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.

#### 1.5 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.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following, or equivalent:
  - 1. Ceramic Tile: American Olean or Daltile.
  - 2. Mortars and Grouts:
    - a. Bostik Construction Products Div. (Hydroment)
    - b. Laticrete International Inc.
    - c. Mapei 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 complying with the following requirements:
  - 1. Match color, texture, and pattern indicated by reference to manufacturer's standard designations for these characteristics.
  - 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.

## 2.3 TILE PRODUCTS

- A. Unglazed Ceramic Mosaic Tile: Provide factory-mounted flat tile complying with the following requirements:

1. Composition: Porcelain.
2. Wearing Surface: Smooth, with abrasive admixture for shower floors and locker room floors.
3. Wearing Surface: Smooth, without abrasive admixture for all other floors.
4. Module Size: 2 inch x 2 inch
5. Nominal Thickness: 1/4 inch.
6. Face: Plain with cushion edges.
7. Product: American Olean "Unglazed Ceramic Mosaics".
8. Colors: As selected by Contracting Officer
9. Pre-mounted Sheets: Factory backmount tiles in sheets.

- B. Glazed Wall Tile: Provide flat tile complying with the following requirements:

1. Module Size: 4-1/4 by 4-1/4 inches
2. Thickness: 5/16 inch (8 mm).
3. Face: Plain with cushion edges.
4. Product: American Olean "Bright and Matte".
5. Colors: As selected by Contracting Officer

- C. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile (unless colors are noted otherwise on Finish Schedule) and to comply with following requirements:

1. Typical Cove Base: 4" high, unless otherwise indicated
2. Provide bull-nose top cap at wainscot
3. Provide preformed internal and external corners for base and wall tile.

## 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.

1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch (12.7 mm) or less, and finish bevel to match face of threshold.

- 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 marble in white color, with honed finish, complying with MIA Group "A" requirements for soundness.

## 2.5 SETTING MATERIALS

- A. Latex-Portland Cement Mortar: Comply with ANSI A118.4. Provide one of the following, or approved equal:
  1. Kerabond with Keralastic; Mapei Corp.
  2. Laticrete 4237 with 211 Crete Filler Powder; Laticrete International, Inc.

## 2.6 GROUTING MATERIALS

- A. Latex-Portland Cement Grout for Unglazed Tile: ANSI A118.6, consisting of commercial sanded portland cement grout with latex additive. Provide the following, or equal, in colors as selected by Contracting Officer.
  1. Laticrete Floor Grout and Joint Filler (Sanded) with Laticrete Grout Admix; Laticrete International, Inc.
- B. Latex-Portland Cement Grout for Glazed Tile: ANSI A118.6, consisting of commercial unsanded portland cement grout with latex additive. Provide the following, or equal, in colors as selected by Contracting Officer.
  1. Laticrete Dry-Set Wall Grout (Unsanded) with Laticrete Grout Admix; Laticrete International, Inc.

## 2.7 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. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.
- C. Grout Release: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
  1. Product: Miracle Sealants Inc., "511 Impregnator", or equivalent.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

## 2.8 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.
  - 3. Verify that subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
  - 4. Perform moisture test at rate of one per 2,000 sq.ft.
- B. 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 manufacturer's directions to fill cracks, holes, and depressions in substrates and to patch and level floors as required to provide suitable substrate for tile application.
- C. Remove coatings, including curing compounds, and other substances that could interfere with adhesion of tile by using a grinder, sander, or polishing machine 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. 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.

### 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: 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. Tile Patterns: Comply with pattern indicated on drawings.
- G. Expansion Joints: Provide expansion joints, control joints and pressure relieving joints of widths and at locations as per TCA Handbook Construction #EJ171. Do not saw cut joints after installation of tiles.
  - 1. Sealing of joints is included in Division 7 Section "Joint Sealers."
- H. Grout tile to comply with ANSI A108.10.

#### 3.4 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. Concrete Subfloor - (thin set)- TCA F113, as follows:
    - a. Bond Coat for Tile: Latex-portland cement mortar, ANSI A108.5 over subfloor.
    - b. Grout: Latex-portland cement.
- B. Joint Widths: Install ceramic tile on floors with 1/16" joint widths.
- C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile unless otherwise indicated. Sealant is specified in Section 07920.

- D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

### 3.5 WALL TILE INSTALLATION METHODS

- A. Glazed Tile: Install tile to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:
  - 1. Gypsum Board over Wood Studs - TCA W243, and as follows:
    - a. Bond Coat: Latex-portland cement mortar, ANSI A108.5, over gypsum board
    - b. Grout: Latex-portland cement.
- B. Joint Widths: Install tile on walls with 1/16" joint widths.

### 3.6 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. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
- 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. 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



## SECTION 09511 - ACOUSTICAL PANEL CEILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes ceilings consisting of acoustical panels and exposed suspension systems.
- B. Related Sections include the following:
  - 1. Acoustical sealants are specified in Division 7 Section "Joint Sealants"

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product specified
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
  - 1. Ceiling suspension members.
  - 2. Method of attaching hangers to building structure.
  - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
  - 4. Minimum Drawing Scale: 1:100
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on samples of size indicated below.
  - 1. 6-inch- (150-mm-) square samples of each acoustical panel type, pattern, and color.
  - 2. Set of 12-inch- (300-mm-) long samples of exposed suspension system members, including moldings, for each color and system type required.
- D. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.
- E. Research/Evaluation Reports: Evidence of acoustical panel ceiling's and components' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
- F. Maintenance Data: For finishes to include in maintenance manuals.

#### 1.3 QUALITY ASSURANCE

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

- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
- C. Surface-Burning Characteristics: Acoustical panels complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84.
  - 1. Smoke-Developed Index: 450 or less.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels 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 panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

#### 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

#### 1.6 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

### PART 2 - PRODUCTS

#### 2.1 ACOUSTICAL PANELS

- A. Acoustical Panel Standard: Provide manufacturer's standard panels 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: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.
- B. Acoustical Panels for Acoustical Panel Ceiling ACT-1: Where this designation is indicated, provide panels selected for moisture- and sag-resistance, and complying with the following:

1. Classification: Panels fitting ASTM E 1264 for Type III, mineral base with painted finish; Form 1.
2. Pattern: Panels fitting ASTM E 1264 pattern designation (description) EIC.
3. Color: White.
4. Light Reflectance Coefficient: Not less than LR 0.85.
5. Noise Reduction Coefficient: NRC 0.75.
6. Ceiling Attenuation Class: Not less than CAC 35.
7. Anti-Mold and Mildew Treatment: Armstrong's BioBlock Plus paint
8. Formaldehyde: Low formaldehyde-based resin content
9. Warranty: 30 year.
10. Edge Detail: Angled tegular.
11. Thickness: 7/8 inch
12. Size: 24 by 24 inches (600 by 600 mm).
13. Product: Armstrong Cirrus Open Plan No. 556.

## 2.2 METAL SUSPENSION SYSTEMS

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.
- B. Suspension System for Acoustical Panel Ceiling ACT: Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 (Z120) coating designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges; other characteristics as follows:
  1. Structural Classification: Intermediate-duty system.
  2. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
  3. Face Design: Flush face.
  4. Cap Material: Steel sheet.
  5. Cap Finish: Manufacturer's standard factory-applied painted finish in white.
  6. Product: Armstrong Prelude system.
- C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
  1. Power-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 and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
  1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

- E. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish and color as that used for exposed flanges of suspension system runners.

## 2.3 ACOUSTICAL SEALANT

- A. Refer to Division 7 Section "Joint Sealants".

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

### 3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
  1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
- 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 supporting structure or of 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. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings 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 and publications.
  4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either 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.
  5. Attach hangers to structural members.
  6. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; 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 ceiling area and where necessary to conceal edges of acoustical panels.
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 more than 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 mm in 3.6 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. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.
  2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
  3. Install with a minimum of 1/4 -inch (6.4 mm) clearance on all sides sprinkler heads and other penetrations.

### 3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION



## SECTION 09650 - RESILIENT FLOORING AND ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes the following:

1. Vinyl composition floor tile.
2. Vinyl wall base.
3. Resilient flooring accessories.

#### 1.2 SUBMITTALS

A. Product data for each type of product specified.

1. Include certification by adhesive manufacturer that products supplied for tile installation comply with local regulations controlling use of volatile organic compounds (VOC's).

B. Samples for verification purposes in form of actual flooring or sections of accessories for each color and pattern specified.

C. Shop Drawings: Indicate decorative pattern layout. Indicate location of columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutout locations.

D. Maintenance data for resilient flooring and accessories, to include in Operating and Maintenance Manual specified in Division 1.

#### 1.3 QUALITY ASSURANCE

A. Single-Source Responsibility for Floor Tile and Accessories: Obtain each type, color, and pattern of tile and accessory from a single source; all stair accessories shall be from one manufacturer.

B. Fire Performance Characteristics: Provide resilient flooring 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.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient materials on flat surface in dry space protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).

- B. Move floor coverings and installation accessories into spaces where they will be installed at least 48 hours before installation, unless longer conditioning periods are recommended in writing by manufacturer.

#### 1.5 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive resilient flooring 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 flooring if subfloor moisture emission rate exceeds indicated amounts when tested by calcium chloride moisture test, with subfloor temperatures not less than 55 deg F.
  - 1. Resilient Tile Flooring: Not more than 5 lb/1000 sq. ft./24 hours.
- C. Do not install flooring or accessories until they are at the same temperature as the space where they are to be installed.
- D. Close spaces to traffic during flooring installation.

#### 1.6 SEQUENCING AND SCHEDULING

- A. Install flooring and accessories after other finishing operations, including painting, have been completed.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
  - 1. Vinyl Composition Tiles:
    - a. Armstrong World Industries
    - b. Azrock
    - c. Tarkett
  - 2. Base and Other Accessories: Endura, Roppe or Johnsonite

#### 2.2 PRODUCTS, GENERAL

- A. Colors, Textures, and Patterns: Provide tile and accessories in color, texture and pattern to match specified products. Colors and patterns indicated by reference to manufacturer's name and designations are for color and pattern identification only and are not intended to limit selection of other manufacturer's products with similar colors and patterns. If no colors or patterns are indicated, provide color(s) and pattern(s) as selected by Contracting Officer from manufacturer's standards.

#### 2.3 RESILIENT TILE

- A. Vinyl Composition Floor Tile (VCT): Products complying with ASTM F 1066, Composition 1 (non-asbestos formulated), Class 2, through pattern tile, 12" x 12" x 1/8" thick, and as follows:
  - 1. Wearing Surface: Smooth.
  - 2. Products: Armstrong Excellon Imperial or equal.
  - 3. Colors and Patterns: As selected by Contracting Officer from full range of industry colors and patterns available.

#### 2.4 RESILIENT WALL BASE

- A. Vinyl Wall Base: ASTM F 1861, Type TV (vinyl, thermoplastic), Group 1 (solid), 4" high, 1/8" thick, straight (toeless) style for all carpeted areas and cove base with toe (set-on type) elsewhere. Provide matching pre-formed corner pieces.
  - 1. Colors: As selected by Contracting Officer from full range of industry colors available.

#### 2.5 MISCELLANEOUS RESILIENT ACCESSORIES

- A. Color: As selected by Contracting Officer from manufacturer's full range of colors produced for accessory molding complying with requirements indicated.
- B. Vinyl Accessory Moldings: Provide vinyl accessory molding complying with the following:
  - 1. Product Description: Carpet edge for glue-down applications, carpet nosing, nosing for rubber tile, reducer strip for resilient flooring, and tile and carpet joiner.
  - 2. Profile and Dimensions: As indicated or required.

#### 2.6 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.
- B. Concrete Sealer: Type recommended and approved by resilient flooring manufacturer and adhesive manufacturer to ensure proper adhesion of resilient flooring to substrate
- C. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
- D. Adhesives (Cements): Water-resistant type recommended by flooring and accessory manufacturers to suit resilient products and substrate conditions indicated.
  - 1. Use adhesives that have a VOC content of not more than the following when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    - a. VCT, Wall Base, Accessories: 50 g/L

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. General: Examine areas where installation of flooring will occur, with Installer present, to verify that substrates and conditions are satisfactory for flooring installation and comply with flooring 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 tests recommended by flooring 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. Concrete Moisture Emission Tests: Perform calcium chloride test as per manufacturer's directions, as follows, and other tests if recommended by resilient flooring and adhesive manufacturer:
  - 1. Perform moisture test at rate of one per 2,000 sq.ft. of floor area to be covered.
  - 2. Report test results in writing to Contracting Officer, and Contractor within 24 hours after tests are completed. Reports of concrete moisture emission tests shall contain the Project identification name and number, date of test location of test within structure.
  - 3. Perform additional moisture emission tests of in-place concrete when test results indicate specified moisture content has been exceeded, as directed by Contracting Officer.
    - a. Repeat test one week after initial test minimally and additionally repeat test if required by field conditions to determine moisture levels in area of resilient flooring application.
- D. 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 flooring.
- B. Use trowelable leveling and patching compounds per flooring manufacturer's directions to fill cracks, holes, and depressions in substrates and to patch and level floors as required to provide suitable substrate for flooring application.
- C. Broom or vacuum clean substrates to be covered by flooring immediately before installation of flooring. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

### 3.3 TILE 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 so tiles at opposite edges of room are of equal width. 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 in decorative pattern as directed by Contracting Officer.
- D. Scribe, cut, and fit tiles to butt tightly to vertical surfaces and edgings.
- E. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install tiles on covers for telephone and electrical ducts, and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on 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 INSTALLATION OF WALL BASE AND ACCESSORIES

- A. General: Install resilient accessories according to manufacturer's written installation instructions.
- B. Apply resilient wall base to walls, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
  - 1. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- C. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that otherwise would be exposed.

#### 3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing installation:

1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers.
  2. Sweep or vacuum floor thoroughly.
  3. Do not wash floor until after time period recommended by resilient flooring manufacturer.
  4. Damp-mop flooring 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 flooring manufacturer.
1. Apply protective floor polish to flooring surfaces that are free from soil, visible adhesive, and surface blemishes. Coordinate selection of floor polish with Government's maintenance service requirements.
  2. Cover flooring with undyed, untreated building paper until inspection for Substantial Completion.
- C. Clean flooring not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean flooring 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

## SECTION 09671 - RESINOUS FLOORING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section Includes Resinous Flooring Systems with Epoxy Body Coats:
  - 1. Application Method: Self-Leveling Slurry with Broadcast Aggregates.

#### 1.2 SUBMITTALS

- A. Product data consisting of manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required and crack suppression membrane.
- B. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing in color specified.
- C. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- D. Material Test Reports: For each resinous flooring component.
- E. Material Certificates: For each resinous flooring component, signed by manufacturer.
- F. Maintenance Data: For resinous flooring to include in maintenance manuals.

#### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
  - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.

- B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

## 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Maintain temperature above 50 deg F for 48 hours before and during installation. The minimum slab temperature for crack suppression system must be conditioned to between 60°F and 90°F before commencing installation, during installation, and for at least 72 hours after installation is complete.
- B. Environmental Conditions: Comply with resinous flooring manufacturer's directions for maintenance of substrate temperature, moisture, ventilation, and other conditions required to execute and protect Work.
- C. Subfloor Moisture Conditions: Moisture emission rate of not more than 3 lb/1000 sq. ft./24 hours when tested by calcium chloride moisture test, with subfloor temperatures not less than (55 deg F).
- D. Substrate Conditions: Do not install resinous flooring unless moisture content of concrete slab has attained acceptable levels as per each individual manufacturer's requirements for their product.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Ceramic Carpet #554 system by General Polymers Corporation, or an approved equivalent by one of the following:
  - 1. Selby-Ucrete Industrial Flooring, a division of Master Builders, Inc.
  - 2. Stonhard, Inc.

### 2.2 RESINOUS FLOORING

- A. System Components: Manufacturer's standard components that are compatible with each other and as follows:
  - 1. Primer: Compound recommended by crack isolation resin manufacturer for priming substrate; 3579 Epoxy Primer, General Polymers Corp.
  - 2. Flexible Epoxy Isolation Membrane: Epoxy-resin matrix manufacturer's 100 percent solids epoxy membrane with fiberglass scrim for crack penetration; Flex-Grid System (3552 Epo-Flex Epoxy and FS38 Fiberglass Scrim, General Polymers Corp.
  - 3. Slurry Coat: 3553 Epoxy Resin Glaze, plus 5900F colored quartz granules.
  - 4. Sealer Coats (2 Coats Required): 3744 High Performance Chemical Resistant Epoxy-Cote.
- B. System Characteristics:
  - 1. Color and Pattern: As selected by Contracting Officer from manufacturer's full range.

2. Wearing Surface: Textured for slip resistance.
  3. Integral Cove Base: 4 inches (100 mm) high.
  4. Overall System Thickness: 1/8 inch to 3/16 inch (3.2 mm to 4.8 mm).
- C. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
1. Tensile Strength: 1,500 psi per ASTM C 307.
  2. Flexural Modulus of Elasticity: 6,000 psi per ASTM C 580.
  3. Flammability: Self-extinguishing per ASTM D 635.
  4. Hardness: 40 at 24 hours, Shore D per ASTM D 2240.
  5. Bond Strength: 350 psi, 100 percent concrete failure per ACI 503R.

### 2.3 ACCESSORY MATERIALS

- A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of resin flooring. Do not proceed with installation until unsatisfactory conditions, including levelness tolerances, have been corrected.

### 3.2 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
  1. Roughen concrete substrates as follows:
    - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
  2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
  3. Verify that concrete substrates are dry.

- a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab in 24 hours.
  - b. Perform moisture test at rate of three for the first 1,000 sq. ft. (92.9 sq. m) and one additional test for each 1,000 sq. ft. (92.9 sq. m) of new and existing floor area to be covered.
4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
  5. Verify that substrates and conditions are satisfactory for resin floor installation and comply with requirements specified. Do not proceed with installation until unsatisfactory conditions have been corrected.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

### 3.3 CRACK ISOLATION SYSTEM INSTALLATION

- A. Prepare and prefill substrate cracks with membrane material and install flexible epoxy isolation membrane according to manufacturer's written instructions. Prepare floor substrate according to manufacturer's written instructions before applying substrate primer.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply each component of the crack suppression system in compliance with manufacturer's written installation instructions and strictly adhere to mixing and installation methods, recoat windows, cure times and environmental restrictions.
- D. Apply reinforcing membrane to substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.
- E. Cure crack suppression system materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of the installation and prior to completion of the curing process.
- F. Protect the crack suppression system from damage and wear during other phases of the construction operation, using temporary coverings as recommended by the manufacturer, if required. Remove temporary covering just prior to final installation of resin flooring.
- G. Clean the crack suppression system just prior to installation of resin flooring, using materials and procedures suitable to the system manufacturer.

### 3.4 APPLICATION

- A. General: Apply each component of resinous flooring system according to manufacturer's directions to produce a uniform monolithic wearing surface of 1/8 to 3/16 inch overall thickness.
- B. Resinous Flooring: Apply prime coat, slurry coat and finish coats as required to obtain seamless flooring matching mock-up.
- C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring to form cove base height of 4 inches unless otherwise indicated. Round internal and external corners. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base.
- D. Apply sealing or finish coat(s), of type indicated, to produce finish indicated. Apply in number of coats and at spreading rates recommended in writing by manufacturer.
- E. Joints: Where substrate is interrupted by expansion or control joints, provide joint in resinous flooring to comply with details indicated or, if not otherwise indicated, as recommended by resinous flooring manufacturer.
  - 1. Apply joint sealant materials to comply with resinous flooring manufacturer's recommendations.

### 3.5 CURING, PROTECTION, AND CLEANING

- A. Cure resinous flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and application method.
- C. Cleaning: Remove temporary covering and clean resinous flooring just before final inspections. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION



## SECTION 09681 - CARPET TILE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes carpet tile and installation.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, and durability. Include installation methods.
- B. Shop Drawings: Show the following:
  - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
  - 2. Existing flooring materials to be removed.
  - 3. Existing flooring materials to remain.
  - 4. Carpet tile type, color, and dye lot.
  - 5. Type of subfloor.
  - 6. Type of installation.
  - 7. Pattern of installation.
  - 8. Pattern type, location, and direction.
  - 9. Pile direction.
  - 10. Type, color, and location of insets and borders.
  - 11. Type, color, and location of edge, transition, and other accessory strips.
  - 12. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
  - 1. Carpet Tile: Full-size sample
  - 2. Exposed Edge Stripping and Accessory: 12-inch- (300-mm-) long samples.
- D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.
- E. Maintenance Data: For carpet tile to include in maintenance manuals specified in Division 1. Include the following:
  - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
  - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Mockups: Before installing carpet tile, install mockups for each type of carpet tile installation required to demonstrate aesthetic effects and qualities of materials and execution. Install mockups to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Contracting Officer.
  - 2. Notify Contracting Officer seven days in advance of dates and times when mockups will be installed.
  - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 4. Obtain Contracting Officer's approval of mockups before starting work.
  - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 6. Remove mockups when directed.
  - 7. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
- C. Performance Characteristics of Carpet Tile: Provide carpet tile identical to that tested for the following performance characteristics, per test methods indicated:
  - 1. Flammability: Passes DOC FF 1-70 Pill Test.
  - 2. Flame Spread: Meets NFPA Class 1 when tested under ASTM E-648 Glue Down.
  - 3. Smoke Density: 450 or less, Flaming Mode when tested under NBS Smoke Chamber NFPA-258.
  - 4. Static: No more than 3.5 KV when tested under AATCC-134.
  - 5. Specific Optical Density: Not more than 300 in first 4 minutes tested in flaming or non-flaming mode when tested under ASTM E662.

### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with CRI 104, Section 5, "Storage and Handling."

### 1.5 PROJECT CONDITIONS

- A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."
- B. Environmental Limitations: Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tile over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

- D. Where demountable partitions or other items are indicated for installation on top of carpet tile, install carpet tile before installing these items.

## 1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Government of other rights Government may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Carpet Tile Warranty: Written warranty, signed by carpet tile manufacturer agreeing to replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

## PART 2 - PRODUCTS

### 2.1 CARPET TILE

- A. Manufacturers: Provide specified products or equal manufactured by one of the following manufacturers:
  - 1. J&J Industries
  - 2. Milliken.
  - 3. Shaw Contract.
  - 4. Blue Ridge Commercial Carpet.
  - 5. Mohawk Commercial Carpet
- B. Recycled Content of Carpet: Provide carpet with an average recycled content of face fibers and/or backings so postconsumer recycled content plus postindustrial recycled content is not less than 35 percent
- C. Carpet Tile:
  - 1. Construction: Tufted textured loop pile

2. Face Yarn: 100% Miliken Certified WearOn Type 6,6 nylon
3. Dye Method: Space dyed, Millitron
4. Face Weight: 24 oz. per square yard, min.
5. Gauge: 1/8
6. Pile Height: 0.165":
7. Backing: PVC free Comfort Plus ES cushion
8. Secondary Backing: Infinity RE with a minimum 10%post-consumer and 20% pre-consumer recycled content by total product weight.
9. Size: 36 in x 36 in.
10. Guarantees: Lifetime for wear, static, edge ravel, delamination, tuft bind, stain, backing material.
11. Environmental Requirements: Provide carpet tile that complies with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program
12. Product: Midnight Sparkle in "Shetland" pattern by Milliken..
13. Color: As selected by Contracting Officer.
14. Location: As scheduled.

## 2.2 INSTALLATION ACCESSORIES

- A. Carpet Edge Guard: Refer to Section "Resilient Flooring and Accessories."
- B. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by carpet tile manufacturer.
- C. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and that is recommended by carpet tile manufacturer.
  1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Verify that substrates and conditions are satisfactory for carpet tile installation and comply with requirements specified.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Broom and vacuum clean substrates to be covered immediately before installing carpet tile. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 13, "Carpet Modules (Tiles)."
- B. Installation Method: As recommended in writing by carpet tile manufacturer
- C. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- D. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- F. Install pattern parallel to walls and borders, unless otherwise indicated.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 15, "Protection of Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION



## SECTION 09910 - PAINTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior and exterior substrates:
  - 1. Concrete
  - 2. Steel.
  - 3. Galvanized metal.
  - 4. Gypsum board.
  - 5. Wood
  
- B. Related Sections include the following:
  - 1. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. Include manufacturers' product data for paints, including printed statement of VOC content and chemical components, include summary with the number of gallon of each type of paint and actual VOC for use in establishing a VOC budget and actual VOC.
  
- B. Samples for Initial Selection: For each type of topcoat product indicated.
  
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
  - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
  
- D. Product List: For each product indicated, include the following:
  - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

### 1.3 QUALITY ASSURANCE

- A. MPI Standards: Maintain copy of this standard at the Project site at all times.
  - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
  - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Contracting Officer will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
    - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
    - b. Other Items: Contracting Officer will designate items or areas required.
  - 2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
  - 3. Final approval of color selections will be based on benchmark samples.
    - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Contracting Officer at no added cost to Government.

### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

### 1.5 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- C. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Benjamin Moore & Co.
  2. ICI Paints.
  3. M.A.B. Paints.
  4. PPG Architectural Finishes, Inc.
  5. Sherwin-Williams Company (The).

## 2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the OTC (Ozone Transport Commission) restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
4. Floor Coatings: VOC not more than 100 g/L.
5. Shellacs, Clear: VOC not more than 730 g/L.
6. Shellacs, Pigmented: VOC not more than 550 g/L.
7. Flat Topcoat Paints: VOC content of not more than 50 g/L.
8. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
9. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
14. Dry-Fog Coatings: VOC content of not more than 400 g/L.
15. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
16. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.

C. Colors: As selected by Contracting Officer from manufacturer's full range

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Gypsum Board: 12 percent.
  - 3. Wood: 15 percent
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
  - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- H. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Application Procedures: Apply paints and coatings by brush or roller according to the manufacturer's directions, except as noted below. Spray application is not permitted for trim, ceilings and walls, unless specifically approved by Contracting Officer in advance for each individual situation. Roller application on woodwork is not permitted.
  - 1. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
  - 2. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
  - 3. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
- C. 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.
- D. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- E. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- F. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- G. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
  - 1. Mechanical Work:
    - a. Uninsulated metal piping.
    - b. Uninsulated plastic piping.
    - c. Pipe hangers and supports.
    - d. Tanks that do not have factory-applied final finishes.
    - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
    - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
  - 2. Electrical Work:
    - a. Switchgear.
    - b. Panelboards.
    - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

### 3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Government reserves the right to invoke the following procedure at any time and as often as Contracting Officer deems necessary during the period when paints are being applied:
  - 1. Government will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  - 2. Testing agency will perform tests for compliance with product requirements.
  - 3. Contracting Officer may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Contracting Officer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 EXTERIOR PAINTING SCHEDULE

- A. Steel Substrates: Polyurethane, Pigmented, Epoxy Zinc Rich Primer and High-Build Epoxy Coating System: MPI EXT 5.1G.
  - 1. Prime Coat: Epoxy Zinc Rich Primer MPI #20.
    - a. ICI Paints; Devoe Coatings, Catha-Cote, 313.
    - b. Sherwin-Williams Company (The); Industrial & Marine, Zinc Clad IV, B69A8/V8.
    - c. Tnemec: Tneme-Zinc Series 90-97
  - 2. Intermediate Coat: High-performance, polyamide-epoxy coating; High-Build Epoxy Marine Coating, Low Gloss: MPI #108.
    - a. ICI Paints; Devoe Coatings, Bar-Rust 235, 235.
    - b. Sherwin-Williams Company (The); Industrial & Marine, Macropoxy 646, B58W6 Series.
    - c. Tnemec: Hi-Build Epoxoline, Series 66, tinted slightly lighter than top coat.
  - 3. Topcoat: Polyurethane, Two-Component, Pigmented, Gloss: MPI #72
    - a. ICI Paints ; Devoe Coatings, Devthane Aliphatic Urethane, 379
    - b. Sherwin-Williams Company (The); Industrial & Marine, Sherthane 2K Urethane, B651150/V150.
    - c. Tnemec Endura-Shield Series 75.
- B. Zinc-Coated (Galvanized) Metal: **Full-gloss, alkyd-enamel finish** - 2 finish coats over a galvanized metal primer.
  - 1. Prime Coat: Factory-formulated galvanized metal primer for exterior application; Rust-Inhibitive Primer (Water Based), MPI #107; VOC Content Range - E3; Environmental Performance Rating -EPR 3.
    - a. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04
    - b. ICI Dulux Paints; 4160-XXXX Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
    - c. Sherwin-Williams; Galvite HS Paint B50WZ3: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  - 2. Intermediate Coat and Topcoat: Factory-formulated full-gloss alkyd enamel for exterior application. VOC Content Range - E3; Environmental Performance Rating -EPR 3.

- a. Benjamin Moore; Moore's IMC Urethane Alkyd Enamel M22
  - b. ICI Dulux Paints; 4308-XXXX Devguard Alkyd Industrial Gloss Enamel
  - c. Sherwin-Williams; Industrial Enamel B-54 Series
- C. Wood Substrates: **Semigloss Waterborne Acrylic-latex Enamel Latex System**; MPI EXT 6.4K, 2 finish coats over a primer.
- 1. Exterior Latex Wood Primer: MPI #6; Prime Coat: Factory-formulated acrylic-latex primer for exterior application; VOC <200 g/L; VOC Content: E Range - E2.
    - a. Benjamin Moore; Moorcraft Super Spec Latex Exterior Primer No. 169-00
    - b. ICI Dulux Paints; 2000-1200 Dulux Professional Exterior 100 Percent Acrylic Latex Primer.
    - c. Sherwin-Williams; PrepRite ProBlockInt/Ext Latex Primer Sealer B51W00020
  - 2. Intermediate Coat and Topcoat: Factory-formulated semigloss waterborne acrylic-latex enamel for exterior application; MPI # 15 Exterior Latex, Low Sheen, MPI Gloss Level 3-4, VOC Content Range - E3.
    - a. Benjamin Moore; Moorcraft Super Spec 100% Acrylic Satin No. 184.
    - b. ICI Dulux Paints; 2406-XXXX Dulux Professional Exterior 100 Percent Acrylic Semi-Gloss Finish.
    - c. Sherwin-Williams; A-100 Latex Satin A82 Series.

### 3.7 INTERIOR PAINTING SCHEDULE

- A. Conventional Gypsum Board Ceilings: **Flat acrylic finish** - MPI INT 9.2M.
- 1. Prime Coat: Latex-based, interior primer; Institutional Low Odor/VOC Interior Latex Primer Sealer, MPI #149; VOC Content Range - E3; Environmental Performance Rating -EPR 3.
    - a. Benjamin Moore; Pristine Eco Spec Interior Latex Primer Sealer No. 231.
    - b. ICI Dulux Paints; LifeMaster 2000 Interior Latex Wall Primer LM 9116.
    - c. Sherwin-Williams; Harmony Interior Latex Primer B11W900.
  - 2. Intermediate Coat and Topcoat: Factory-formulated flat acrylic latex paint for interior application; Institutional Low-Odor/VOC Latex (Flat), MPI #143 (Gloss Level 1); VOC Content - E3; Environmental Performance Rating -EPR 4.
    - a. Benjamin Moore; Pristine Eco Spec Interior Latex Flat No. 219.
    - b. ICI Dulux Paints; LifeMaster 2000 Interior Flat, LM 9100.
    - c. Sherwin-Williams; Harmony Interior Latex B5 Series.
- B. Gypsum Drywall Walls: **Low-luster (eggshell), acrylic finish** - MPI INT 9.2M.
- 1. Prime Coat: Latex-based, interior primer; Institutional Low Odor/VOC Interior Latex Primer Sealer, MPI #149; VOC Content - E3; Environmental Performance Rating -EPR 3.
    - a. Benjamin Moore; Pristine Eco Spec Interior Latex Primer Sealer No. 231.
    - b. ICI Dulux Paints; LifeMaster 2000 Interior Latex Wall Primer LM 9116.
    - c. Sherwin-Williams; Harmony Interior Latex Primer B11W900.

2. Intermediate Coat and Topcoat: Low-luster (eggshell or satin), acrylic-latex, interior enamel; Institutional Low-Odor/VOC Latex (Low Sheen), MPI #144 (Gloss Level 2); VOC Content - E3; Environmental Performance Rating -EPR 4.5
    - a. Benjamin Moore; Pristine Eco Spec Interior Latex Eggshell Enamel No. 223.
    - b. ICI Dulux Paints; LifeMaster 2000 Interior Eggshell, LM 9300.
    - c. Sherwin-Williams; Harmony Interior Latex Eg-Shel B9 Series.
- C. Gypsum Drywall Walls: **Semi-Gloss, waterborne acrylic epoxy finish** - similar to MPI INT 9.2F.
1. Prime Coat: Latex or two component epoxy-based, interior primer:
    - a. Benjamin Moore; I.M.C. Waterborne Epoxy Primer #M08/M09.
    - b. ICI Dulux Paints; 3210-1200 Ultra-Hide Aquacrylic GRIPPER Stain Killer Primer Sealer
    - c. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series.
  2. Intermediate Coat and Topcoat: Two component semi-gloss acrylic-epoxy; Interior/Exterior Epoxy (water based), MPI #115; VOC Content - E1, <250 g/L.
    - a. Benjamin Moore; I.M.C. Acrylic Epoxy Semi-Gloss #M43/M44.
    - b. ICI Dulux Paints; Tru-Glaze 4418 Waterborne Epoxy Coating.
    - c. Sherwin-Williams; Water Based Catalyzed Epoxy B70/B60V25.
- D. Concrete Floors: **Semigloss, waterborne epoxy Polyamide self-priming finish** - VOC Range <250; similar to MPI INT 3.2C.
1. Intermediate Coat and Topcoat:
    - a. Benjamin Moore; I.M.C. Acrylic Epoxy Gloss #M43/M44. Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
    - b. ICI Devco Paints, Tru-glaze-WBTM 4406, Waterborne Epoxy, Semi-Gloss Coating, 4406-XXXX/4408-9999
    - c. Sherwin-Williams; Armorseal Floor-Plex 7100 B70400/V400
- E. Hollow Metal Doors, Frames, and Sidelights, and Ferrous Metals: **Semigloss, acrylic-enamel finish** - MPI INT 5.1S.
1. Prime Coat: Rust-Inhibitive Primer (Water Based), MPI #107; VOC E Range of E2; Environmental Performance Rating -EPR 2.
    - a. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04.
    - b. ICI Dulux Paints; 4020-XXXX Devflex DTM Flat Interior/Exterior Waterborne Primer & Finish
    - c. Sherwin-Williams; Aquaclad Water based Primer, B55-A710 Series.
  2. Intermediate Coat and Topcoat: Factory-formulated semigloss acrylic-latex enamel for interior application; Institutional Low-Odor/VOC Latex (Low Sheen), MPI #144 (Gloss Level 2); VOC E Range of E3; Environmental Performance Rating -EPR 5.
    - a. Benjamin Moore; Pristine Eco Spec Interior Latex Semi-Gloss Enamel No. 224.
    - b. ICI Dulux Paints; LifeMaster 2000 Interior Semi-Gloss, LM 9200.
    - c. Sherwin-Williams; Harmony Interior Latex Semi-Gloss B10 Series.

- F. Woodwork and Hardboard: **Semigloss, acrylic-enamel finish**, MPI INT 6.3V.
1. Prime Coat: Interior Latex-Based Wood Primer, MI #39; VOC E Range of E3; Environmental Performance Rating -EPR 3.
    - a. Benjamin Moore; Pristine Eco Spec Interior Latex Primer Sealer No. 231.
    - b. ICI Dulux Paints; Prep & Prime Gripper Multi-purpose Interior/Exterior Water-Based Primer Sealer 3210-1200.
    - c. Sherwin-Williams; Harmony Interior Latex Primer B11W900.
  2. Intermediate Coat and Topcoat: Factory-formulated semigloss acrylic-latex enamel for interior application; Institutional Low-Odor/VOC Latex (Low Sheen), MPI #144 (Gloss Level 2); VOC E Range of E3; Environmental Performance Rating -EPR 5.
    - a. Benjamin Moore; Pristine Eco Spec Interior Latex Semi-Gloss Enamel No. 224.
    - b. ICI Dulux Paints; LifeMaster 2000 Interior Semi-Gloss, LM 9200.
    - c. Sherwin-Williams; Harmony Interior Latex Semi-Gloss B10 Series.

END OF SECTION

## SECTION 10200 - LOUVERS AND VENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section Includes the Following:

1. Fixed, extruded-aluminum louvers.

B. Related Sections Include the Following:

1. Division 7 Section "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
2. Division 15 Sections for louvers that are a part of mechanical equipment.

#### 1.2 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

#### 1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of louvers.

1. Wind Loads: Uniform pressure (velocity pressure) of 18 lbf per sq. ft. acting inwards.

B. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on 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.

C. Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.
- C. Samples for Initial Selection: For units with factory-applied color finishes
- D. Samples for Verification: For each type of metal finish required.
- E. Product Certificates: Signed by manufacturers stating the location of the material manufacturer and the distance from the manufacturer to the Project site.

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

#### 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
  - 1. Basis-of-Design Product: The design for each louver is based on the product named. Subject to compliance with requirements, provide either the named product or approved equivalent by one of the other manufacturers specified.
    - a. Construction Specialties.
    - b. Airolite Co.
    - c. Reliable Metal Products.
    - d. Industrial Acoustics Company.

#### 2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T5 or T-52.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 for required finish.
- C. Aluminum Castings: ASTM B 26/B 26M, alloy 319.
- 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 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. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

### 2.3 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Where indicated, provide subsills made of same material as louvers or extended sills for recessed louvers.
- F. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

### 2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Double Drainable-Blade Louver:
  - 1. Basis-of-Design Product: Construction Specialties, Inc.; Model A4157.
  - 2. Louver Depth: 4-inches (100 mm).
  - 3. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch (2.0 mm).

4. Mullion Type: Fixed.
5. Performance Requirements:
  - a. Free Area: Not less than 8.22 sq. ft. (0.764 sq. m) for 48-inch- (1.2 mm) wide by 48-inch (1.2 mm) high louver.
  - b. Percent Free Area: 51.4
  - c. Point of Beginning Water Penetration: Not less than 849 fpm (258.9 m/min).
6. Sizes: Refer to Contract Drawings for sizes, configurations, and locations.
7. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

## 2.5 LOUVER SCREENS AND BLANK-OFF PANELS

- A. General: Provide screen at each exterior louver.
  1. Screen Location for Fixed Louvers: Interior face.
  2. Screening Type: Bird screening. NO Insect screening allowed.
- B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
  1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
  2. Finish: Same finish as louver frames to which louver screens are attached.
- D. Louver Screening for Aluminum Louvers:
  1. Bird Screening: Aluminum, 1/2-inch- (12.7-mm-) square mesh, 0.063-inch (1.6-mm) wire.

## 2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish louvers after assembly.

## 2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- B. 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 manufacturers' written instructions.

1. Fluoropolymer Two-Coat Coating System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
  - a. Color and Gloss: Contracting Officer shall select from manufacturer's standard range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
  1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 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.

### 3.3 INSTALLATION

- A. Locate and place louvers level, plumb, 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. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, 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 weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

### 3.4 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of louvers 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. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Contracting Officer, remove damaged units and replace with new units.
  - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

## SECTION 10431 - SIGNS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section Includes the Following:

1. Panel Signs.
2. Signage Accessories.
3. Dimensional letters.

B. Related Sections Include the Following:

1. Division 15 Mechanical section for labels, tags, and nameplates for mechanical equipment.
2. Division 16 Electrical section for labels, tags, and nameplates for electrical equipment.
3. Division 16 Electrical section for illuminated exit signs and lighting for exterior signage. .

#### 1.2 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.

1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and braille layout.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. 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.
4. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers

C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.

D. Samples for Verification: For each type of sign, include the following Samples to verify color selected:

1. Panel Signs: Full-size Samples of each type of sign required.
2. Dimensional Letters and Symbols: Provide full-size representative samples of each dimensional letter type and symbol required, showing letter style, color, and material finish and method of attachment
3. Approved samples will be returned for installation into Project.

- E. Qualification Data: For Installer.
- F. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative of signage manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain each sign type through one source from a single manufacturer.
- C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.
  - 1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
    - a. Illuminated Exit Signs: Refer to Division 16.
    - b. Fire Doors.
    - c. Signs for Accessible Spaces.
    - d. Room Capacity

### 1.4 PROJECT CONDITIONS

- A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.
- B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

### 1.5 COORDINATION

- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
  - 1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

### 2.2 PANEL SIGNS

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally.
  2. Sign materials shall meet a Class A Flame Spread.
- 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. ASI Sign Systems, Inc.
  2. Innerface Architectural Signage, Inc.
  3. Modulex.
  4. Mohawk Sign Systems
- C. Interior Panel Signs: Sand carved 1/8 inch (3.1 mm) thick melamine plastic. Provide lettering, graphics and background materials in colors as selected by Contracting Officer from manufacturer's standard color line.
1. Produce smooth, even, level sign surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.58 mm) measured diagonally.
  2. Lettering and Braille Content: Provide uppercase letters raised 1/32 inch (.79 mm), and grade 2 braille for each specific location. Minimum text height: 5/8 inch (15.8 mm).
  3. Pictograms: Provide graphics raised 1/32 inch (.79 mm), with minimum 6 inch (152.4 mm) high background field, and lettering and braille written description directly below.
  4. Lettering Style: Gill Sans upper case.
  5. Copy Location: Centered.
  6. Corners and Edges: Radius corners and square edges.
  7. Product: Mohawk Frame Series 200A, 'Sand Carved.'
  8. Provide specified signage as scheduled.
    - a. Restroom signs shall be style ADA-8 in size as scheduled.
    - b. Room name and number signs shall be style M-311 in size as scheduled
    - c. Exterior handicapped entrance sign shall be style —2-3-9 in size 9" x 9".
    - d. Provide other signs as scheduled.

### 2.3 DIMENSIONAL LETTERS AND SYMBOLS

A. Manufacturers of Dimensional Letters and Symbols:

1. Andco Industries Corp.
2. A.R.K. Ramos Manufacturing Company, Inc.
3. ASI-Modulex.
4. Gemini, Inc.
5. Matthews International Corp.
6. Metal Arts.
7. Metallic Arts, Inc.
8. The Southwell Company.
9. Spanjer Brothers, Inc.
10. Vomar Products, Inc.

B. Fabricated Channel Characters: Form exposed faces and sides of characters to produce surfaces free from warp and distortion. Include internal bracing for stability and attachment of mounting accessories. Comply with the following requirements.

1. Aluminum Sheet: Not less than 0.090 inch (2.29 mm) thick.
  - a. Finish: Clear anodized.
2. Letter Height: 1'-8" high
3. Letter Thickness: 3/8"
4. Letter Style: Swiss721 Lt BT.
5. Mounting: Provide manufacturer's hardware for projection mounting of channel characters at 2" distance from wall surface.

C. 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.

## 2.4 ACCESSORIES

A. Mounting Methods: Use silicone adhesive fabricated from materials that are not corrosive to sign material and mounting surface.

B. Anchors and Inserts: Provide nonferrous-metal or hot-dip 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.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

- B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.
- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Locate interior wall signs and accessories where indicated, in accordance with the ADA, 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.
  - 2. Mount signs on wall adjacent to the latch side of door, unless otherwise indicated. Where there is no wall space to the latch side of the door, including at double leaf doors, mount sign on the nearest adjacent wall as approved by the Contracting Officer. Mount signs at 48-inches (1219 mm) from the baseline of the lowest characters to the finished floor.
  - 3. Locate signs to allow approach within 3-inches (75 mm) of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
  - 1. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
  - 2. Where panel signs are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.
- C. Dimensional Letters and Symbols: Mount letters and symbols 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. Projected Mounting: Mount letters at the projection distance from the wall surface indicated

### 3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Government.

### 3.4 INTERIOR SIGN SCHEDULE

- A. Provide signage at entrance to each room as described below.

ROOM	Sig Sign Size (inches) H by L	SIGN CONTENT		QUANTITY
		TEXT AND SIZE	SYMBOLS	
Toilet Rooms	8 b 8 x8	T*, 5/8" high	SA, P	at each toilet room
Room Signage (Room number and/or name designations by Contracting Officer)	6 b 6 x 8	T* (max. 4 digit numbers), 3/4" (19 mm), all signs the same size: 2-1/2" by 6".		At each designated door, refer to door schedule.
Any Assembly Space	6 x 8	MAXIMUM OCCUPANCY ____ persons 2 "		one at each room
Any other locations as required by Code	As required	to be supplied by Contracting Officer		1 each location required

**Sign Content Key\***

**T** Text describing room, as approved by Contracting Officer.

**SA** International Symbol of Accessibility.

**P** Pictogram (boys, girls, men, women)

**Note 1:** Coordinate with Contracting Officer for capacity numbers to include on signage.

END OF SECTION

## SECTION 10520 - FIRE-PROTECTION SPECIALTIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Portable fire extinguishers.
  - 2. Fire-protection cabinets for portable fire extinguishers.
  - 3. Fire-protection accessories.
- B. Field painting of fire extinguisher cabinets is specified in Division 9 "Painting" section.

#### 1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
  - 1. Fire Extinguishers: Include rating and classification.
  - 2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

#### 1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
- C. Fire Extinguishers: FM listed and labeled for type, rating, and classification specified.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. J.L. Industries, Inc.
  - 2. Kidde: Walter Kidde, The Fire Extinguisher Co.
  - 3. Larsen's Manufacturing Company.
  - 4. Potter-Roemer; Div. of Smith Industries, Inc.

#### 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.

## 2.3 PORTABLE FIRE EXTINGUISHERS

- A. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, in enameled-steel container.

## 2.4 FIRE-PROTECTION CABINETS

- A. Cabinet Construction: Provide manufacturer's standard box (tub), 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. Cabinet Metal: Enameled-steel sheet.
- C. Cabinet Type: Suitable for fire extinguisher.
- D. Cabinet Mounting: Semirecessed, with cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.
- E. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
  - 1. Exposed Rolled-Edge Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend), 2-1/2-inch (64-mm) backbend depth.
- F. Cabinet Trim Material: Manufacturer's standard steel sheet.
- G. Door Material: Manufacturer's standard steel sheet.
- H. Door Glazing: Manufacturer's standard tempered float glass, ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, Class 1 (clear).
- I. Door Style: Vertical duo panel with frame.
- J. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
  - 1. Provide minimum 1/2-inch- (13-mm-) thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
- K. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

1. Door Handle and Locks: Provide special handle and built-in cylinder lock system, designed to allow locked door to be opened in emergency without breaking glass. Key all cabinets alike. Provide factory applied lettering adjacent to handle that reads "IN CASE OF FIRE ONLY - PULL FIRMLY ON HANDLE."
  - a. Basis of Design Product: Larsen-LOC by Larsen or equal.

## 2.5 ACCESSORIES

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicated, with plated or baked-enamel finish. Provide brackets for extinguishers not located in cabinets.
- B. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Contracting Officer.
  1. Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.

## 2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Cabinet Finishes: Provide manufacturer's standard baked-enamel paint for the interior of cabinets.
- D. Door Finishes: Provide manufacturer's standard factory priming for field-painted finish for exterior of cabinets and doors.

## 2.7 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.
- B. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.
  1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-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.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for hose valves, hose racks, and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets are to be installed.
- C. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged units.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing fire-protection specialties.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
  - 1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
  - 2. Fasten mounting brackets to structure, square and plumb.
  - 3. Fasten cabinets to structure, square and plumb.

### 3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust cabinet doors that do not swing or operate freely.
- B. Refinish or replace cabinets and doors damaged during installation.
- C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

## **SECTION 10801 - TOILET ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes:
  - 1. Toilet and bath accessory items
  - 2. Underlavatory guards
  - 3. Custodial accessories.
  
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 6 Section "Rough Carpentry" for wood blocking.

#### **1.2 SUBMITTALS**

- A. Product data for each toilet accessory item specified.
- B. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.
- C. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.
- D. Maintenance instructions including replaceable parts and service recommendations.

#### **1.3 QUALITY ASSURANCE**

- A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.
- B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Contracting Officer.

#### **1.4 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.

#### **1.5 WARRANTY**

- A. Warranty, Mirrors: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.
- B. The warranties shall not deprive the Government of other rights the Government 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 of the Contract Documents.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:
1. A & J Washroom Accessories, Inc.
  2. American Specialties, Inc.
  3. Bobrick Washroom Equipment, Inc. (listed product numbers)
  4. Bradley Corporation.
  5. Brocar Products.

### 2.2 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with satin finish unless otherwise indicated, 0.034-inch (22-gage) minimum thickness.
- B. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20-gage) minimum. Surface preparation and metal pretreatment as required for applied finish.
- C. Galvanized Steel Sheet: ASTM A 527, G60.
- D. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- E. Mirror Glass: Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.
- F. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

### 2.3 SOAP DISPENSERS

- A. Liquid Soap Dispenser, Horizontal Surface-Tank Type: Minimum 40-ounce (1184 ml) capacity, stainless steel, tank-type dispenser fabricated for surface mounting. Provide stainless steel piston, springs, and internal parts designed to dispense soap in measured quantity by pump action and with

integral check valve to prevent leaking. Provide unbreakable window-type refill sight gauge and equip unit with push-type valve for dispensing soap in liquid form; Bobrick B-2112 or equivalent.

#### 2.4 TOILET TISSUE DISPENSERS

- A. Surface-Mounted Double Roll Dispenser: Heavy duty cast aluminum, satin finish bracket with molded ABS plastic spindles designed to accommodate two standard core rolls up to 5-1/2 inch (139.7 mm) diameter, with concealed locking mechanism; Bobrick B-2740, or equivalent

#### 2.5 SANITARY-NAPKIN DISPOSAL UNIT

- A. Surface-Mounted Type: Fabricate of stainless steel with seamless exposed walls, tightly self-closing top cover and locking bottom panel with continuous, stainless steel piano hinge; Bobrick B-254 or equivalent.

#### 2.6 MIRROR UNITS

- A. Stainless Steel Framed Mirror Units: Fabricate frame with 3/4 by 3/4 inch (19 mm by 19 mm) angle shapes with square corners mitered, welded, and ground smooth, from satin-finished stainless. Provide shock absorbing strips and perimeter frame and for full size of back, with galvanized steel back, concealed wall hanger and theft-proof fasteners. Provide 24 by 36 inch mirrors, unless another size is indicated on drawings; Bobrick B-290, or equivalent.

#### 2.7 GRAB BARS

- A. Stainless Steel Type: Provide grab bars with wall thickness not less than 18 gage (1.27 mm thick), snap flange cover, smooth satin finish, 1-1/2-inch (38.1 mm) clearance between wall surface and inside face of bar, outside diameter of 1-1/2 inches (38.1 mm); Bobrick B-6806, dimensions and configurations as indicated on drawings.

#### 2.8 UNDERLAVATORY GUARDS

- A. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded-plastic, white.
3. Basis-of-Design Product: LAV-GUARD™, as manufactured by Truebro, Inc. Subject to compliance with requirements, provide the named product or an approved equivalent product by one of the following:
  - a. Plumberex Specialty Products, Inc.
  - b. TCI Products..

#### 2.9 CUSTODIAL ACCESSORIES

- A. Surface-Mounted Utility Shelf with Mop and Broom Holder: Fabricate shelf, mop holder and hook support of 18-gage type 304 stainless steel with satin finish, welded construction. Provide unit with stainless steel rag hooks, rod for wet rags below shelf, and spring loaded rubber cam mop and broom holders with no slip coating. 8 inch (203.2 mm) deep and 6 inch (152.4 mm) high with four (4) hooks and three (3) mop holders; Bobrick B-239, in 34 inch length; or approved equivalent

## 2.10 FABRICATION

- A. General: No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.
- D. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theftproof installation.
- E. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to Contracting Officer.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. 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 heights indicated.
- B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.
- C. Install grab bars to withstand a downward load of at least 250 lbf, complying with ADA regulations.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that 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



## SECTION 12494 - ROLLER SHADES

### PART 1 - GENERAL

#### 1.1 .SUMMARY

- A. This Section includes manually operated light-filtering shades
- B. Related Sections include the following:
  - 1. Division 6 Section "Miscellaneous Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

#### 1.2 .SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.
- C. Samples for Initial Selection: Sections of fabric demonstrating complete range of colors available, for Contracting Officer's selection.
- D. Samples for Verification:
  - 1. Complete, full-size operating unit not less than 16 inches (400 mm) wide for each type of roller shade indicated.
  - 2. Shade Material: Not less than 12-inch- (300-mm-) square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
- E. Window Treatment Schedule: Include roller shades in schedule using same room designations indicated on Drawings.
- F. Product Certificates: For each type of roller shade product, signed by product manufacturer.
- G. Product Test Reports: For each type of roller shade product.
- H. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
  - 1. Methods for maintaining roller shades and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.

3. Operating hardware.

### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed installation of roller shades similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  1. Flame-Resistance Ratings: Passes NFPA 701.

### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

### 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Contracting Officer of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, provide specified products of MechoShade System, Inc. or equivalent by one of the following:
  1. Draper Shade & Screen Co., Inc.
  2. Hunter Douglas Vertical
  3. Levolor Contract; a Newell Company.
  4. Silent Gliss USA, Inc

### 2.2 MATERIALS

- A. Fabric: Dense Vertical Weave, Glare Control Type: Dense vertical weave; non-raveling vinyl/polyester yarn comprised of 21% polyester core and 79% vinyl; fabric thickness 32 mils; weight 16.4 oz./sq.ft., openness factor 2-3%; provide “Thermoveil Dense vertical Weave 1000 Series” by MechoShade, or equal in color as selected.
- B. Brackets: Plated steel, with adequate projection to clear all window fixtures.
- C. Aluminum Extrusions: Alloy and temper recommended by manufacturer for use intended and as required for proper application of finish indicated but not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.

## 2.3 FABRICATION

- A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
- B. Components: Noncorrosive, self-lubricating materials.
- C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material.
- D. Direction of Roll: Regular, from back of roller.
- E. Mounting Brackets: Galvanized or zinc-plated steel, style for between jamb mounting unless otherwise indicated.
- F. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as required for between the jambs mounting; removable design for access.
- G. Top/Back Cover: L shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.
- H. Bottom Bar: Steel or extruded aluminum, with plastic or metal capped ends. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
- I. Shade Operation: Manual; with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.
  - 1. Position of Clutch Operator: Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.
  - 2. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
  - 3. Loop Length: Length required to make operation convenient from floor level

- 4. Bead Chain: Stainless steel.
  
- J. Shade Units: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
  - 1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch (6 mm) from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
  
- K. Installation Fasteners: Fabricated from metal that is noncorrosive to shade hardware and adjoining construction and to support shades as required by manufacturer's written instructions.
  
- L. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
  
- M. Colors of Metal and Plastic Components Exposed to View: As selected by Contracting Officer from manufacturer's full range unless otherwise indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow clearances for window operation hardware.
- B. Install metal parts isolated from concrete or mortar to prevent corrosion.
- C. Install mounting brackets with not less than 2 fasteners per bracket.

#### 3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

#### 3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Contracting Officer, before time of Substantial Completion.

END OF SECTION



## SECTION 13701 - ACCESS CONTROL ALARM MONITORING SYSTEMS

### PART 1 - GENERAL

#### 1.1 WORK INCLUDED

- A. Access Control/Alarm Monitoring (ACAM) system.

#### 1.2 SYSTEM DESCRIPTION

- A. System Components: The basic components of the ACAM system shall include:
  1. ACAM file server system complete with CPU, keyboard, color monitor, all required database management, configuration software, database storage system software and hardware, as well as complete access control and alarm monitoring software package as standard. The ACAM system shall also incorporate a fully integrated photo badging and video imaging system, elevator control software, CCTV subsystem interfaces, intrusion detection operation, and shall support optional software packages for a radio paging subsystem interface, automated guard tour, high-security SCIF area monitoring and verification, high integrity dial-up, partitions database and other subsystem functions as defined in the specifications and contract documents. ACAM file server shall communicate with ACAM client workstations over an industry standard Ethernet local area network (LAN). The ACAM file server shall support two printers, one for report printing and the other for printing of system events. Location of ACAM file service shall be as directed by the Owner.
  2. ACAM client workstations shall be fully functional, and provide all of the features available at the ACAM server. All workstations shall be capable of operating as fully functional photo badging and video imaging stations for enrollment and verification of badge holders, and such administrative function as badge production and development. The workstations shall be capable of providing full color graphic representation of the alarm, event and control facilities (see item 3 below), and shall be capable of displaying video from cameras connected to the Video NIC panels (as described in Section a.7. below). In addition, stored video associated with an alarm, event or access condition monitored by the ACAM system or triggered as a result of motion detection shall be displayed at these workstations on demand. The ACAM client workstation shall incorporate a color monitor and keyboard for data entry, and shall also support printers for operator requested reports and alarm/event reporting. The operator interface shall be completely menu-driven through easy to understand menus, text and prompts. ACAM client workstations shall communication with the ACAM file server over an industry standard Ethernet LAN. Quantity and location of operator terminals shall be as specified in contract documents and drawings.
  3. Alarm color graphics software package with full graphic map/floor plan display capability shall be standard. The system shall have the capability to display floor plan maps along with selectable colored alarm icons and indicators, together with an audible alarm, alarm descriptive text and operator instructions simultaneously. The color graphics display shall be both dynamic and interactive. IT shall allow the operator to lock and unlock doors and place them in a controlled mode, directly from the graphics display. It shall provide for the acknowledgment of alarm conditions and the masking and unmasking of alarm points directly from the graphic display. It shall provide facilities for displaying the boundaries of individual security areas programmed into the system, and shall allow the operator to mask and unmask these security areas from the graphic display. This action shall automatically cause all alarm devices within these security areas to be masked and unmasked. It shall also provide the user with the ability to call camera displays to the screen from camera icons,

and shall allow the operator to pan, tilt, zoom and focus cameras directly from the display. Icons representing various alarm devices, relays, doors and cameras shall be available from a device tree, which represents the various devices controlled by the ACAM system. In addition, these icons shall be capable of being selected and placed on each individual graphic display using a drag and drop facility. The alarm color graphics package shall be a standard component of the ACAM system, and shall be available at the server and any or all workstations attached to the ACAM system.

4. Logging and report printers shall be provided for the specified locations. Logging printers shall be black and white, dot matrix printers of a minimum of 160 CPS print speed using tractor-feed fan fold paper. Report printers may be either black and white, dot matrix printers of the minimum of 160 CPS print speed using tractor-feed fanfold paper, or laser printers. Quantity, type and location of printers shall be as specified in contract documents and drawings.
5. Networked intelligent controllers (NICs) shall be capable of utilizing both central processing and true distributed processing technology. Local processing shall be based on the full local storage of cardholders, access groups, time zones, input and output information in controller RAM. In the event that database information has not been downloaded, is corrupted or is insufficient to make necessary local transaction decisions, the NIC shall access the ACAM server directly. The ACAM server shall take over the functions of making access decisions, controlling doors, monitoring alarms, activating relays and performing the functions of remote control and time activated actions. This shall continue until such time as the full database of the NIC has been correctly downloaded from the ACAM server. This function shall ensure that during database downloads to the NIC, operation of the filed panel would be the same as though a proper download had been completed. In addition, it ensures that in the event of a corruption of the NIC database, all actions which would have been carried out by the NC in response to transaction requests and alarm or data inputs will still be performed under the control of the ACAM server.
  - a. The NIC shall be a microprocessor-based device, which utilizes a 32-bit processor and a 32-bit bus structure. The controller shall have a minimum clock speed of 90 MHz, and shall be configured with at least 16 Mbytes of battery backed dynamic RAM. The controller shall feature a direct LAN/WAN connection to the controller bus structure in addition to two RS-232RS-232 or RS-485 connections, all of which shall be designed for use in communication with the ACAM server. The communication architecture of the NIC shall be such that in the event that the primary communication channel to the ACAM server is lost, the unit shall be capable of automatically switching to a secondary communication channel using one of the host RS-232 or RS-485 connections, and if required shall be able to establish communications via dial-up modem.
  - b. The NIC shall be provided with a parallel printer port, which will enable it to print transaction data during loss of communication with the ACAM server. The NIC shall be capable of dynamically allocating its memory between database information and transaction history, which shall be stored if the controller has lost communication with the ACAM server. Such transaction history shall be automatically uploaded to the ACAM server once communication has been restored. In its maximum configuration, the NIC shall be capable of storing 500,000 cardholders, and its memory utilization shall be such that if storing database information for 10,000 cardholders, it shall also be capable of storing one million transactions.
  - c. The NIC shall have two additional RS-485 ports to connect 8 or 16 card readers and keypads in a multi-drop configuration, mounted up to 4,000 feet from the NIC. Utilizing both ports shall allow a maximum span of 8,000 feet end-to-end. The NIC shall also be equipped with 12 five-state supervised alarm inputs and 12 auxiliary relay outputs, mounted directly on the main circuit board. The number of inputs and

relay outputs available through each NIC shall be expandable by the addition of Remote Input Modules (RIMs) and Remote Relay Modules (RRMs) for a maximum of 172 inputs, or 156 outputs depending on configuration. RIMs and RRM's shall also be capable of connection in the same multi-drop configuration as the card readers and keypads, up to 4,000 feet from the NIC. Utilizing both ports shall allow a maximum span of 8,000 feet end-to-end. Each NIC shall be UL listed as conforming to UL 294 and L 1076, and utilize a UL listed uninterruptible power supply (UPS) that shall be mounted within the NIC enclosure. The power supply shall be capable of supplying power to all associated electronics, card readers and electric locks that are connected to each NIC. Quantity and location of NICs shall be as specified in contract documents and drawings.

- d. Combined camera call-up, digital video recorder and Video NIC panels can be provided to combine the functions of a CCTV matrix switcher a networked digital video.
6. Remote Reader Electronics (RRE) modules shall be provided to support all card readers, door contact switches, request-to-exit devices and electric locks. RRE modules shall support all industry standard card reader technologies as well as keypads. RRE modules shall be available in individual units, which can control one, two or four card readers. Each RRE module shall support sufficient five-state supervised input points, and output relays to control the designated number of doors. It shall also provide 5 VDC, 12 VDC and 24 VDC output at 500 mA for powering external devices such as readers, PIRs or other request-to-exit (REX) devices and door strikes. Each RRE module shall be capable of being powered by an on-board UPS or a NIC. Quantity and location fo RRE modules shall be as specified in contract documents and drawings.
7. Card readers, keypads and access control cards shall be provided int eh encoding technology and quantities specified in the contract documents and drawings. Door contact switches, REX devices, electric locks, local alarm horns, status indicators and other devices shall also be provided as shown on the contract drawings.
  - a. All of the ACAM equipment, including file servers, workstations, NICs, RRE modules, card readers, RIMs, RRM's, and integrated card readers and keypads shall be listed by Underwriters Laboratories as conforming to UL 1076 and UL 94. Each of the above devices should carry a label indicating the UL listing.

## B. Operational Objectives

1. Card Access Control: The security access control system shall provide the following card access control operational objectives:
  - a. Controlled entry, via access card readers, of only authorized personnel to secured areas based on cardholder information entered and stored in the system database.
  - b. The access request response time from card presentation, database verification, to electric lock/unlock shall be no more than one second in normal operating mode on a fully loaded system.
  - c. All access requests, both authorized and denied, shall be sent to the host for storage and annunciation, as required, with the cardholder number, name, and access point/area where access was attempted or gained.
  - d. The software package shall provide for global and local anti-passback, and also provide a facility for soft anti-passback (i.e. allowing entry following an anti-passback at individual readers, and the time shall be capable of being selected by the operator. Anti-passback shall operate on a system wide basis across multiple NICs and across multiple ports on a single server.

- e. The system shall provide for automatic lock/unlock of access controlled doors on a scheduled basis using time zones.
- f. Each card and cardholder shall be entered into the database prior to use. Each card can be manually disabled at any time without the requirement to delete the card. Each card can then be subsequently re-enabled at a later time.
- g. Card records shall include the entry of activation and deactivation dates to provide for the automatic enabling and expiring of the card record.
- h. The system shall provide the capability of setting a parameter of days whereby cards will be automatically disabled if they are not used at all for access for the preset number of days (i.e. 30 days, 60 days, etc.). Any card can be subsequently re-enabled at any time.
- i. The operating mode of access controlled doors shall be indicated as locked, unlocked, or controlled. The door status shall be indicated as open or closed.
- j. The system shall provide for the monitoring of the reader controlled door position in order to detect and report door-forced-open and door-held-open alarm conditions. Door-held-open condition shall be based on a user-adjustable time period. The act of opening the door shall initiate the door timer, and also cause the immediate reset of the door lock.
- k. Each cardholder shall be specified with access authority to a combination of up to 64 security areas and 64 groups of security areas, each security area comprised of one or more card reader controlled door. Up to 10,000 security areas may be defined. Each individual security area or group of security areas designated as authorized to an individual cardholder shall include a time zone assignment for that specific area. Each cardholder may be specified as authorized access to any , or all, or any combination of the 10,000 security areas.
- l. The system shall provide for the designation of certain calendar days to be holidays, with special access privileges and system activity to be specified for those days.
- m. The system shall provide the capability to unlock the door and/or mask (shunt) the door alarm, via a request-to-exit door motion sensor device or exit push-button. The capability shall be software programmable to allow selectable exit reporting.
- n. All system controlled electric locks shall be capable of being unlocked via operator command at a workstation as well as by request-to-exit devices.
- o. The system shall provide for a completely downloaded and distributed database such that access control decisions are made locally at the access controller and, in the event of the failure of the host computer or loss of communications to the host computer, the access control system shall continue to operate using full database information for all cardholders including security areas authorizations, time zones, expiration dates of cards, holidays, etc. At no time after a card has been entered into the database of the file server and validated, shall the system fail to respond to an access request by a valid cardholder. In the event that the database in the access control field panel is being downloaded or the database is corrupted or voided for any reason, the ACAM server shall make the access transaction decisions based on the current information held in the ACAM server (Restricted subsets of access control privileges and time zone facilities in the distributed database will not be accepted.)
- p. The system shall be capable of utilizing dial-up modems to communicate with remote NICs, so that operators can download cardholder database information to remotely located card reader panels, and upload historical transaction information. The system shall also be capable of receiving alarm transactions (active alarm, loss of primary power, door forced, etc), from the remote NICs at any time. The system shall include a provision for specific Alarm Only communication ports, which are to be accessed only for the reporting of alarm information from the NIC's. These ports must not be used for upload and download of database information or transaction history. Each NIC must be capable of dialing at least eight telephone numbers in order to

communicate with the ACAM system. Failure to communicate on all programmed telephone numbers shall result in a local alarm being generated at the NIC.

2. Alarm Monitor Points: The security access control system shall provide the following alarm monitoring and reporting functions:
  - a. Each supervised security system input point (door contacts, motion detectors and other associated alarm inputs ) shall have a user-specified 16 character minimum, text identifier. Each point shall be software programmable as either an alarm or non-alarm event, and shall be capable of reporting active alarm, secure, short circuit trouble, open circuit trouble, ground fault trouble and circuit fault trouble.
  - b. The system shall allow masking and unmasking (shunt/enable) of alarm points manually by the operator, automatically by time zone, automatically by the activation of another alarm point, or, where required, by a cardholder from a reader keypad. The system shall not allow an alarm point to be masked if the alarm point is in a trouble condition.
  - c. All alarm points shall be individually annunciated upon any change of state. Alarm contacts shall not be connected in parallel or series in zones, unless specifically shown on the contract drawings or stated herein. Double doors with alarm contacts on each leaf of the double door unit may be wired in series, for that double door unit.
  - d. All door contacts and request-to-exit devices must be connected in such a manner to provide five-state supervised alarm monitoring. They must be terminated at a the RRE module at or near the door, and shall not require direct wiring to the NIC. The input points used for door contact and request-to-exit device shall be user-configurable.
  - e. The system shall provide for 16 levels of alarm prioritization. The priority determines the order in which a given alarm report will be presented at an ACAM client workstation for disposition when more than one alarm is simultaneously active.
  - f. The system shall provide for special purpose alarm monitoring and/or transaction reporting for specific events, such as, but not limited to the following:
    - 1) Duress condition at a card reader.
    - 2) Anti-passback or tailgating violation.
    - 3) Rejected access request.
    - 4) Card reader tamper.
    - 5) Card reader off-line.
    - 6) Controller cabinet tamper.
    - 7) Commercial AC power failure.
    - 8) Controller communications failure.
    - 9) Low battery at UPS power supply.
  - g. All input points may be configured and/or linked to activate a relay output control point or group of control points. Any one input point may be linked to a minimum of at least 64 output control relays.
  - h. Unacknowledged alarm reports (an alarm condition that has not been acknowledged within a user-specified time period at a client workstation) shall register in the system event transaction file as an Operator Fails to Respond message and shall initiate a SPECIAL alarm message to a designated alternate client workstation on the system.
3. Relay Output Points: The security access control system shall provide the following relay output control and operational functions.

- a. Each security system output point (door lock, gate controller and other associated relay outputs) shall have a user-specified 16 character minimum, text identifier, Each point shall be software programmable for activation and deactivation, and shall be capable of reporting short circuit trouble, open circuit trouble, ground fault trouble and circuit fault trouble.
  - b. The system shall allow activation and deactivation of output points manually by the operator, automatically by time zone, automatically by the activation of an alarm point, or, where required, by a card reader.
4. Data Management: The system shall provide for the following database management capabilities:
- a. The software shall be capable of providing for the recall of system historical transactions with a minimum of one million transactions recallable by operator command from the main event transaction file on the file server hard disk. Additional events may be recalled directly from an archived history log file on a removable hard disk cartridge.
  - b. Data searching parameters shall be provided as a menu driven feature of the ACAM system software. The search capability shall include, but is not limited to the following:
    - 1) Card activity.
    - 2) Cardholder, by card number or name.
    - 3) Card readers.
    - 4) Security areas.
    - 5) Alarm points.
    - 6) Alarm categories.
    - 7) Date and time periods.
  - c. The software shall provide report creation capabilities which offer search, organize and sorting according to the operator instructions, and have the ability to print, spool, or display a full report at a printer or client workstation.
  - d. All operator commands and database entry functions shall be completely menu driven with plain English text and prompts, and the system shall provide on-screen Help information.
  - e. All access to the operator system functions shall require the entry of a valid password. A password must be used by the operator, manager, or administrator to access the system, access authority for each password is completely user-selectable by individual menu selection

### 1.3 QUALIFICATIONS

- A. Vendor shall be accredited and trained by manufacturer of the system.
  - 1. Upon request, vendor shall provide documentation, including references, or experience on similar projects.

### 1.4 MAINTENANCE SERVICE

- A. For 24 months after acceptance, provide a maximum of 4-hour response to call for any adjustments or repairs required to keep the system fully operational without additional charges to the Owner.

## PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

- A. Prior to being eligible to bid, system manufacturer must demonstrate proven compatibility and seamless integration with the CCTV and Intrusion Alarm system. System manufacturer must obtain pre-approval from the Owner's Security Department to be eligible for inclusion in bid. Current acceptable manufacturers are:

1. DSC Kantech; HID Corporation - Proximity Readers.
2. Dell, IBM, Hewlett Packard - Security Server and Workstations.
3. DSC Maxisys; Infographic - Access Control System

- B. Others:

1. Hewlett Packard - Printers.
2. Cable Talk, Ammco, Damac, Hoffman, or Winstead - Equipment Racks.

## 2.2 SITE CENTRAL SECURITY SERVER

- A. The access control system central security service shall provide all host functions for the facility. As additional security functions are added to the system, the host must be upgradeable to provide the same level of service as before the upgrade. This shall include hardware and software interfaces for networking and following systems:

1. Access Control.
2. Enterprise Badging.
3. CCTV.
4. Intrusion Alarm System.

- B. ACAM File Server:

1. The file server shall be provided with 17-inch color monitor, standard 101-key keyboard and two-button mouse. The file server computer system shall be constructed from commercially available computer hardware.
2. The file server shall utilize an Intel Pentium 3 processor operating at a minimum of 800 MHz supporting true multi-user, multi-tracking and multi-threaded capabilities with a minimum of 1000 Mbytes fo RAM. The file server shall be capable of directly supporting up to 127 serial ports. The file server shall be capable of supporting at least two printers.
3. The file server system shall utilize the Microsoft Windows Server operating system together with Microsoft SQL Server 200. The file server shall support the Microsoft Active Directory system which shall be an integral function of the operating software.
4. The file server shall be supplied with an Ethernet network interface card that supports 10/100 topology. The system shall be capable of running and supporting TCP/IP network protocol.
5. The system shall be optionally capable of supporting a true fully hot redundant file server configuration, warm stand-by, hot standby, and RAID configurations are not acceptable and will be rejected.
6. The system shall be capable of supporting at least 64 ACAM client workstations, and have the capability of being expanded to support an unlimited number.
7. The system shall be provided with a fixed hard disk drive with a capacity of at least 200 GB and shall be provided with a removable hard disk drive, directly accessible from the on-line system, with a capacity of at least 10 GB for archiving, and archive reporting purposes. Event transaction data copies and archived to a removable hard disk cartridge shall be capable of being accessed directly from the on-line operational system application programs

and menus. The system shall support a RAID (redundant array of inexpensive disks) fixed hard disk system.

8. The computer system shall be capable of accommodating upgrades in color monitor, hard disk drive, RAM and I/O port capacity, without rendering the ACAM file server hardware and/or software obsolete.

### 2.3 SECURITY WORKSTATIONS

- A. The client workstation shall be provided with 17-inch color monitor, standard 101-key keyboard and two-button mouse. The computer system shall be constructed from commercially available computer hardware. The client workstation shall utilize a minimum Intel Pentium processor supporting true multi-user, multi-tasking capabilities with a minimum of 512 Mbyte of RAM. The system shall be capable of supporting up to two serial I/O ports (expandable to four or more) and at least two parallel ports. Each client workstation shall be capable of supporting at least two printers.
  1. The client workstation shall utilize Microsoft Windows 2000 Professional operating system.
  2. The client workstation shall be supplied with Ethernet network interface card that supports 10/100 topology.
  3. Each client workstation shall be capable of supporting alarm color graphics, photo badging for enrollment and verification, video imaging from both the Video NIC panels and from CCTV matrix switchers which may be integrated with the interactive alarm color graphics display facilities. The workstation shall be equipped with the standard ACAM operator software package, and shall be provided with USB connection to support the photo badging camera system.

### 2.4 SECURITY PRINTERS

- A. Security printers shall be Hewlett Packard HP LaserJet 1100 XI (Part No. C4225A), and Infographic Dual side Printer (Part No. P420C).

### 2.5 SECURITY ROUTERS AND HUB'S

- A. Utilize Owner's Switch, Routers and HUBS.

### 2.6 EQUIPMENT RACKS

- A. Equipment racks shall be from one of the following manufacturers:
  1. Ammco.
  2. Damac.
  3. Hoffman.
  4. Winsted.
  5. Cable Talk.

### 2.7 SECURITY SYSTEM

- A. Security system shall be an Infographic Diamond II system, with D2-SVR-64 and D2-WKSTN utilized for server and workstations or equal.
- B. System Software:

1. The software system design shall be object oriented and shall be a native 32-bit application running under the Windows operating system. It shall be an Open Architecture design supporting industry standard databases, networks, video matrix switchers and other peripheral equipment.
2. All client workstations and the server(s) shall have full system functionality and shall not be segregated in any way by function, except as defined by the user authentications of sign on and password.
3. The system shall have a simple, easy to use graphical user interface which is browser based, and all functions shall be accessible by use of either mouse or keyboard. Help text shall be provided for each screen function, and shall be sufficiently interactive that a user may access page help directly and be provided with explicit information relevant to the particular screen being displayed.
4. The system shall have a distributed architecture, however the central server shall have the capability to make transaction decisions for access requests, alarm handling and output control. The software shall be provided with a high-speed real time functionality, which allows the server to take over the transaction handling function of NICs and Video NICs which are being downloaded, or whose database is incomplete or corrupted, and thus maintain the fully functional access and security response of the NICs under these circumstances. This same real time functionality shall provide for linking of inputs and outputs globally across all NICs within the system on a single ACAM server, and also provide the same global anti-passback linking of card readers across all the NICs connected to a single server.
5. The system shall be provided with the capability to download all of the NICs and Video NICs on the ACAM server system simultaneously. Constraints requiring downloads to NICs in groups is not acceptable.
6. It is vitally important that the access and alarm functionality of the system shall in no way be impaired during periods when database information is being downloaded to NICs or other field devices, or when these NICs or other field devices have insufficient information to make necessary transaction decisions. Thus, it is unacceptable for the performance of NICs to be degraded in any way. Access decisions based solely on company codes or facility codes or even a combination of the two are not acceptable.
7. The system software architecture shall be designed not only to provide a high speed open architecture platform for individual single server applications, but also be specifically designed to insure high speed, high integrity partitioning and redundancy for global, large cardholder database systems. The server within the ACAM architecture should store its data within both a conventional relational database, such as SQL Server or Oracle, and a network directory. The network directory to be utilized shall be the Microsoft Active Directory. Data movement between workstations and the server, and between the NICs or Video NICs and the server shall use two distinct connections and protocols. For the relational database, a DCOM (distributed component object Model) interface shall be utilized in conjunction with an ADO/OLEDB (Active X Data Objects/Object Linking and Embedding Database) driver into the database. For the Network Directory an LDAP interface shall be used. These two connection types together in an optimized architecture are directed towards the following goals:
8. High-speed cardholder data replication and redundancy in both a small and large-scale global LAN/WAN/Internet environment.
9. Open Architecture, insuring the ability to quickly connect to third party software for a seamless integrated enterprise solution for the client, including database sharing, import and export.
10. Highly secure, highly reliable access control and security monitoring in an open architecture environment, through the use of Windows and Secured Socket Layers (SSL) technology.
11. In a multi-server (Enterprise) environment, the Active Directory shall provide multi-master replication, for all or a portion (partitioning) of the database between each of the servers.

This shall allow cardholder updates to be applied to any replica of a given partition. The Active Directory replication system shall propagate the changes from a given replica (Server) to all other replicas (Servers). Replication shall be automatic and transparent. Full Active Directory replication between two servers shall form the basis for a hot redundant system.

12. To insure high speed and high reliability in data transmissions between servers, the system shall allow the configuration of the Active Directory, specifically based on the data and physical site needs of each client. The system shall utilize an LDAP (Lightweight Directory Access Protocol) interface to communicate with the Active Directory. The use of LDAP or ADO/OLE DB shall be transparent to the user.
13. Security provisions within the system shall be native to Windows. At the workstation, Windows security shall be used for workstation/user authentication. This authentication shall take place under the control of the DCOM. To insure that the data transmitted between the workstation and server is secure. SSL shall be incorporated as a layer over the DCOM.
14. The access control system software shall, as a minimum, support the following features:
  - a. Cardholder records - 500,000 maximum.
  - b. Card readers - 2048 maximum per server.
  - c. Alarm input points - 40,000 maximum per server.
  - d. Relay outputs - 40,000 maximum.
  - e. Client workstations - unlimited.
  - f. Operator passwords - unlimited.
  - g. Interface with up to 2048 NICs per server.
  - h. Up to 10,000 security areas (controlled areas) per server.
  - i. Time intervals - 127.
  - j. 255 time zones (eight time intervals per time zone).
  - k. 82 user-defined cardholder fields and 92 visitor fields.
  - l. 28 data fields per cardholder.
  - m. 16 alarm priorities.
  - n. 16 user-defined alarm categories.
  - o. 512 action/instruction text messages.
  - p. Global and local, hard, soft and timed anti-passback/anti-tailgate capability.
  - q. Configurable alarm-to-relay linking, downloaded to field controllers for local operation.
  - r. Configurable automatic time zone controlled commands, downloaded to the field controller for automatic local operation.
  - s. Configurable automatic, time controlled report generation and/or disk backup commands.
  - t. Visitor logging and badging utility.
  - u. History/audit trail.
  - v. Ability to respond to access requests/alarm conditions before and during download to networked intelligent controllers.
  - w. Automatic card activation and deactivation.
  - x. Global and local alarm masking by operator or cardholder.
  - y. Access activity analysis by card reader.
  - z. High integrity dial-up capability to support access control panels and readers at remotely located sites via dial-up communication over public switches telephone network, and to download database and upload transaction history based on operator commands. This feature shall provide the capability to segregate dial-up modem ports for Alarm Only reception, and for uploading and downloading database and transaction history information, so that even if all the upload/download ports are in use; the remote dial-up NICs can establish communication through Alarm Only modem ports to annunciate alarm conditions. The memory systems and functionality

of the remote NICs shall be such that data corruption during database download, or interrupted communications during download shall not interfere with the ability of the remote NICs to continue to operate normally using database information previously downloaded to it.

- aa. Capability to define within the system up to 127 variable card formats and have each card reader able to read three separate formats.
- bb. Integrated video imaging/photo-badging system incorporating a complete multi-layer, drag and drop, WYSIWYG, database keyed badge design facility, editor and drawing package. The system must be capable of allowing enrollment facilities at any designated workstation, and displaying photo-images of cardholders at any workstation on an individual system.
- cc. The system shall be capable of interfacing through NICs to keypads or card reader/keypad combinations with LCD displays allowing the system to operate as a proprietary burglar alarm system for designated security areas. The system shall provide delayed alarm reporting and masking facilities using these devices so that arming and disarming of security areas is delayed for a preset period. This will allow personnel entering an area to have the opportunity to disarm (mask) the alarm reporting facility by entering a code into the keypad, entering a card or both. During this entry delay period the LDC/keypad/card reader device shall emit an audible tone until the area is disarmed (masked). The system will allow the user to arm (unmask) the system before leaving the designated area, by entering data on the keypad, using a card or both, and the display shall provide information concerning the status of any unsecured alarm points in the area. Once the security area has been armed, the device will emit an audible tone for a predetermined time, and delay reporting alarm status for this same time to allow the occupant time to exit the secured area.
- dd. The system shall provide a serial output from the server, which can be connected through a central station dialer device to alert a remote central alarm receiving station.

C. On-Line System Management & Reporting: The system shall maintain, on disk, an event transaction log file, and be capable of historical data reports as well as cardholder report listings in a variety of formats.

1. System Event Transaction Log File:

- a. The system shall maintain an event transaction log file on hard disk for the recording of all historical event log data.
- b. The historical data file shall maintain the most recent one million event transactions without having to resort to archived media.
- c. The system shall warn the user of the need to archive historical data before data is over-written.
- d. The system shall provide the utilities by which the historical event log file may be backed up to a removable disk cartridge of not less than 1 GB capacity, which may be accessed on-line, without the need to copy the archived data back to hard disk. The system must be capable of recalling historical events directly from the back-up magnetic media without the need to interrupt normal on-line activity of the ACAM system.

2. Historical Reports: The system shall be capable of producing the following reports, based on logged historical events over a specified date and time period, both individually and in any combination.

- a. Report of valid accesses for a selected cardholder, group of cardholders, selected card reader, group of card readers and selected areas.

- b. Report of rejected access attempts for a selected cardholder, group of cardholders, selected card reader, group of card readers and selected alarm activation's for a selected alarm point, group of alarm points, selected category or type of alarms, and by selected areas or group of areas.
  - c. Report of alarm acknowledgments for a selected alarm or group of alarms.
  - d. Report of operator entered comments in conjunction with alarm acknowledgments.
  - e. Report of manual operator override commands such as performed alarm point masking/unmasking, manual card reader door locking and unlocking, and manual auxiliary relay activate/deactivate.
  - f. Report of automatic time controlled system commands such as automatic masking/unmasking, and automatic door lock/unlocks.
  - g. Report of visitor card valid access and rejected access attempts.
  - h. Report of access statistics including the number of valid accesses, rejected access attempts, and card read errors, reported by selected card readers, or group of card readers, or by selected areas, over a selected date and time period.
  - i. In addition, the system shall offer the user the option of directing the historical reports to a client workstation color monitor for display or to the report printer.
3. Cardholder Reports: The system shall be capable of producing lists of selected cardholder data records on a client workstation color monitor and/or a report printer. The system shall allow the user to select sorting by card number, cardholder name or other fields.
- a. Standard cardholder record reports may be requested by an operator, with the data records sorted numerically by encoded card number, alphabetically by cardholder name, numerically by cardholder ID number, and numerically by the embossed card serial number. Such listings may also be requested to include only those cardholders who are authorized access to a specified area.
  - b. Special Ad Hoc reports may be created by the operator to provide cardholder record listings that include only operator specified data fields. Each report may include conditional testing on up to the 16 data fields in order to include data for only those cardholders that comply to those conditions specified. Each report shall be capable of being sorted in alphabetical or numeric order.
  - c. Cardholder report formats: The system shall allow the user to create and design and Ad Hoc reports with report format names. The system shall save and store these named formats on the system hard disk for later use and recall by format name.
4. Custom Reporting Facilities: The system must be provided with an ODBC compatible database with full SQL facilities, which will allow the interfacing of industry standard report generating facilities such as Crystal Reports, Oracle, or Informix.

## 2.8 PROXIMITY READERS

- A. Proximity readers shall be by HID Corporation:

- 1. Miniprox.

- B. Provide 100 cards.

## 2.9 I/O CONTROLLERS/FIELD PANELS

- A. Networked Intelligent Controller:

1. The Networked Intelligent Controller (NIC) shall be a microprocessor-based device, which utilizes a 32-bit processor and a 32-bit bus structure. The controller shall have a minimum clock speed of 90 MHz, and shall be provided with at least 16 Mbytes of battery back dynamic RAM. The controller shall feature a direct LAN/WAN connection to the controller bu structure in addition to two RS-232 or RS-485 connections, all of which should be designed for use in communication with the ACAM server. The communication architecture of the NIC shall be such that in the event that the primary communication channel to the ACAM server is lost, the unit shall be capable of automatically switching to the secondary communication channel using one of the host RS-232 or RS-485 connections, and if required shall be able to establish communications via dial-up modem.
  - a. The NIC shall be provided with a parallel printer port, which will enable it to print transaction data during loss of communication with the ACAM server. The NIC shall be capable of dynamically allocating its memory between database information and transaction history, which shall be stored if the controller has lost communication with the ACAM server. Such transaction history shall be automatically uploaded to the ACAM server once communication has been restored. In its maximum configuration, the NIC shall be capable of storing 50,000 cardholders, and its memory utilization shall be such that if storing database information for 10,000 cardholders, it shall also be capable of storing one million transactions.
2. The NIC shall support the monitoring and control of 8 or 16 card readers, with or without keypads. It shall also be provided with at least 12 five-state, fully supervised and fully configurable input points, and at least 12 fully configurable auxiliary output control relays mounted on the main circuit board.
3. Each controller must also be capable of expansion, by external Remote Input Modules (RIMs) and/or Remote Relay Modules (RRMs), to support a combination of up to 172 fully configurable five-state supervised input points or 156 output relays per NIC depending on configuration.
4. Each NIC shall be provided with a UL Listed uninterruptible power supply (UPS) mounted within the NIC enclosure. It shall provide sufficient battery backup to sustain complete operational effectiveness including Remote Reader Electronic (RRE) modules, card readers, electric locks (fail secure), RIMs and RRM for a minimum of four (eight) hours of normal operation.
5. Each NIC shall utilize on-board self-diagnostic LEDs, removable terminal strips and a pop-in/pop-out circuit board.
6. Each NIC in addition to its on-board LAN/WAN connection shall support RS-232 and multi-drop RS-485 communication topologies. Provision of external LAN terminal server devices that are connected through serial communications to the NIC are not acceptable.
7. Each NIC shall support RS-485 bi-directional communication paths (dual multi-drop paths back to ACAM file server) with no additional hardware or firmware required.
8. Each NIC shall be supplied with all specified options available, including an enclosure with a tamper switch.
9. Each NIC shall be capable of reporting the following alarm conditions to the ACAM file server:
  - a. Enclosure door tamper;
  - b. Primary power failure;
  - c. Low battery conditions;
  - d. Loss of communications;
  - e. All access control violations.
10. Quantity and location of NICs shall be as specified in contract documents and drawings.

11. The NIC shall be equipped with 24 VDC UPS.

B. Remote Reader Electronic Modules:

1. The Remote Reader Electronic (RRE) modules shall be provided to support all card readers, door contact switches, request-to-exit devices and electric locks. The RRE modules shall support all industry standard card reader technologies (magnetic stripe, Wiegand, bar code, barium ferrite, and proximity) as well as keypads and compatible biometric devices. These modules shall be available in configurations suitable to support the connection of one, two or four card devices as required.
2. Each RRE module shall support five-state supervised input points, output relays, and shall provide power outputs of 5 VDC, 12 VDC and 24 VDC output at 500 mA to power card readers, biometric devices, request to exit (REX) devices and door strikes. Each RRE module shall be capable of being powered by the on-board UPS of a NIC to avoid the need for power supplies and 115 volt outlets to be located near controlled doors. Each RRE shall also be capable of being powered by a local 24 VDC UPS where required.
3. RRE modules shall utilize on-board self-diagnostic LEDs, removable terminal strips and pop-in/pop-out circuit boards.
4. RRE modules shall be supplied with all specified options available, including an enclosure with an enclosure tamper switch.
5. Quantity and location of RRE modules shall be as specified in contract documents and drawings.

C. Remote Input Module:

1. The Remote Input Module (RIM) shall be provided to support additional input points. The RIM shall support all industry standard alarm input devices.
2. Each RIM shall support 16 five-state supervised input points and two output relays. The status of each input point shall be indicated by a tri-state LED, and shall be available if required with an enclosure through which these status LEDs can be viewed, and it shall be possible to append legends denoting the connection details of each input point on the outside of the enclosure. Each RIM shall be capable of being powered by the on-board UPS of a NIC or by a local 24 VDC UPS.
3. Each RIM shall utilize on-board self-diagnostic LEDs, industry standard terminal strips and a pop-in/pop-out circuit board.
4. Each RIM shall be supplied with all specified options available, including an enclosure with an enclosure tamper switch. Quantity and location of remote input modules shall be as specified in contract documents and drawings.

D. Remote Relay Module:

1. The Remote Relay Module (RRM) shall be provided to support additional output relays. The RRM shall utilize industry standard dry contact output relays.
2. Each RRM shall support eight SPST and eight DPDT output relays. Each RRM shall be capable of being powered by the on-board UPS of a NIC.
3. Each RRM shall utilize on-board self-diagnostic LEDs, and a pop-in/pop-out circuit board.
4. Each RRM shall be supplied with all specified options available, including an enclosure with an enclosure tamper switch. Quantity and location of RRM's shall be as specified in contract documents and drawings.

2.10 CARD READERS

- A. The card readers shall be proximity readers. They shall read the identification credential when presented to the reader at a specified distance.
- B. Damage to card reader shall not affect the system monitoring and alarm. The transmission of signals into the sensor or damage to the card reader data cable shall not compromise the System.
- C. Door contacts, junction boxes, wiring, and connections that control door security shall not be accessible from the unsecured side of access-controlled doors.
- D. Card Readers shall have the following capabilities:
  - 1. Panel/host communication speed of 9600 baud upgradeable to 56.6 KB per second.
  - 2. Support site requirements, scaleable up to 800 individual access readers per host system.
  - 3. Denied access, granted access and no read shall generate unique indications.
  - 4. Read failures shall generate a visible or audible notification.
  - 5. Visual indicator of granted or denied access shall be supported.
  - 6. Audible indicator of access granted or denied shall be supported.
  - 7. The system shall support Owner's Security standard card types.
  - 8. Each reader can optionally have a keypad associated with it.
  - 9. Operate up to 1000' from I/O controller.
  - 10. Attachable to a standard electrical box.
  - 11. Capable of indoor and outdoor operation.
  - 12. Readers must be selectable for degraded operation mode.
  - 13. Rated at 1 million reads before failure.
  - 14. Operating range: -30 degrees F to + 150 degrees F, 0-100 percent Humidity.
  - 15. Readers shall be tamper resistant or monitored for tampering.
  - 16. Support manual and automatic request to exit "REX" operations.
  - 17. Support multiple lock voltages.
  - 18. Support momentary REX devices.
  - 19. Generate an alarm on door forced open.
  - 20. Generate an alarm on door held open too long. The time required to generate this alarm shall be user selectable.

## 2.11 DOOR HARDWARE

- A. Door Monitor Switches:
  - 1. Sentrol 1076D Double-Pole Throw 1-Inch Alarm Contact: C2568-24 unless otherwise indicated.
  - 2. The status switch shall be a normally closed (switch is closed when door is closed, open when door is opened) reed switch, with magnet, UL-listed for central station direct-wire circuits. Switch shall be suitable for indoor and outdoor use.
  - 3. Switch shall be rated at 120V, 500 mA and 100,000 operations.
  - 4. Switch shall be suitable for use with metal doors and frames, normally closed type contacts.
  - 5. Switch and magnet shall be made for recessed mounting.
  - 6. Status switches shall be in accordance with Section 08710, Door Hardware.
- B. Door Hardware:
  - 1. Refer to Door Hardware Schedule.
  - 2. Coordinate work with Division 8.
- C. Request to Exit (Pushbutton)

1. Provide heavy duty pushbutton designed for high traffic application.
2. Pushbutton shall have delay action function and positive stop mechanism.
3. Button shall be equipped with heavy duty pneumatic mechanism, Form Z relay.
4. Provide Locknetics Model #DA603RD or approved equal.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Equipment and wiring shall be installed in accordance with the manufacturer's diagrams, manufacturer's recommendations, the drawing set and these specifications.

#### 3.2 INSTALLATION

- A. All system wiring shall be color coded in a consistent manner throughout the installation.
- B. Security system conductors shall be installed in completely separate outlet boxes, junction boxes, or raceways from other systems. Data loop wiring shall be routed in dedicated conduit.
- C. Mount card reader sensors in accordance with Americans with Disabilities Act (ADA) requirements.
- D. All reader/terminals, contact modules, and terminal cabinets shall be located per the Drawings.
- E. Provide Security System application database programming, ie, I/O, alarms, etc.
- F. Coordinate the mounting of all system access and monitor devices with the door hardware installation subcontractor.
- G. All field devices shall be mounted on back boxes.
- H. Connections to all external wiring between the central controller and the card reader modules shall be made on terminal strips installed in accessible locked terminal cabinets. Connections may be made either with terminal spade lugs set on the conductors with a special setting tool or with an approved pressure type terminal blocks. A terminal cabinet shall be installed at each point where a station circuit riser originates or at any point along a circuit where a tap is made, and as shown on the Drawings.
- I. Subcontractor shall coordinate the mounting and wiring of door monitor switches, electric door strikes, transfer hinges, and all other security system associated door hardware with door installer.
- J. No 120VAC or higher rated equipment shall be directly connected to the security system. Interposing relays shall be used where 120VAC or higher energy equipment or circuits have to interface with the security system
- K. Conductor shielding:
  1. Conductor shielding shall be continuous, properly polarized, appropriately spliced, and insulated with heat shrink.
  2. Conductor shielding shall be treated as a third conductor and be free from connections to any circuit, conduit, or grounds except as noted.

- a. Loop cable shields shall be terminated at the loop driver bulkhead board ground. The other end of the shield shall be open-ended.
- L. All cables shall be installed with a minimum of 16 inches free conductor at each end for termination. Where cables terminate in consoles, enough free conductors shall be installed to equal one-half the outside perimeter of the cabinet(length + width). Upon termination, excess cable shall be neatly coiled and secured to the console structure with nylon ties. Cables shall be labeled at the panel and in the field. All spare conductors shall be folded back a minimum of 2 inches along the outer jacket, and heat shrink shall be applied to hold the conductor in place.
- M. Card Readers:
  - 1. Exterior card readers shall be provided with a weatherproof housing/cover.
  - 2. On double-door installations, the card reader shall be installed on the unsecured side of the active door.
  - 3. On single-door installations, the card reader shall be installed on the unsecured side of the door opposite the hinge side.
- N. Exit control shall be accomplished using a narrow beam infrared motion sensor powered from security panel auxiliary power supplies or a proximity reader. The infrared sensor shall be equipped with a time delay drop out relay. The contacts of the infrared sensor or the exit proximity shall be used to shunt the door monitor contacts to prevent alarming during exiting.

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's certificate of satisfactory operation to be furnished upon project completion.

### 3.4 MANUFACTURER'S FIELD SERVICE

- A. Include services of factory certified personnel to supervise installation, adjustments, final connections, and system testing.

### 3.5 SYSTEM TESTING

- A. At the completion of the panel assembly, the system shall be demonstrated to operate in all designated modes. All controls and indicators shall be shown on operate designed.
- B. At the completion of installation, the system shall be subject to a final acceptance test, and witnessed by the Owner.

### 3.6 TRAINING

- A. Manufacturer's representative shall provide written instruction to instruct campus security and maintenance personnel on the basic operation and maintenance of the system to enable them to properly operate, maintain, and make routine minor adjustments. Include (3) 4-hour training classes in the operation and maintenance of the system for campus security and maintenance personnel. If the project location is the first building on a new site, include full factory training for the campus security and maintenance personnel.

END OF SECTION 13701



## SECTION 13720 - INTRUSION DETECTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes the following:

1. Intrusion detection with modular, microprocessor based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions.

#### 1.2 DEFINITIONS

- A. LCD: Liquid-crystal display.
- B. LED: Light-emitting diode.
- C. PIR: Passive infrared.
- D. RFI: Radio-frequency interference.
- E. UPS: Uninterruptible power supply.
- F. Protected or Protection Zone: A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.
- G. Standard Intruder: A person who weighs 100 lb (45 kg) or less and whose height is 60 inches (1525 mm) or less; dressed in a long-sleeved shirt, slacks, and shoes unless environmental conditions at the site require protective clothing
- H. Standard-Intruder Movement: Any movement, such as walking, running, crawling, rolling, or jumping, of a "standard intruder" in a protected zone.

#### 1.3 SUBMITTALS

- A. Product Data: Components for sensing, detecting, and control, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections. Indicate methods used to achieve systems integration. Indicate control, signal, and data communication paths and identify control interface devices and media to be used. Describe characteristics of network and other data communication lines.
  2. Raceway Riser Diagrams: Detail raceway runs required for intrusion detection and for systems integration. Include designation of devices connected by raceway, raceway type, and size, and type and size of wire and cable fill for each raceway run.

3. Site and Floor Plans: Indicate final outlet and device locations, routing of raceways, and cables inside and outside the building. Include room layout
4. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
5. Sensor detection patterns and adjustment ranges.

C. Qualification Data: For Installer

D. Field quality-control test reports.

#### 1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the National Burglar & Fire Alarm Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the same manufacturer as existing system.

#### 2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Supervision: System components shall be continuously monitored for normal, alarm, and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.

1. Alarm Signal: Display at central-station control unit and actuate audible and visual alarm devices.
2. Trouble Condition Signal: Distinct from other signals, indicating that system is not fully functional. Trouble signal shall indicate system problems such as battery failure, open or shorted transmission line conductors, or controller failure.

B. System Control: Central-station control unit shall directly monitor intrusion detection units and connecting wiring.

## 2.3 SYSTEM COMPONENT REQUIREMENTS

- A. Compatibility: Detection devices and their communication features, connecting wiring, shall be selected and configured with accessories for full compatibility with the central-station control unit
  - 1. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Lines: Comply with requirements in Division 16 Section "Transient Voltage Suppression" as recommended by manufacturer for type of line being protected.
- B. Interference Protection: Components shall be unaffected by radiated RFI and electrical induction of 15 V/m over a frequency range of 10 to 10,000 MHz and conducted interference signals up to 0.25-V RMS injected into power supply lines at 10 to 10,000MHz.
- C. Interior Sensors: Enclosures that protect against dust, falling dirt, and dripping noncorrosive liquids.
- D. Interior Electronics: NEMA 250, Type 12.
- E. Exterior Electronics: NEMA 250, Type 4X
- F. Corrosion Resistant: NEMA 250, Type 4X
- G. Screw Covers: Where enclosures are accessible to inmates, secure with security fasteners of type appropriate for enclosure.

## 2.4 DOOR CONTACTS

- A. Description: Magnetic reed switch, complying with UL 634, installed on frame with wireless transmitter and lithium battery capable of transmitting alarm, supervisory and low battery signal.

## 2.5 MICROWAVE-PIR DUAL-TECHNOLOGY MOTION SENSORS

- A. Description: Single unit combining a sensor that detects changes in microwave signals and a PIR sensor that detects changes in ambient level of infrared emissions caused by standard-intruder movement within detection pattern.
- B. Device Performance: An alarm is transmitted when either sensor detects a standard intruder within a period of three to eight seconds from when the other sensor detects a standard intruder.
  - 1. Minimum Detection Pattern: A room 20 by 30 feet (6 by 9 m).
  - 2. PIR Sensor Sensitivity: Adjustable pattern coverage to detect a change in temperature of 2 deg F (1 deg C) or less, and standard-intruder movement within sensor's detection patterns at any speed between 0.3 to 7.5 fps (0.09 to 2.3 m/s) across 2 adjacent segments of detector's field of view.
  - 3. Microwave Sensor Sensitivity: Adjustable, able to detect standard-intruder movement within sensor's detection pattern at any speed between 0.3 to 7.5 fps (0.09 to 2.3 m/s). Sensor sensitivity adjustments shall be accessible only when sensor housing is removed, and sensors shall comply with 47 CFR 15.
  - 4. Activation Indicator: LED indicator shall not be visible during normal operation. Indicator shall light when sensor detects a standard intruder. Locate test enabling switch under sensor housing cover.

5. Remote Test: When initiated by central-station control unit, start a test sequence for each detector element that simulates standard-intruder movement within sensor's detection patterns, causing an alarm.

## 2.6 ACOUSTIC-TYPE, GLASS-BREAK SENSORS

- A. Device Performance: Detect unique, airborne acoustic energy spectrum caused by breaking glass.
  1. Sensor Element: Microprocessor-based, digital device to detect breakage of plate, laminate, tempered, and wired glass while rejecting common causes of false alarms. Detection pattern shall be at least a 20-foot (6-m) range.
  2. Hookup Cable: Factory installed, not less than 72 inches (1830 mm).
  3. Activation Indicator: LED on sensor housing that lights when responding to vibrations, remaining on until manually reset at sensor controller or at central station control unit
  4. Controller: Integral with sensor housing or in a separate assembly, locally adjustable by control under housing cover.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of intrusion detection.
  1. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.
  2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.
- B. Inspect built-in and cast-in anchor installations, before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.
  1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Reinspect after repairs or replacements are made.
  2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.
- C. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 WIRING INSTALLATION

- A. Wiring Method: Install wiring in metal raceways according to Division 16 Section "Raceways and Boxes." Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch (13 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.

- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- C. Wires and Cables:
  - 1. Conductors: Size as recommended in writing by system manufacturer, unless otherwise indicated.
  - 2. 120-V Power Wiring: Install according to Division 16 Section "Conductors and Cables," unless otherwise indicated.
  - 3. Control and Signal Transmission Conductors: Install unshielded, twisted-pair cable, unless otherwise indicated or if manufacturer recommends shielded cable, according to Division 16 Section "Voice and Data Communication Cabling."
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- E. Install power supplies and other auxiliary components for detection devices at controllers, unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.

### 3.3 FIELD QUALITY CONTROL

- A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
  - 1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.
- B. Test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.
- C. Perform the following field tests and inspections and prepare reports:
  - 1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
  - 2. Operational Tests: Schedule tests after pretesting has been successfully completed. Test all modes of system operation and intrusion detection at each detection device. Test for detection of intrusion and for false alarms in each protected zone. Test for false alarms by simulating activities outside indicated detection patterns.

3. Electrical Tests: Comply with NFPA 72, Section A-7. Minimum required tests are as follows:
  - a. Verify the absence of unwanted voltages between circuit conductors and ground.
  - b. Test all conductors for short circuits using an insulation-testing device.
  - c. With each circuit pair, short circuit at the far end of circuit and measure circuit resistance with an ohmmeter. Record circuit resistance of each circuit on Record Drawings.
  - d. Test each initiating and indicating device for alarm operation and proper response at central-station control unit.

END OF SECTION 13720

## **SECTION 13760 - VIDEO SURVEILLANCE**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes a video surveillance system consisting of cameras, digital video recorder, data transmission wiring, and a control station with its associated equipment.
- B. Video surveillance system shall be integrated with monitoring and control system specified in Division 13 Section " Security Access," which specifies systems integration.

#### **1.2 DEFINITIONS**

- A. AGC: Automatic gain control.
- B. BNC: Bayonet Neill-Concelman - type of connector.
- C. B/W: Black and white.
- D. CCD: Charge-coupled device.
- E. FTP: File transfer protocol.
- F. IP: Internet protocol.
- G. LAN: Local area network.
- H. MPEG: Moving picture experts group.
- I. NTSC: National Television System Committee.
- J. PC: Personal computer.
- K. PTZ: Pan-tilt-zoom.
- L. RAID: Redundant array of independent disks.
- M. TCP: Transmission control protocol - connects hosts on the Internet.
- N. UPS: Uninterruptible power supply.
- O. WAN: Wide area network.

#### **1.3 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Video surveillance system shall withstand the effects of earthquake motions determined according to BC-NYS.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.
  1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
  3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
  4. Wiring Diagrams: For power, signal, and control wiring.
- C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.
- D. Seismic Qualification Certificates: For video surveillance, cameras, camera-supporting equipment, accessories, and components, from manufacturer.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Field quality-control reports.
- F. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
  1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.
- G. Warranty: Sample of special warranty.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NECA 1.
- C. Comply with NFPA 70.
- D. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

## PART 2 - PRODUCTS

### 2.1 SYSTEM REQUIREMENTS

- A. Video-signal format shall comply with NTSC standard, composite interlaced video. Composite video-signal termination shall be 75 ohms.
- B. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.
  - 1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Division 16 Section "Transient Voltage Suppression."
  - 2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Division 16 Section "Transient Voltage Suppression" as recommended by manufacturer for type of line being protected.
- C. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

### 2.2 STANDARD CAMERAS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. CBC (AMERICA) Corp.
  - 2. Crest Electronics, Inc.
  - 3. GE Security, Inc.
  - 4. JVC Americas Corp.; JVC Professional products.
  - 5. Panasonic Corporation of North America; Panasonic Security Systems.
  - 6. Pelco.
  - 7. Samsung Opto-Electronics.
  - 8. SANYO North America Corporation.
  - 9. Telpix Electronics, Inc.
  - 10. Toshiba Corporation; Surveillance products.
  - 11. Trinus Systems Inc.
  - 12. Tyco International Limited; Sensormatic products.
  - 13. VELTEK.

14. Vicon Industries, Inc.
15. Videology Imaging Solutions, Inc.
16. Visiontech.
17. Watec America Corporation.

B. Color Camera:

1. Comply with UL 639.
2. Pickup Device: CCD interline transfer, 380,000 771(H) by 492(V) pixels.
3. Horizontal Resolution: 480 lines.
4. Signal-to-Noise Ratio: Not less than 50 dB, with camera AGC off.
5. With AGC, manually selectable on or off.
6. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. Illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with camera AGC off.
7. Manually selectable modes for backlight compensation or normal lighting.
8. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
9. White Balance: Auto-tracing white balance, with manually settable fixed balance option.
10. Motion Detector: Built-in digital.

C. Automatic Color Dome Camera: Assembled and tested as a manufactured unit, containing dome assembly, color camera, motorized pan and tilt, zoom lens, and receiver/driver.

1. Pickup Device: CCD interline transfer, 380,000 768(H) by 494(V) pixels.
2. Horizontal Resolution: 480 lines.
3. Signal-to-Noise Ratio: Not less than 50 dB, with camera AGC off.
4. With AGC, manually selectable on or off.
5. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. Illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with camera AGC off.
6. Manually selectable modes for backlight compensation or normal lighting.
7. Pan and Tilt: Direct-drive motor, 360-degree rotation angle, and 180-degree tilt angle. Pan-and-tilt speed shall be controlled by operator. Movement from preset positions shall be not less than 300 degrees per second.
8. Preset Positioning: Eight user-definable scenes, each allowing 16-character titles. Controls shall include the following:
  - a. In "sequence mode," camera shall continuously sequence through preset positions, with dwell time and sequencing under operator control.
  - b. Motion detection shall be available at each camera position.
  - c. Up to four preset positions may be selected to be activated by an alarm. Each of the alarm positions may be programmed to output a response signal.
9. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
10. White Balance: Auto-tracing white balance, with manually settable fixed balance option.
11. Motion Detector: Built-in digital.
12. Dome shall support multiplexed control communications using coaxial cable recommended by manufacturer.

## 2.3 REINFORCED DOME CAMERAS

- A. Camera: Designed for high-abuse locations, with a weathertight mounting, impact-resistance polycarbonate dome, and heavy-gage, 6061 T6 aluminum body.
  - 1. Suitable for exterior environment, rated for continuous operation in ambient temperatures of minus 40 to plus 122 deg F (minus 40 to plus 50 deg C) dry bulb and up to 85 percent relative humidity.
  - 2. Pickup Device: CCD interline transfer, 290,000 510(H) by 492(V) pixels.
  - 3. Horizontal Resolution: 350 lines.
  - 4. Signal-to-Noise Ratio: Not less than 46 dB.
  - 5. With AGC and automatic backlight compensation.
  - 6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of 6 lux at f/2.0.
  - 7. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
  - 8. White Balance: Auto-tracing white balance.

## 2.4 LENSES

- A. Description: Optical-quality coated lens, designed specifically for video-surveillance applications and matched to specified camera. Provide color-corrected lenses with color cameras.
  - 1. Auto-Iris Lens: Electrically controlled iris with circuit set to maintain a constant video level in varying lighting conditions.
  - 2. Fixed Lens: With calibrated focus ring.
  - 3. Zoom Lens: Motorized, remote-controlled unit, rated as "quiet operating." Features include the following:
    - a. Electrical Leads: Filtered to minimize video signal interference.
    - b. Motor Speed: Variable.
    - c. Lens shall be available with preset positioning capability to recall the position of specific scenes.

## 2.5 POWER SUPPLIES

- A. Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, and of type as recommended by manufacturer of camera and lens.
  - 1. Enclosure: NEMA 250, Type 3.

## 2.6 CAMERA-SUPPORTING EQUIPMENT

- A. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.
- B. Pan Units: Motorized automatic-scanning units arranged to provide remote-controlled manual and automatic camera panning action, and equipped with matching mounting brackets.

1. Scanning Operation: Silent, smooth, and positive.
  2. Stops: Adjustable without disassembly, to limit the scanning arc.
- C. Pan-and-Tilt Units: Motorized units arranged to provide remote-controlled aiming of cameras with smooth and silent operation, and equipped with matching mounting brackets.
1. Panning Rotation: 0 to 355 degrees, with adjustable stops.
  2. Tilt Movement: 90 degrees, plus or minus 5 degrees, with adjustable stops.
  3. Speed: 12 degrees per second in both horizontal and vertical planes.
  4. Wiring: Factory prewired for camera and zoom lens functions and pan-and-tilt power and control.
  5. Pan-and-tilt unit shall be available with preset positioning capability to recall the position of a specific scene.
- D. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.
- E. Protective Housings for Fixed and Movable Cameras: Steel enclosures with internal camera mounting and connecting provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed.
1. Tamper switch on access cover sounds an alarm signal when unit is opened or partially disassembled. Central-control unit shall identify tamper alarms and indicate location in alarm display. Tamper switches and central-control unit are specified in Division 13 Section "Intrusion Detection."
  2. Camera Viewing Window: Lexan window, aligned with camera lens.
  3. Duplex Receptacle: Internally mounted.
  4. Alignment Provisions: Camera mounting shall provide for field aiming of camera and permit removal and reinstallation of camera lens without disturbing camera alignment.
  5. Built-in, thermostat-activated heater and blower units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded.
  6. Sun shield shall not interfere with normal airflow around the housing.
  7. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket shall be of same material as the housing; mounting hardware shall be stainless steel.
  8. Finish: Housing and mounting bracket shall be factory finished using manufacturer's standard finishing process suitable for the environment.

## 2.7 MONITORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Bosch Security Systems, Inc.
  2. CBC (AMERICA) Corp.
  3. COP-USA.
  4. Crest Electronics, Inc.
  5. Elbex Ltd.; Elbex America Inc.
  6. ELMO.
  7. EverFocus Electronics Corporation.

8. GENWAC; a brand of Watec Cameras.
9. GE Security, Inc.
10. Hitachi, Ltd.
11. Honeywell International Inc.; Honeywell Video Systems.

## 2.8 VIDEOTAPE RECORDERS

- A. Description: Industrial, time-lapse type recorder, designed for continuous operation. Tape format is 1/2 inch (13 mm) using industrial-grade, T-120 cassettes.
1. Horizontal Resolution: 400 lines, minimum.
  2. Recording Heads: Rotary-scan type.
  3. Integral Timer: Permits programming of recording operation for adjustable daily and weekly periods.
  4. Time-Lapse Operating Modes: Multiple, covering 24 to 240 hours, minimum.
  5. Other Operating Modes:
    - a. Manual play and recording at two- and six-hour speeds.
    - b. Forward and reverse high-speed search.
    - c. Reverse, slow, and single-frame play.
  6. Alarm Recording: Operating mode is automatically switched from time-lapse to two- or six-hour recording mode when an externally generated alarm signal is received.
  7. Audio Recording: 70 to 7000 Hz. Phono and microphone input; phono output.
  8. Time and Date Generator: Records time and date legend in corner of recorded scenes.
  9. Tape Counter: Displays tape position.
  10. Manual Recording Lock: Key or keypad operated. Prevents unauthorized tampering or control changes during preset operation.
  11. Signal-to-Noise Ratio: 45 dB for video output in standard play mode.
  12. Mounting: Standard 19-inch (483-mm) rack complying with CEA 310-E, or freestanding desktop.

## 2.9 DIGITAL VIDEO RECORDERS

- A. Description: Digital, time-lapse type, full-frame and motion recorder, with removable hard drive.
1. Recording Time: 400 hours minimum.
  2. Resolution: 720 by 480 lines, minimum.
  3. Programming shall be from trackball and push buttons on face of the recorder, settings shall be displayed on any video monitor connected to the recorder. Programming shall include the following:
    - a. Motion analysis graph.
    - b. Password protection.
    - c. Alarm and timer controls.
    - d. Continuous recording option.
    - e. Time-lapse operating modes.
    - f. Search video by time, event, or motion.

4. Programming: SmartMedia card for software updating, image archiving, and image transfer to a PC.
5. Storage: 120 GB, removable hard drive. Software shall permit hot-swapping drives.
6. Compression: MPEG-2.
7. Time and Date Generator: Records time (hr:min:sec) and date legend of each frame.
8. Audio Recording: 70 to 7000 Hz. Phono and microphone input; phono output.
9. Mounting: Standard 19-inch (483-mm) rack complying with CEA 310-E, or freestanding desktop.

## 2.10 NETWORK VIDEO RECORDERS

## 2.11 DIGITAL SWITCHERS

- A. Quad Switch: For displaying images from four cameras on a single monitor. Provide color switcher if one or more cameras or monitors are in color.
  1. Controls: Unit-mounted front panel.
  2. Resolution: 720 by 480 lines.
  3. Modes: Auto, manual, and alarm. In manual mode, each channel can also be viewed in single display mode. In the event of an alarm, alarming channel shall automatically switch to full screen. If several alarms are activated, channels in alarm shall be in auto-switching mode.
  4. Channel Loss Alarm: Audible buzzer; occurrence details shall be recorded.
  5. Time: Indicate date and time.
  6. Timing of Auto-Switcher: 1 to 30 seconds, selectable.
  7. Mounting: Standard 19-inch (483-mm) rack complying with CEA 310-E, or freestanding desktop.
- B. Manual Switch Bank: Low-loss, high-isolation, multiple-video switch to allow manual switching of multiple quad switches and cameras to a single output. Switches shall be illuminated.
- C. Sequential Switchers: Automatically sequence outputs of multiple cameras to single monitor and videotape recorder.
  1. Switching Time Interval: Continuously adjustable, 5 to 20 seconds minimum, with manual override.
  2. Skip-Sequential-Hold Switch: One for each camera, with LED to indicate active camera.
  3. Camera Identification Legend: Either on-screen message or label at skip-sequential switch.
  4. Alarm Switching: In the event of an alarm, alarming channel shall automatically switch the monitor to full screen.
  5. Mounting: Standard 19-inch (483-mm) rack complying with CEA 310-E.
- D. PTZ Controls: Arranged for multiple-camera control, with switches to select camera to be controlled.
  1. Pan-and-Tilt Control: Joystick type.
  2. Zoom Control: Momentary-contact, "in-out" push button.
  3. Automatic-Scan Control: A push button for each camera with pan capability that places camera in automatic-scanning mode.

## 2.12 CONTROL STATIONS

- A. Description: Heavy-duty, freestanding, modular, metal furniture units arranged to house electronic equipment. Coordinate component arrangement and wiring with components and wiring of other systems.
- B. Equipment Mounting: Standard 19-inch (483-mm) rack complying with CEA 310-E.
- C. Normal System Power Supply: 120 V, 60 Hz, through a locked disconnect device and an isolation transformer in central-station control unit. Central-station control unit shall supply power to all components connected to it unless otherwise indicated.
- D. Power Continuity for Control Station: Batteries in power supplies of central-station control units and individual system components shall maintain continuous system operation during outages of both normal and backup ac system supply.
  - 1. Batteries: Rechargeable, valve-regulated, recombinant, sealed, lead-acid type with nominal 10-year life expectancy. Capacity adequate to operate portions of system served including audible trouble signal devices for up to four hours and audible and visual alarm devices under alarm conditions for an additional 10 minutes.
  - 2. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Charger shall recharge fully discharged battery within 24 hours.
- E. Annunciation: Indicate change in system condition and switching of system or component to backup power.

## 2.13 SIGNAL TRANSMISSION COMPONENTS

- A. Cable: Coaxial cable elements have 75-ohm nominal impedance. Comply with requirements in Division 16 Section "Conductors and Cables for Electronic Safety and Security."
- B. Video Surveillance Coaxial Cable Connectors: BNC type, 75 ohms. Comply with requirements in Division 16 Section "Conductors and Cables for Electronic Safety and Security."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.
- B. Examine roughing-in for LAN, WAN, and IP network before device installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 WIRING

- A. Comply with requirements in Division 16 Section "Raceways and Boxes."

- B. Wiring Method: Install cables in raceways unless otherwise indicated.
  - 1. Except raceways are not required in accessible indoor ceiling spaces and attics.
  - 2. Except raceways are not required in hollow gypsum board partitions.
  - 3. Conceal raceways and wiring except in unfinished spaces.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- E. For LAN connection and fiber-optic and copper communication wiring, comply with Division 16 Sections "Communications Backbone Cabling" and "Communications Horizontal Cabling."
- F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

### 3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

- A. Install cameras and infrared illuminators level and plumb.
- B. Install cameras with 84-inch- (2134-mm-) minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.
- C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.
- D. Install power supplies and other auxiliary components at control stations unless otherwise indicated.
- E. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.
- F. Avoid ground loops by making ground connections only at the control station.
  - 1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.
- G. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Electrical Identification."

### 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:
  - a. Prepare equipment list described in "Submittals" Article.
  - b. Verify operation of auto-iris lenses.
  - c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
  - d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet (17 to 23 m) away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
  - e. Set and name all preset positions; consult Owner's personnel.
  - f. Set sensitivity of motion detection.
  - g. Connect and verify responses to alarms.
  - h. Verify operation of control-station equipment.
3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

D. Video surveillance system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

### 3.5 CLEANING

- A. Clean installed items using methods and materials recommended in writing by manufacturer.
- B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

### 3.6 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train] [Train]** Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION 13760

## SECTION 13851 - FIRE ALARM

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes specifications for furnishing and installing of new interior fire alarm system including fire alarm control panel, initiating and indicating devices, raceways and wiring and associated accessories, complete in place, as indicated. The system must be Peer to Peer Token Ring Topography and be capable of interfacing to the building management system through a U.L. approved interface. All equipment and devices shall be manufactured to strict ISO 9001 standards.

#### 1.2 DEFINITIONS

- A. FACP: Fire alarm control panel.
- B. LED: Light-emitting diode.
- C. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

#### 1.3 SYSTEM DESCRIPTION

- A. General: Noncoded, addressable system with manual and automatic alarm initiation; and multiplexed signal transmission dedicated to fire alarm service only.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is an authorized representative of the FACP manufacturer for both installation and maintenance of units required for this Project.
- B. Manufacturer Qualifications: A firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.
- C. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.
- D. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.
- E. The fire detection and alarm system shall be configured in accordance with NFPA 72. The equipment furnished shall be compatible and be UL listed or FM approved or approved or listed by a nationally recognized testing laboratory in accordance with the applicable NFPA standards. The equipment and installation shall meet the requirements of American with Disabilities Act (ADA).

### PART 2 - PRODUCTS

#### 2.1 FUNCTIONAL DESCRIPTION OF SYSTEM

- A. Operation:

1. The fire alarm and detection system shall be a complete, analog, addressable, Peer to Peer Topography, supervised fire detection and alarm system. The system shall be activated into the alarm mode by actuation of any alarm-initiating device. The system shall automatically display on the control panel liquid crystal display the first event of the highest priority by type while simultaneously displaying the last event. The priority and type shall be alarm, supervisory, trouble and monitor. The system shall remain in the alarm mode until initiating device is reset and the fire alarm control panel is reset and restored to normal. Alarm initiating devices shall be connected to signal line circuits (SLC), Style 6 in accordance with NFPA 72. Alarm notification appliances shall be connected to notification appliance circuits (NAC), Style Z in accordance with NFPA 72. A loop raceway system (outgoing and return loop) shall be provided so that if any one raceway and all conductors contained in those raceways are severed all NAC, and SLC on that circuit shall remain functional. All textual, audible, and visual appliances and systems shall comply with NFPA 72.
2. The system shall be microprocessor based with a minimum word size of eight bits.
  - a. Individual identity of each addressable device shall be provided for the following conditions:
    - 1) Alarm
    - 2) Trouble.
    - 3) Open
    - 4) Short.
    - 5) Appliances missing/failed.
    - 6) Remote detector - sensitivity adjustment from the panel for smoke detectors.
  - b. All addressable devices shall have the capability of individually being disabled or enabled from the panel. The disable function should be protected with a password.
3. Sequence of Operation: Operation of a fire alarm manual station, or any automatic fire alarm initiating device (system smoke detector, system heat detector or a sprinkler flow) will initiate the following:
  - a. Notification appliance operation;
  - b. Flash all visual signals throughout the building;
  - c. Transmission to central station;
  - d. Identification at the FACP, remote annunciator and central station of the device origination of the alarm.
  - e. Shut down of fans and other air handling equipment.
  - f. Unlocking of electric door locks in designated egress paths.
  - g. Water flow switches will initiate the flashing of the device location indicating light.

B. Operational Features: The System shall have the following operating features:

1. Every addressable device shall be a discreet alarm zone.
2. Electrical supervision of alarm SLC and NAC. All addressable devices shall have combined alarm initiating and power circuits.
3. Electrical supervision of the primary power (AC) supply, battery voltage, placement of alarm zone module (card, PC board) within the control panel, and transmitter tripping circuit integrity.
4. Trouble buzzer and trouble lamp (light emitting diode) to activate upon a single break, open or ground fault condition, which prevents the required normal operation of the system. The trouble signal shall also operate upon loss of primary power (ac) supply, low battery voltage,

removal of alarm zone module (card, PC board), and disconnection of the circuit used for transmitting alarm signals off-premises. A trouble alarm silence switch shall be provided which will silence the trouble buzzer, but will not extinguish the trouble indicator lamp. After the system returns to normal operating conditions, the trouble buzzer shall again sound until the silencing switch returns to normal position. Trouble buzzer shall automatically reset after the trouble is cleared.

5. Transmission to Remote Alarm Receiving Station:
  - a. System shall automatically route alarm, supervisory, and trouble signals to the Central Monitoring Station, by means of a digital alarm communicator transmitter. The fire alarm system shall report and the central monitoring station shall visually annunciate the signal from each device, individually, by building name, apartment/unit number and type of device. Signals shall be transmitted to the central monitoring station via fiber optic network loop or copper data circuit as recommended by the system manufacturer.
  - b. Provide transmitter with a disconnect switch to allow testing and maintenance of the system without activating the transmitter. When the transmitter is disconnected a trouble signal shall be sent to the central monitoring station. When the transmitter is reconnected, a restoration signal shall be sent to the central monitoring station.
  - c. One-person test mode: Activating an initiating device in this mode will activate an alarm for a short period of time, then automatically reset the alarm, without activating the transmitter for the entire period.
6. Evacuation alarm silencing switch or switches which, when activated, will silence alarm devices, but will not affect the LCD display nor the operation of the transmitter. This switch shall be over-ridden upon activation of the subsequent addressable alarm which will reactivate evacuation signals.
7. Electrical supervision of circuits used for supervisory signal services. Supervision shall detect any open, short or ground.
8. Each addressable analog loop shall be circuited as shown on the drawings but device loading shall not exceed 80% of loop capacity in order to leave space for future devices.

C. Alarm Functions: An alarm condition on a circuit shall automatically initiate the following functions:

1. Transmission of signals to the Central Monitoring Station.
2. Visual indications of the alarmed devices on the fire alarm control panel annunciators in the building and the Central Monitoring Station Color Graphics Terminal located in the Security Office.
3. Continuous operation of alarm notification appliances in all areas when a manual pull station or non-dwelling unit detector is activated.

D. System Diagnostics: Provide the following diagnostic features:

1. Provide internal system diagnostics and maintenance user interface controls to display/report the power, communication and general status of specific panel components, detectors and modules.
2. Provide loop controller diagnostics to identify common alarm, trouble, ground fault. Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short and ground conditions. Ground faults on the circuit wiring of remote module shall be identified by device address.
3. Allow the manufacturer's representative to display/report the condition of addressable analog devices. Include device address, device type, percent obscuration, and maintenance

indicator. The maintenance indicator shall provide the user with a measure of contamination in percent obscuration, of a device upon which cleaning decisions can confidently be made. The control panel must be listed by UL for this operation.

4. Allow the manufacturer's representative to report history for alarm, supervisory, monitor, trouble, smoke verification, watchdog and restore activity. Include Facility Name, License, Project Program Compilation date, Compiler Version, Project Revision Number and the time and date of the History Report.
5. Allow the manufacturer's representative to activate/restore outputs, actions, sequences, and simulated detector smoke levels.
6. Allow the manufacturer's representative to enter time and date, reconfigure and external port for download programming, initiate auto programming and change passwords. Protect these functions with a password.

## 2.2 ACCEPTABLE MANUFACTURERS

- A. GE Firefox 64G.

## 2.3 GENERAL

- A. All materials, equipment, materials and devices shall, as a minimum, meet the requirements of UL where UL standards are established for those items, and the requirements of NFPA 70. All equipment and materials provided shall be new.

## 2.4 FIRE ALARM CONTROL PANEL (FACP)

- A. Contractor shall provide, after completion of work, 3 reprogramming as directed by Owner.
- B. Control Panel shall comply with all the applicable requirements of UL 864. Panel shall be modular, installed in a surface mounted steel cabinet with hinged door and cylinder lock. Control panel shall be a clean, uncluttered, and orderly assembled panel containing all components and equipment required to provide the specified operating and supervisory functions of the system. The panel shall have prominent rigid plastic, phenolic or metal identification plates for all lamps, controls, meters, fuses, and switches. Nameplates for fuses shall also include ampere rating. Control panel switches shall be within the locked cabinet. The assembly shall contain a base panel, system power supply batteries and battery charger with optional modules suitable to meet the requirements of these specifications. System circuits shall be configured as follows:
  1. Addressable analog loops Class B
  2. Initiating device Circuits Class B.
  3. Notification Appliance Circuits Class B.
- C. The system shall be supervised, site programmable, and of modular design with analog loop modules to serve up to 125 detectors or 125 remote modules per loop. A suitable means shall be provided for testing the control panel visual indicating devices (meters or LEDs). Meters and LEDs shall be plainly visible when the cabinet door is closed. Signals shall be provided to indicate by device any alarm, supervisory or trouble condition on the system. Each SLC circuit shall be powered and supervised so that a signal on one device does not prevent the receipt of signals from other devices. Loss of power, including any or all batteries, shall not require the reloading of a program. Upon restoration of power, startup shall be automatic, and shall not require any manual operation. The loss of primary power or the sequence of applying primary or emergency power shall not affect the transmission of alarm, supervisory or trouble signals.

- D. The system shall store all basic system functionality and job specific data in non-volatile memory. The system shall remain intact and survive a complete power failure.
- E. The system shall allow downloading of a job specific custom program created by system application software. It shall support programming of any input point to any output point. It shall allow authorized customization of fundamental system operations using initiating events to start actions, timers, sequences and logical algorithms.
- F. The system shall support distributed processor intelligent devices with the following operational attributes, integral multiple differential sensors, environmental compensation, pre-alarm, dirty detector identification, automatic day/night sensitivity adjustment, dual normal/alarm LEDs, relay bases, and isolator bases.
- G. The system shall use full digital communications to supervise all addressable devices, distributed audio amplifiers and power supplies for placement, correct location, and operation. It shall allow swapping of "same type" devices without the need of addressing and impose the "location" parameters on replacement device. It shall initiate and maintain a trouble if a device is added to a loop and clear the trouble when the new device is mapped and defined into the system. Systems requiring jumpers or rotary switches used to address analog devices will not be acceptable.
- H. The system shall provide amplifier back up and in the event of back up amplifier fault shall enter a second level of survivability by providing a self-generating tone for signaling.
- I. The amplifiers shall have self contained back up tone generators in the event of primary tone generator failure.
- J. All amplifiers must be housed in the local Fire Alarm Control Panel. Separate audio amplifier housings will not be acceptable.
- K. The system shall have a UL listed Detector Sensitivity test feature, which will be a function of the smoke detectors and perform automatically every 4 hours. Proof of the UL listing must be submitted to the Consultant prior to approval.
- L. All panel modules shall be supervised for placement and return trouble if damaged or removed.
- M. The system shall have a CPU watchdog circuit to initiate trouble signal should the CPU fail.
- N. The system shall be equipped with local capability of generating an evacuation tone as directed by the Owner. Audible notification appliances shall be affected by signal silence features. Visual signal appliance shall not be affected by signal silence features.
- O. Passwords shall protect any changes to system operations. Provide a copy of custom program on Disk specific to this installation. The equipment shall have the capability for changing the password with the help of the Program Disk at a later date.
- P. The power supply shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc continuous for notification appliance circuits.
- Q. The LCD Display Module shall be of membrane style construction with a 4 line by 42 character Liquid Crystal Display. The LCD shall use a super-twist technology and backlighting for high contrast visual clarity. In the normal mode it shall display the time, the total number of active

events and the type of events on display. LCD shall be capable of displaying first and last event automatically without operator intervention.

- R. The module shall have visual indicators for the following common control functions: AC power, alarm, supervisory, monitor, trouble, disable, ground fault, CPU fail and test. There shall be common control keys and visual indicators for: reset, alarm silence, trouble silence, drill, and one custom programmable key/indicator. Provide four pairs of display control keys for selection of event display by type (alarm, supervisory, monitor and trouble) and forward/backward scrolling through event listing. Allow the first event of the highest priority to capture the LCD for display.
- S. Provide system function keys; status, report, enable, disable, activate, restore, program and test. The module shall have a numeric keypad, zero through nine with delete and enter keys.
- T. The Main Controller Module shall control and monitor all local or remote peripherals. It shall support the LCD Display Module, power supply, strip and carriage printers, and communication interface standard protocol (CSD) devices such as color computer annunciator and support color graphic displays. The Main Controller Module shall be capable of handling ten (2) loop modules for a total a 2,500 Analog devices per panel.
- U. Cabinet: Cabinets shall be provide with ample gutter space to allow proper clearance between the cabinet and live parts of the panel equipment. If more than one modular unit is required to form a control panel, the units shall be installed in a single cabinet large enough to accommodate all units. Cabinets shall be painted red. It shall include a pocket for holding the operations manual.
- V. Circuit Connections: Circuit conductors entering or leaving the panel shall be connected to screw-type terminals with each terminal marked for identification.
- W. Storage Batteries: Storage batteries shall be provided and shall be the sealed, lead-calcium type requiring no additional water. The batteries shall have ample capacity, with primary power disconnected, to operate the fire alarm system for a period of 24 hours. Following this period of operation via batteries, the batteries shall have ample capacity to operate all components of the system, including all alarm signaling devices in the total alarm mode for a minimum period of 15 minutes. Batteries shall be sized to deliver 50 percent more ampere/hours based on a 48 hour discharged rate than required for the calculated capacities. Battery cabinet shall be a separate compartment within the control panel. Batteries in the control panel shall be located at the bottom of the panel. Battery shall be provided with overcurrent protection in accordance with NFPA 72.
- X. Battery Charger: Battery charger shall be completely automatic, with high/low charging rate, capable of restoring the batteries from full discharge to full charge within 12 hours. A pilot light indicating when batteries are manually placed on a high rate of charge shall be provided as part of the unit assembly. Charger shall be located in control panel.
- Y. Overvoltage and Surge Protection: All equipment connected to alternating current circuits shall be protected from surges per IEEE C62.41 and NFPA 70. All cables and conductors which serve as communications links, except fiber optics, shall have surge protection circuits installed at each end. Fuses shall not be used for surge protection.

## 2.5 MANUAL PULL STATIONS

- A. Manual fire alarm stations shall comply with the applicable requirements of UL 38. The stations shall be capable of storing up to 24 diagnostic codes, which can be retrieved for troubleshooting assistance. Manual stations shall be connected into alarm-initiating circuits. The circuit shall be supervised for open and ground faults. Stations shall be installed on surface mounted outlet boxes

as indicated. Stations shall be of metal construction with an internal toggle switch. Stations shall be addressable dual action type. Stations shall be finished in red, with raised letter operating instructions of contrasting color. Stations requiring the breaking of glass or plastic panels for operation are not acceptable. Stations employing glass rods are not acceptable. The use of a key or wrench shall be required to reset the station. Gravity or mercury switches are not acceptable. Switches and contacts shall be rated for the voltage and current upon which they operate. Stations shall have a separate screw terminal for each conductor. Surface mounted boxes shall be painted the same color as the fire alarm manual stations. Pull stations shall be capable of being field programmed, shall latch upon operation and remain latched until manually reset. Manual stations installed outdoors shall be of weatherproof construction.

## 2.6 FIRE DETECTING DEVICES

- A. Fire detecting devices shall comply with the applicable requirements of NFPA 72, New York State Mechanical Code, UL 268, and UL 521. The detectors shall be provided as indicated. The addressable devices shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Detector base shall have screw terminals for making connections. No solder connections will be allowed. Detectors shall be connected into alarm initiating circuits. Detectors located in concealed locations (in attic) shall have remote input modules with visible indicator lamp. Installed devices shall conform to the classification of the area. Addressable fire detecting devices shall be dynamically supervised and uniquely identified in the control panel.
- B. The addressable detectors shall be Photo Electric with integral heat capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters. Devices not capable of combining different fire parameters or employing digital filters will not be acceptable.
- C. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and analog loop controller. Detectors not capable of making independent alarm decisions will not be acceptable. Maximum total analog loop response time for detectors changing state shall be 0.75 seconds.
- D. Each detector shall have a separate means of displaying communications and alarm status. A green LED shall flash to confirm communication with the analog loop controller. A red LED shall flash to display alarm status.
- E. The detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector.
- F. Each smoke detector shall be capable of transmitting pre-alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings.
- G. Each detector microprocessor shall contain an environment compensation algorithm, which identifies and sets ambient "Environmental Thresholds" approximately six times an hour. The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminants as well as detector aging. The process shall employ digital compensation to adapt the detector to both 24 hour long-term and 4 hour short-term environmental changes. The

microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80 deg and 100 deg of the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the “learned” base line sensitivity. The base line sensitivity information shall be updated and permanently stored at the detector approximately once every hour.

- H. Fixed Temperature Heat Detectors (Non-Addressable): Heat detectors shall be designed for detection of fire by fixed temperature as indicated. The heat detector shall have a low mass thermistor heat sensor and operate at fixed temperature. It shall continually monitor the temperature of the air its surroundings to minimize thermal lag to the time required to process an alarm. Fixed temperature heat detectors shall be installed where required. The heat detector shall have a nominal alarm rating of 90 degrees C (194 degrees F).
- I. Combination Fixed-Temperature and Rate-of-Rise Heat Detectors: Detectors shall be designed for surface outlet box mounting and supported independently of wiring connections. The heat detector shall have a low mass thermistor heat sensor and operate at fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions will not be acceptable. The detector shall have a nominal fixed temperature alarm point rating of 57 degrees C (135 degrees F) and rate-of-rise alarm point of 9 degrees C (15 degrees F) per minute.
- J. Combination Smoke and Heat Detectors: The multisensor analog detector shall use a light scattering type photoelectric smoke sensor and a fixed temperature type heat sensor to sense changes in air samples from its surroundings. The integral microprocessor shall employ time based algorithms to dynamically examine values from both sensors simultaneously and initiate an alarm based on that data. The microprocessor shall provide self-diagnostics and history log, automatic device mapping, stand-alone operation, and fast, stable communication. Systems using central intelligence for alarm decisions will not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC. Detectors shall be provided with a guard where required.
  - 1. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%. The fixed temperature alarm setpoint shall be 135 deg F (57 deg C) nominal.
  - 2. Relay bases shall be provided at detectors as required.
  - 3. Provide relay detector mounting bases suitable for mounting on 1-gang, 4" octagon or square box. The relay base shall have the following minimum requirements.
    - a. The relay shall be a bi-stable type and selectable for normally open or normally closed operation.
    - b. The position of the contact shall be supervised.
    - c. The relay operation shall be exercised by the detector processor upon power up.
    - d. The relay shall automatically de-energize when a detector is removed.
    - e. The operation of the relay base shall be controlled by its respective detector processor. Detectors operating in standalone mode shall operate the relay upon changing to alarm state. Relay bases not controlled by the detector microprocessor will not be acceptable.
    - f. Form “C” Relay contacts shall have a minimum rating of 1 amp @ 30 Vdc and be listed for “pilot duty”.

- g. Removal of the respective detector shall not affect communications with other detectors.
  - h. Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals will not be acceptable.
- K. Locate smoke detectors not closer than 3 feet from air supply diffuser or air return opening.

## 2.7 NOTIFICATION APPLIANCES

- A. All appliances shall be UL Listed for Fire Protective Service.
- B. Audible appliances shall be heavy duty and conform to the applicable requirements of UL 464. Devices shall be connected into alarm indicating circuits and shall have a separate screw terminal for each conductor. Devices shall be painted red. Devices shall have manufacturer's standard finish and color.
- C. All appliances shall be capable of providing the "Equivalent Facilitation" which is allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADA(AG)), and shall be UL 1971 and ULC S526 Listed.
- D. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control panels and to insure that the application of the appliances are done in accordance with the single manufacturers instructions.
- E. Horns/Strobes
  - 1. Electronic, rated 24V DC with piez electric driver and capable of producing 90 Db at 10 feet..
  - 2. The strobes shall be especially designed for use with compatible life safety communication and control equipment to alert hearing impaired. Strobes shall be self-synchronizing to provide flash outputs of 1 fps across their full operating voltage range. The intensities shall be as required by NFPA 72 and ADA (AG) guidelines. Separately installed "synch control modules" are not acceptable. The light dispersion shall be controlled with a specially shaped reflector. It shall direct a minimum of 12 percent of rated light output above and below the strobe, and a minimum fo 25 percent of rated light output straight out both sides. It shall be UL 1971 listed with both wall and ceiling cd intensity ratings. The strobes shall be suitable for 20 to 24 volts dc operation and must be connected to signal circuits which output a constant (not used) voltage. A diode shall be used to allow full signal circuit supervision and terminals to accept up to #12 AWG wire for making polarized connections.
  - 3. Fire alarm speakers shall produce an audible signal in accordance with NFPA 72, Chapter 2. The speaker, however, shall also be capable of announcing messages from the microphone station contained within the building fire alarm control panel.
- F. Strobes: Strobes shall provide the same requirements as described in A above for the strobe except they shall be mounted as a unit in standard backboxes. Provide multiple candela (15/30/75/110) strobes.
- G. Mount audible alarm/visible alarm not less than 24inches below ceiling or 80 inches above floor to bottom of devices whichever is lower.

## 2.8 INPUT MODULES FOR NON-ADDRESSABLE DEVICES

- A. It shall be possible to address each input module without the use of DIP switches. Devices using DIP switches for addressing will not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using software downloaded from the Analog Loop Controller. Modules requiring EPROM, PROM, ROM changes or DIP switch and/or jumper changes will not be acceptable. The modules shall have a minimum of 2 diagnostic LED's mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes, which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults.
- B. The single or dual input module shall provide supervised Class A input circuit capable of a minimum of 4 personalities, each with a distinct operation. The input module shall support the following circuit types:
  - 1. Normally-Open Alarm Latching (Beam Detectors, Heat Detectors, fire suppression system, fire pump controllers, deluge system, etc.)
  - 2. Normally Open Active Latching (Supervisory, Tamper Switches)
  - 3. Normally-Open Alarm Delayed Latching (Waterflow Switches, Pressure Switches)

## 2.9 CONTROL RELAY MODULE

- A. The control relay module shall provide one form "C" dry relay contact rated 2 amp @ 24 vdc to control external equipment such as hatch release, damper operation, elevator recall, etc.

## 2.10 FIRE DETECTION AND ALARM SYSTEM PERIPHERAL EQUIPMENT

- A. Sprinkler Pressure Alarm Switch (Waterflow Alarm): Pressure switch shall include a metal housing with a neoprene diaphragm, SPDT snap action switches. The switch shall have a service pressure rating of 175 psi. There shall be two SPDT Form C contacts factory adjusted to operate at 4 to 8 psi. It shall be possible to mount the switch in any position in the alarm line trim piping of the automatic water control.
- B. Water Flow Switch: Vane type detector, rated for 250 psig designed for horizontal or vertical installation, with 2-SPDT circuit switches to provide isolated alarm and auxiliary contacts. Factory set field adjustable retard element to prevent false signals and tamperproof cover with supervisory contact.
- C. Valve Supervisory (Tamper) Switch: Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT Form C contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.
- D. Special tools necessary for the maintenance of the equipment shall be furnished. Two spare fuses of each type and size required and five spare LED's of each type shall be furnished. Two percent of the total number of each different type of detector, but no less than two each, shall be furnished. Fuses and LEDs shall be mounted in the fire alarm panel.

## 2.11 REMOTE ANNUNCIATOR

- A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, reset, and test.
  - 1. Mounting: Flush cabinet, NEMA 250, Class 1.
- B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.
- C. Display Panel: Wall-mounted floor plan indicating the building floor plan with a "You Are Here" designation. Mount adjacent to annunciator in a frame with a plastic cover.

## 2.12 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Listed and labeled under UL 864 and NFPA 72.
- B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP panel, and automatically sends a signal via fiberoptic remote cable through campus system to a central station. When contact is made with the central station(s), the signal is transmitted. If service is lost on the fiber cable, the local trouble signal is initiated.
- C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.
- D. Self Test: Conducted automatically every 24 hours with report transmitted to central station.

## 2.13 PRIMARY POWER

- A. A single dedicated circuit connection for supplying power to the building fire alarm system shall be provided. The power supply shall be equipped with a locking mechanism and marked "FIRE ALARM CONTROL CIRCUIT". Transfer from normal to emergency power or restoration from emergency to normal power shall be fully automatic and not cause transmission of false alarm. Loss of ac power shall not prevent transmission of signal via the fire reporting system upon operation of any initiating circuit.

## 2.14 BATTERY BACKUP POWER

- A. Battery backup power shall be through use of rechargeable, sealed-type storage batteries and battery charger. Batteries shall be sized to operate the system in a supervisory mode for 24 hours followed by 15 minutes of alarm under full load.

## 2.15 WIRE

- A. General: Provide Class B wiring.
- B. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
  - 1. Low-Voltage Circuits: No. 16 AWG, minimum.
  - 2. Line-Voltage Circuits: No. 12 AWG, minimum.

- C. Power-Limited Circuits: NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.

## 2.16 JUNCTION BOXES

- A. As required, and painted red, label per Division 16 "Basic Electrical Materials and Methods".

## 2.17 EXTRA MATERIAL

- A. Furnish extra materials described below that match product installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Manual pull stations: 10% of product installed but not less than one unit.
  2. Audio/visual appliances: 10% of product installed (audible only, visual only, each candela rating, etc.) but not less than one of each unit.
  3. Smoke, heat detectors: 10% of product installed but not less than one of each type.
  4. Detector Base: 10% of product installed but not less than two of each type.
  5. Control modules: 5 units.
  6. Monitor Modules: 5 units.
  7. Fuses: Two of each type.
  8. Tools: One extra set for access to locked and tamperproof components.

## PART 3 - EXECUTION

### 3.1 WIRING INSTALLATION

- A. Wiring Method: Install wiring in metal conduit according to Division 16 Section "Raceways and Boxes." Conceal conduit except in unfinished spaces and as indicated.
- B. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- C. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- D. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.
- E. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

### 3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.
- B. Testing: The Contractor shall notify the Consultant 30 days before the preliminary and acceptance tests are to be conducted. The tests shall be performed in accordance with the requirements of NFPA 72 in the presence of the Consultant and witnessed by the Campus Authorities. The control panel manufacturer's representative shall be present to supervise all tests. The Contractor shall furnish all instruments and personnel required for the tests.
  - 1. Preliminary Tests: Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed initiating and notification appliance. Tests shall include the meggering of all system conductors to determine that the system is free from grounded, shorted, or open circuits. The megger test shall be conducted prior to the installation of fire alarm equipment. If deficiencies are found, corrections shall be made and the system shall be retested to assure that it is functional.
  - 2. Acceptance Test: Testing shall be in accordance with NFPA 72. The recommended tests in NFPA 72 shall be considered mandatory and shall verify that all previous deficiencies have been corrected. The Contractor shall provide 6 copies of acceptance test report and certification that the fire alarm system was tested as per requirements of NFPA 72. The Contractor shall provide all computer software and all required hardware to the Campus. The test shall include the following:
    - a. Test of each function of the control panel.
    - b. Test of each circuit in both trouble and normal modes.
    - c. Tests of alarm initiating devices in both normal and trouble conditions.
    - d. Tests of each control circuit and device.
    - e. Tests of each alarm notification appliance.
    - f. Tests of the battery charger and batteries.
    - g. Visual inspection of all wiring connections.
    - h. Opening the circuit at each alarm initiating device and notification appliance to test the wiring supervisory feature.
    - i. Ground fault.
    - j. Short circuit faults.
    - k. Stray voltage.
    - l. Loop resistance.
  - 3. The testing/acceptance section should minimally include the following:
    - a. Prior to the acceptance testing the contractor shall complete and submit the "Record of Completion" form as identified in NFPA 72 figure 1-6.2.1.
    - b. The Contractor shall conduct an acceptance test of the fire alarm system with the fire alarm equipment vendor as directed by the Owner only after the fire alarm equipment vendor has performed a 100% test of the system.
- C. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

END OF SECTION 13851



## **SECTION 13935 - DRY-PIPE FIRE-SUPPRESSION SPRINKLERS**

### **PART 1 - GENERAL**

1.1 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. Section Includes:**

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Sprinkler specialty pipe fittings.
4. Sprinklers.
5. Alarm devices.
6. Manual control stations.
7. Control panels.
8. Pressure gages.

**B. Related Sections:**

1. Division 13 Section "Digital, Addressable Fire-Alarm System" for alarm devices not specified in this Section.
2. Division 13 Section "Wet-Pipe Fire-Suppression Sprinklers" for wet-pipe sprinkler piping.
3. Division 13 Section "Foam Fire Extinguishing" for AFFF piping.
4. Division 13 Section "Fire-Suppression Standpipes" for standpipe piping.

#### **1.3 DEFINITIONS**

A. Standard-Pressure Sprinkler Piping: Dry-pipe sprinkler system piping designed to operate at working pressure 175 psig (1200 kPa) maximum.

#### **1.4 SYSTEM DESCRIPTIONS**

A. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from sprinklers that are open.

#### **1.5 PERFORMANCE REQUIREMENTS**

A. Standard-Pressure Piping System Component: Listed for 175-psig (1200-kPa) minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:

- a. Building Service Areas: Ordinary Hazard, Group 1.
  - b. General Storage Areas: Ordinary Hazard, Group 2.
  - c. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
  - d. Attic Space: Ordinary hazard, Group 1.
3. Minimum Density for Automatic-Sprinkler Piping Design:
- a. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. (6.1 mm/min. over 139-sq. m) area.
  - b. Special Occupancy Hazard: As determined by authorities having jurisdiction.
4. Maximum Protection Area per Sprinkler: Per UL listing.
5. Maximum Protection Area per Sprinkler:
- a. Mechanical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
  - b. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.
6. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13.

#### 1.6 SUBMITTALS

- A. Shop Drawings: For dry-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Wiring Diagrams: For power, signal, and control wiring.
- B. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Domestic water piping.
  - 2. Compressed air piping.
  - 3. HVAC hydronic piping.
  - 4. Items penetrating finished ceiling including the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
- D. Qualification Data: For qualified Installer and professional engineer.
- E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- F. Fire-hydrant flow test report.

- G. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- H. Field quality-control reports.
- I. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

## 1.7 QUALITY ASSURANCE

### A. Installer Qualifications:

- 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
  - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

### B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### C. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

- 1. NFPA 13, "Installation of Sprinkler Systems."
- 2. NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height."
- 3. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

## 1.8 COORDINATION

### A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

## 1.9 EXTRA MATERIALS

### A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

#### A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and joining methods for specific services, service locations, and pipe sizes.

## 2.2 STEEL PIPE AND FITTINGS

- A. Standard Weight, Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 30, Galvanized-Steel Pipe: ASTM A 135; ASTM A 795/A 795M, Type E; or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.
- C. Thinwall Galvanized-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.
- D. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- E. Galvanized, Steel Couplings: ASTM A 865, threaded.
- F. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- G. Malleable- or Ductile-Iron Unions: UL 860.
- H. Cast-Iron Flanges: ASME B16.1, Class 125.
- I. Plain-End-Pipe Fittings: UL 213, ductile-iron body with retainer lugs that require one-quarter turn or screwed retainer pin to secure pipe in fitting.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Anvil International, Inc.
    - b. Shurjoint Piping Products.
- J. Grooved-Joint, Steel-Pipe Appurtenances:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Anvil International, Inc.
    - b. Corcoran Piping System Co.
    - c. National Fittings, Inc.
    - d. Shurjoint Piping Products.
    - e. Tyco Fire & Building Products LP.
    - f. Victaulic Company.
  - 2. Pressure Rating: 250 psig (1725 kPa) minimum.
  - 3. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
  - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

## 2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free.
  - 1. Class 125, Cast-Iron and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
  - 2. Class 250, Cast-Iron and Class 300, Raised-Face Flanges: Ring-type gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

## 2.4 LISTED FIRE-PROTECTION VALVES

- A. General Requirements:
  - 1. Valves shall be UL listed or FM approved.
  - 2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig (1200 kPa).
- B. Ball Valves:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
    - a. Anvil International, Inc.
    - b. Victaulic Company.
  - 3. Standard: UL 1091 except with ball instead of disc.
  - 4. Valves NPS 1-1/2 (DN 40) and Smaller: Bronze body with threaded ends.
  - 5. Valves NPS 2 and NPS 2-1/2 (DN 50 and DN 65): Bronze body with threaded ends or ductile-iron body with grooved ends.
  - 6. Valves NPS 3 (DN 80): Ductile-iron body with grooved ends.
- C. Bronze Butterfly Valves:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
    - a. Fivalco Inc.
    - b. Global Safety Products, Inc.
    - c. Milwaukee Valve Company.
  - 3. Standard: UL 1091.
  - 4. Pressure Rating: 175 psig (1200 kPa).
  - 5. Body Material: Bronze.

6. End Connections: Threaded.

D. Iron Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
  - a. Anvil International, Inc.
  - b. Fivalco Inc.
  - c. Global Safety Products, Inc.
  - d. Kennedy Valve; a division of McWane, Inc.
  - e. Milwaukee Valve Company.
  - f. NIBCO INC.
  - g. Pratt, Henry Company.
  - h. Shurjoint Piping Products.
  - i. Tyco Fire & Building Products LP.
  - j. Victaulic Company.
3. Standard: UL 1091.
4. Pressure Rating: 175 psig (1200 kPa).
5. Body Material: Cast or ductile iron.
6. End Connections: Grooved.

E. Check Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
  - a. Crane Co.; Crane Valve Group; Crane Valves.
  - b. Crane Co.; Crane Valve Group; Jenkins Valves.
  - c. Crane Co.; Crane Valve Group; Stockham Division.
  - d. Fire-End & Croker Corporation.
  - e. Fire Protection Products, Inc.
  - f. Globe Fire Sprinkler Corporation.
  - g. Kennedy Valve; a division of McWane, Inc.
  - h. Milwaukee Valve Company.
  - i. Mueller Co.; Water Products Division.
  - j. NIBCO INC.
  - k. Potter Roemer.
  - l. Reliable Automatic Sprinkler Co., Inc.
  - m. Tyco Fire & Building Products LP.
  - n. Victaulic Company.
  - o. Viking Corporation.
  - p. Watts Water Technologies, Inc.
3. Standard: UL 312
4. Pressure Rating: 250 psig (1725 kPa) minimum.

5. Type: Swing check.
6. Body Material: Cast iron.
7. End Connections: Flanged or grooved.

F. Iron OS&Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
  - a. Clow Valve Company; a division of McWane, Inc.
  - b. Crane Co.; Crane Valve Group; Crane Valves.
  - c. Crane Co.; Crane Valve Group; Jenkins Valves.
  - d. Crane Co.; Crane Valve Group; Stockham Division.
  - e. Hammond Valve.
  - f. Milwaukee Valve Company.
  - g. Mueller Co.; Water Products Division.
  - h. NIBCO INC.
  - i. Tyco Fire & Building Products LP.
  - j. Watts Water Technologies, Inc.
3. Standard: UL 262.
4. Pressure Rating: 250 psig (1725 kPa) minimum.
5. Body Material: Cast or ductile iron.
6. End Connections: Flanged or grooved.

G. Indicating-Type Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
  - a. Anvil International, Inc.
  - b. Global Safety Products, Inc.
  - c. Kennedy Valve; a division of McWane, Inc.
  - d. Milwaukee Valve Company.
  - e. NIBCO INC.
  - f. Tyco Fire & Building Products LP.
  - g. Victaulic Company.
3. Standard: UL 1091.
4. Pressure Rating: 175 psig (1200 kPa) minimum.
5. Valves NPS 2 (DN 50) and Smaller:
  - a. Valve Type: Ball or butterfly.
  - b. Body Material: Bronze.
  - c. End Connections: Threaded.
6. Valves NPS 2-1/2 (DN 65) and Larger:

- a. Valve Type: Butterfly.
  - b. Body Material: Cast or ductile iron.
  - c. End Connections: Flanged, grooved, or wafer.
7. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch visual indicating device.

H. NRS Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
  - a. Clow Valve Company; a division of McWane, Inc.
  - b. Crane Co.; Crane Valve Group; Stockham Division.
  - c. Kennedy Valve; a division of McWane, Inc.
  - d. Mueller Co.; Water Products Division.
  - e. NIBCO INC.
  - f. Tyco Fire & Building Products LP.
3. Standard: UL 262.
4. Pressure Rating: 250 psig (1725 kPa) minimum.
5. Body Material: Cast iron with indicator post flange.
6. Stem: Nonrising.
7. End Connections: Flanged or grooved.

I. Indicator Posts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
  - a. Clow Valve Company; a division of McWane, Inc.
  - b. Crane Co.; Crane Valve Group; Stockham Division.
  - c. Kennedy Valve; a division of McWane, Inc.
  - d. Mueller Co.; Water Products Division.
  - e. NIBCO INC.
  - f. Tyco Fire & Building Products LP.
3. Standard: UL 789.
4. Type: Horizontal for wall mounting.
5. Body Material: Cast iron with extension rod and locking device.
6. Operation: Hand wheel.

2.5 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig (1200 kPa) minimum.

B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Fire Protection Products, Inc.
  - b. United Brass Works, Inc.

C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Anvil International, Inc.
  - b. Barnett.
  - c. Conbraco Industries, Inc.; Apollo Valves.
  - d. Fire-End & Croker Corporation.
  - e. Fire Protection Products, Inc.
  - f. Flowserve.
  - g. FNW.
  - h. Jomar International, Ltd.
  - i. Kennedy Valve; a division of McWane, Inc.
  - j. Milwaukee Valve Company.
  - k. NIBCO INC.
  - l. Potter Roemer.
  - m. Tyco Fire & Building Products LP.
  - n. Victaulic Company.
  - o. Watts Water Technologies, Inc.

D. Globe Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Fire Protection Products, Inc.
  - b. United Brass Works, Inc.

## 2.6 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating:
  - a. Standard-Pressure Piping Specialty Valves: 175 psig (1200 kPa) minimum.

- b. High-Pressure Piping Specialty Valves: 250 psig (1725 kPa) minimum.
  3. Body Material: Cast or ductile iron.
  4. Size: Same as connected piping.
  5. End Connections: Flanged or grooved.
- B. Dry-Pipe Valves:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
    - a. AFAC Inc.
    - b. Globe Fire Sprinkler Corporation.
    - c. Reliable Automatic Sprinkler Co., Inc.
    - d. Tyco Fire & Building Products LP.
    - e. Victaulic Company.
    - f. Viking Corporation.
  3. Standard: UL 260
  4. Design: Differential-pressure type.
  5. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
  6. Air-Pressure Maintenance Device:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - b. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
      - 1) AFAC Inc.
      - 2) Globe Fire Sprinkler Corporation.
      - 3) Reliable Automatic Sprinkler Co., Inc.
      - 4) Tyco Fire & Building Products LP.
      - 5) Venus Fire Protection Ltd.
      - 6) Victaulic Company.
      - 7) Viking Corporation.
    - c. Standard: UL 260.
    - d. Type: Automatic device to maintain minimum air pressure in piping.
    - e. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig (95- to 410-kPa) adjustable range, and 175-psig (1200-kPa) outlet pressure.
  7. Air Compressor:

- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- b. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
  - 1) Gast Manufacturing Inc.
  - 2) General Air Products, Inc,
  - 3) Viking Corporation.
- c. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
- d. Motor Horsepower: Fractional.
- e. Power: 120-V ac, 60 Hz, single phase.

C. Automatic (Ball Drip) Drain Valves:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
  - a. AFAC Inc.
  - b. Reliable Automatic Sprinkler Co., Inc.
  - c. Tyco Fire & Building Products LP.
- 3. Standard: UL 1726.
- 4. Pressure Rating: 175 psig (1200 kPa) minimum.
- 5. Type: Automatic draining, ball check.
- 6. Size: NPS 3/4 (DN 20).
- 7. End Connections: Threaded.

2.7 SPRINKLER SPECIALTY PIPE FITTINGS

A. General Requirements for Dry-Pipe-System Fittings: UL listed for dry-pipe service.

B. Branch Outlet Fittings:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. National Fittings, Inc.
  - b. Tyco Fire & Building Products LP.
  - c. Victaulic Company.
- 2. Standard: UL 213.
- 3. Pressure Rating: 175 psig (1200 kPa) minimum.
- 4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
- 5. Type: Mechanical-T and -cross fittings.
- 6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.

7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

C. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. AGF Manufacturing Inc.
  - b. Reliable Automatic Sprinkler Co., Inc.
  - c. Tyco Fire & Building Products LP.
  - d. Victaulic Company.
2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig (1200 kPa) minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

D. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Elkhart Brass Mfg. Company, Inc.
  - b. Fire-End & Croker Corporation.
  - c. Potter Roemer.
2. Standard: UL 199.
3. Pressure Rating: 175 psig (1200 kPa) minimum.
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

E. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Triple R Specialty.
  - b. Tyco Fire & Building Products LP.
  - c. Victaulic Company.
  - d. Viking Corporation.
2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

3. Pressure Rating: 175 psig (1200 kPa) minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

F. Adjustable Drop Nipples:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. CECA, LLC.
  - b. Corcoran Piping System Co.
  - c. Merit Manufacturing; a division of Anvil International, Inc.
2. Standard: UL 1474.
3. Pressure Rating: 250 psig (1725 kPa) minimum.
4. Body Material: Steel pipe with EPDM O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

2.8 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: (Reference sprinkler schedule in construction drawings)

1. Tyco Fire & Building Products LP
2. Viking Corporation

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Residential Sprinklers: 175 psig (1200 kPa) maximum.
3. Pressure Rating for Automatic Sprinklers: 175 psig (1200 kPa) minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.
2. Characteristics: Nominal 1/2-inch (12.7-mm) orifice with discharge coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes:

1. Bronze.

2.9 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

2.10 SLEEVES

- A. Cast-Iron Wall Pipe Sleeves: Cast or fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- C. Molded-PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- D. Molded-PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
- E. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- F. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard weight, zinc coated, plain ends.
- G. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
  - 1. Underdeck Clamp: Clamping ring with set-screws.

#### 2.11 SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Advance Products & Systems, Inc.
  - 2. Calpico, Inc.
  - 3. Metraflex, Inc.
  - 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  - 1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 2. Pressure Plates: Carbon steel or Plastic.
  - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

#### 2.12 GROUT

- A. Standard: ASTM C 1107, Grade B, posthardening and volume adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink, and recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

### PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

### 3.2 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
  - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements in NFPA 13 for installation of sprinkler piping.
- C. Install seismic restraints on piping. Comply with requirements in NFPA 13 for seismic-restraint device materials and installation.
- D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or to outside building.
- K. Connect compressed-air supply to dry-pipe sprinkler piping.
- L. Connect air compressor to the following piping and wiring:
  - 1. Pressure gages and controls.
  - 2. Electrical power system.
  - 3. Fire-alarm devices, including low-pressure alarm.
- M. Install alarm devices in piping systems.
- N. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13 for hanger materials.

- O. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- P. Drain dry-pipe sprinkler piping.
- Q. Pressurize and check dry-pipe sprinkler system piping and air-pressure maintenance devices and air compressors.

### 3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- J. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Braze Joints" Chapter.
- K. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

- L. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.
- M. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

### 3.4 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
  - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
  - 2. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
    - a. Install air compressor and compressed-air supply piping.
    - b. Air-Pressure Maintenance Device: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig (95- to 410-kPa) adjustable range; and 175-psig (1200-kPa) maximum inlet pressure.
    - c. Install compressed-air supply piping from building's compressed-air piping system.

### 3.5 SPRINKLER INSTALLATION

- A. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

### 3.6 ESCUTCHEON INSTALLATION

- A. Install escutcheons for penetrations of walls, ceilings, and floors.
- B. Escutcheons for New Piping:
  - 1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
  - 2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, stamped steel with set-screw or spring clips.
  - 3. Bare Piping at Ceiling Penetrations in Finished Spaces: Split casting, cast brass with polished chrome-plated finish.

4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with polished chrome-plated finish.
5. Bare Piping in Equipment Rooms: One piece, cast brass.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

### 3.7 SLEEVE INSTALLATION

- A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.
- B. Sleeves are not required for core-drilled holes.
- C. Permanent sleeves are not required for holes formed by removable PE sleeves.
- D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.
- E. Install sleeves in new partitions, slabs, and walls as they are built.
- F. For interior wall penetrations, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 7 Section "Joint Sealants".
- G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 7 Section "Joint Sealants".
- H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals.
- I. Seal space outside of sleeves in concrete slabs and walls with grout.
- J. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe unless otherwise indicated.
- K. Install sleeve materials according to the following applications:
  1. Sleeves for Piping Passing through Concrete Floor Slabs: Galvanized-steel pipe .
  2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Galvanized-steel pipe.
    - a. Extend sleeves 2 inches (50 mm) above finished floor level.
    - b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Comply with requirements for flashing in Division 7 Section "Sheet Metal Flashing and Trim".
  3. Sleeves for Piping Passing through Gypsum-Board Partitions:
    - a. Galvanized-steel-pipe Insert type sleeves for pipes smaller than NPS 6 (DN 150).
    - b. Galvanized-steel-sheet sleeves for pipes NPS 6 (DN 150) and larger.
    - c. Exception: Sleeves are not required for water-supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Exterior Concrete Walls:
  - a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6 (DN 150).
  - b. Cast-iron wall pipe sleeves for pipes NPS 6 (DN 150) and larger.
  - c. Install sleeves that are large enough to provide 1-inch (25-mm) annular clear space between sleeve and pipe when sleeve seals are used.
5. Sleeves for Piping Passing through Interior Concrete Walls:
  - a. Galvanized-steel pipe sleeves for pipes smaller than NPS 6 (DN 150).
  - b. Galvanized-steel-sheet sleeves for pipes NPS 6 (DN 150) and larger.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for firestop materials and installations.

### 3.8 SLEEVE SEAL INSTALLATION

- A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.
- B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.9 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."

### 3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
  2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
  4. Energize circuits to electrical equipment and devices.
  5. Start and run air compressors.
  6. Coordinate with fire-alarm tests. Operate as required.
  7. Coordinate with fire-pump tests. Operate as required.
  8. Verify that equipment hose threads are same as local fire-department equipment.
- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

### 3.11 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

### 3.12 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

### 3.13 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Copper-tube, extruded-tee connections may be used for tee branches in copper tubing instead of specified copper fittings. Branch-connection joints must be brazed.

D. Standard-pressure, dry-pipe sprinkler system, NPS 2 (DN 50) and smaller (,) shall be one of the following:

1. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, galvanized-steel pipe with plain ends; plain-end-pipe fittings; and twist-locked joints.
3. Standard-weight, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

E. Standard-pressure, dry-pipe sprinkler system, NPS 2-1/2 to NPS 4 (DN 65 to DN 100) , shall be one of the following:

1. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

### 3.14 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Spaces Subject to Freezing: Dry attic pendent sprinklers.
3. Special Applications: Extended-coverage and quick-response sprinklers where indicated.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Flush Sprinklers: Bright chrome, with painted white escutcheon.

3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
4. Pendent, Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 13935

