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DATE : Dec-22

By: Vna

PROJECT:

HOUSING AUTHORITY OF THE CITY OF YUMA



VEGA & VEGA  
ENGINEERING, P.L.L.C.

## Construction Specifications

PROJECT:

# HOUSING AUTHORITY OF THE CITY OF YUMA TENANT IMPROVEMENTS FOR ARIZONA AVE. & 20TH ST APARTMENT COMPLEX

VnV22-500

**PREPARED FOR:**

**CITY OF YUMA**

ONE CITY PLAZA  
YUMA, AZ. 85364

**PREPARED BY:**

**VEGA & VEGA**  
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## **PROJECT TABLE OF CONTENTS**

### **DIVISION 01 – GENERAL REQUIREMENTS.**

Section 01 00 00 General Requirements  
Section 01 26 00 Contract Modification Procedures  
Section 01 33 00 Submittal Procedures

### **DIVISION 02 – EXISTING CONDITIONS**

Section 02 41 00 Demolition

### **DIVISION 03 - CONCRETE**

Section 02 11 13 Structural Cast-in-Place Concrete Forming  
Section 03 35 00 Concrete Finishing

### **DIVISION 04 - MASONRY**

Section 04 20 00 Structural Masonry

### **DIVISION 06 – WOOD, PLASTICS AND COMPOSITES**

Section 06 10 00 Rough Carpentry  
Section 06 15 20 Plastic Lumber Yard Vinyl Trellis

### **DIVISION 07 – THERMAL AND MOISTURE PROTECTION**

Section 07 44 00 Rainscreen Wall System  
Section 07 60 00 Flashing and Sheet Metal  
Section 07 92 00 Joint Sealants

### **DIVISION 08 - OPENINGS**

Section 08 15 00 Sliding Windows

### **DIVISION 09 - FINISHES**

Section 09 29 00 Gypsum Board

### **DIVISION 10 - SPECIALTIES**

Section 10 14 01 Exterior Signage

**DIVISION 31 - EARTHWORK**

Section 31 00 00 Earthwork

Section 31 11 00 Clearing and Grubbing

Section 31 23 00 Excavation and Fill

Section 31 31 00 Soil Treatment for Subterranean Termite Control

**DIVISION 32 – EXTERIOR IMPROVEMENTS**

Section 32 11 1 Based Course for Rigid Paving

Section 32 17 13 Parking Bumpers

Section 32 17 24 Pavement Markings

Section 32 17 26 Tactile Warning Truncated Domes Detectable Warnings.

**END OF TABLE OF CONTENTS**

**SECTION 01 00 00**  
**GENERAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

A. All the Contract Documents, including Drawings, General Conditions, Supplementary Conditions, and all Sections of Division 1- General Requirements, apply to the Work of this Section.

**1.02 DESCRIPTION OF WORK**

A. The Work of this Section applies to all Work performed under the Contract.

B. Any discrepancies found in the Contract Documents after signing of the Owner-Contractor agreement must be brought to the attention of the Architect for resolution. The Architect will determine which document entry governs and his decision will be final. The Contractor will not be entitled to a change in the Contract Time or Contract Sum based on discrepancies found after signing of the Owner-Contractor agreement.

C. Should conflict be evident between Contract Documents or within any Contract Document, the Contractor is deemed to have estimated the more expensive method of doing the Work unless he shall have asked for, and obtained, a written decision prior to submittal of bid or price quote, as to which method or materials will be required. Should the Work proceed after the discovery of errors, conflict, or omission by the Contractor and clarification has not been received from the Architect, the Contractor will be held fully responsible for replacement or correction, as directed by the Architect, at the Contractor's expense.

**1.03 RELATED WORK SPECIFIED ELSEWHERE**

A. Carefully examine all the Contract Documents for requirements which effect the Work of this Section.

B. Other Specification Sections which directly relate to the Work of this Section include, but are not limited to, the following:

1. DIVISION 01 – GENERAL REQUIREMENTS; including all Sections contained therein
2. Section 02 41 13 – Selective Demolition
3. Section 05 50 00 – Metal Fabrications
4. DIVISION 06 – WOODS AND PLASTICS; including all Sections contained therein.
5. DIVISION 07 – THERMAL AND MOISTURE PROTECTION; including all Sections contained therein.
6. DIVISION 08 – DOORS AND WINDOWS; including all Sections contained therein.

7. DIVISION 09 – FINISHES; including all Sections contained therein.

8. Section 10 14 00 – Signage

9. Section 26 00 00 – Electrical

#### 1.04 PROJECT IDENTIFICATION AND DESCRIPTION OF WORK

A. Project Identification: The name of the Project is Housing Authority of The City of Yuma. Tenant Improvements.

The Project site is located at Arizona Ave. & 20<sup>th</sup> Street Apartment Complex, Yuma Arizona

B. Abbreviated Written Summary: The Work of the Contract can be summarized by reference to the Contract Documents.

Work of this Contract includes the coordination of the entire Work indicated by the Contract Documents. Partial exterior façade renovation with partial demolition. Work which together provide a fully functioning facility in accordance with requirements of the Contract Documents. All items shown, indicated, or inferable from the Contract Documents are to be included such that there are no omissions which would prevent full use in all respects. Materials shown or indicated in any one Contract Document are to be inferred as if required by all. Work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions, and other forces outside the Contract Documents. Briefly, without limitation the Work can be summarized as follows:

1. The Project consists of: Selective demolition; renovation to existing exterior elevations. Removal of carports and installation of metal covered trellis. Partial electrical work. Landscape and replacement of exterior light fixtures. Cleaning and removal of construction debris.

C. Examination of Site and Documents:

1. All Bidders are required to visit the site and examine all Contract Documents before submitting a bid. Inspect and be thoroughly familiar with the same and conditions under which the Work will be carried out. Neither the Owner nor the Architect will be responsible for errors, omissions and/or charges for extra Work arising from Contractor's failure to familiarize themselves with the Contract Documents or existing site and conditions. By submitting a Bid, the Bidder agrees and warrants that he had the opportunity to examine the building site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the Work, a given result to be produced, that the Contract Documents are adequate and that he will produce the required result.

2. The building site will be available for inspection as set forth in Housing Authority of The City of Yuma Front End, Pre-Bid Conference/Site Inspection

#### 1.05 SPECIFICATION INFORMATION

- A. These specifications are a special form of technical writing edited from master specifications and contain deviations from traditional writing formats. Capitalization, underlining and bold print is only used to assist reader in finding information and no other meaning will be implied.
- B. Except where specifically indicated otherwise, the subject of all imperative statements is the Contractor.
- C. Sections are generally numbered in conformance with Construction Specifications Institute Master Format System. Numbering sequence is not consecutive. Refer to Index of Specification Sections for names and numbers of Sections included in this Project.
- D. Pages are numbered separately for each Section. Each Section is noted with "End of Section" to indicate when Section is complete.

#### 1.06 DEFINITIONS

- A. Owner: Housing Authority of The City of Yuma.
- B. Provide: means furnish and install, complete with all necessary components and accessories, ready for intended use.
- C. Indicated: is a reference to other portions of the Contract Documents.
- D. Approved: Except where specifically stated otherwise, the words "approved", "directed", "requested", "selected", "accepted" mean "approved by the Architect", "directed by the Architect" and so on. The words "approved" and "accepted" shall be held to the limitations stated in the General Conditions. In no case, shall "approval" or "acceptance" by the Architect be interpreted as a release of Contractor of his responsibilities to fulfill all the requirements of the Contract Documents. Where the Contract Documents require Contractor approval, approval must be submitted in writing using the word "approved" Contractor "review" only is not an acceptable substitute for Contractor approval.
- E. Observe/Observation: Except as otherwise defined in greater detail, the Architect's observation of the Work will be held to the limitations stated in the General Conditions and the Owner/Architect agreement. In no case, shall observation by the Architect be interpreted as a release of Contractor of his responsibilities to fulfill all the requirements of the Contract Documents. Observe shall be defined in accordance with the General Conditions of the Contract to include only visiting the site periodically, observing the condition and progress of the Work, and reporting to the Owner.
- F. Furnish: Except as otherwise defined in greater detail, furnish means supply, including shop fabrication if applicable, and deliver to project site, ready for unloading, unpacking, assembly, installation and the like as applicable in each instance.
- G. Install: Except as otherwise defined in greater detail, install means operations at project site including, but not limited to, unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, placing in service and similar operations as applicable in each instance.

H. Installer: The person or firm engaged by Contractor or Subcontractor for performance of a specific unit of installation Work at the project site. It is a general requirement that Installers be expert and experienced in the Work they are engaged to perform.

I. Day: Except as otherwise defined in Owner-Contractor Agreement, day means calendar day.

J. Public: Any person in the building other than those attending to central mechanical, electrical, and plumbing services.

K. Public Areas: All areas other than rooms dedicated solely to central mechanical, electrical, and plumbing equipment.

L. Back-of-House Areas: Rooms not designated as part of a public area.

M. Continuation of Material: Where a given material is indicated on any of the Drawings, it is intended that such material be used throughout the length and height of walls, partitions, spandrels, panels, windows, lights, areas, etc., or in the assembly detail in which it occurs, for other similar locations throughout the building, unless a different material is specifically indicated.

#### 1.07 INDUSTRY STANDARDS

A. Referenced standards are part of the Contract Documents and have the same force and effect as if bound with these specifications.

B. Except where specifically indicated otherwise, comply with the current standard in effect as of the date of the Owner/Contractor Agreement.

C. Obtain copies of industry standards directly from publisher.

D. The titles of industry standard organizations are commonly abbreviated; full titles may be found in Encyclopedia of Associations or consult Architect.

E. Where Workmanship is governed by a referenced standard, submit one copy to Architect and additional copies to fabricators, installers, and others involved in the performance of the Work.

#### 1.08 CONTRACTOR USE OF PREMISES

A. The Contractor may be allowed to use a limited portion of the existing building for field offices and/or storage areas at the discretion of the Owner. Temporary office and storage space shall be provided by the Contractor in accordance with requirements of Section 01 50 00 - Temporary Facilities and Controls. Owner approval will be required for all temporary office facilities and storage areas, including their size and location.

B. The Contractor shall submit a Site Utilization Plan for approval prior to commencing the Work of this Contract. The plan shall include, but not be limited to, proposed locations for Contractor and Subcontractor laydown and/or material storage areas, field offices, and site access.

#### 1.09 USER OCCUPANCY

A. The existing site will be occupied during the Work of this Contract. Work required to be performed in areas occupied shall be performed before or after hours, or on weekends, at no additional cost to the Owner.

#### 1.10 PERMITS, INSPECTION AND TESTING REQUIRED BY GOVERNING AUTHORITIES

A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested or approved, the Contractor shall give the Architect and such Authority timely notice of its readiness so that the Architect may observe such inspection and testing.

B. Prior to the start of construction, the Contractor shall complete application to the applicable Building Code enforcement authority for the building permits. Such Permits shall be displayed in a conspicuous location at the project sites. Permit Fees shall be paid in accordance with the government permitting entities.

C. Submit copies of all permits, licenses, certifications, inspection reports, releases, notices, judgements, and communications from authorities having jurisdiction.

#### 1.11 CONSTRUCTION SCHEDULES

A. Within 14 days after signing the Owner/Contractor Agreement, provide the following for the Project:

1. A comprehensive bar chart schedule showing all major and critical minor portions of the Work, sequence of Work and duration of each activity. Update and reissue regularly.
2. Progress schedule indicating Substantial Completion within the specified Contract Time
3. Critical path chart indicating the interrelationships of critical and non-critical events required to complete the Project on the dates established.
4. Update all schedules and distribute monthly.
5. Other required schedules, including but not limited to, Submittals and Testing.

B. Provide all schedules in accordance with requirements of Section 01 51 11 – Progress Schedule.

#### 1.12 SCHEDULE OF VALUES

A. Prepare Schedule of Values to coordinate with application for payment breakdown. The Schedule of Values shall be broken down into labor and materials for each Work activity. Submit at least 10 days before first payment application. Update and reissue regularly. The CPM shall be tied into and reflect the Schedule of Values.

#### 1.13 PAYMENT REQUESTS

A. Provide three copies of each request in a complete filled out copies of AIA G702 and continuation sheet G703. Substantiate requests with complete documentation; include change orders to date. Provide partial lien waivers for Work in progress and full lien waivers for completed Work. Contractor shall be required by Law to submit payroll records substantiating payment of wage rates to employees on a weekly basis.

B. Before first payment application, provide the following:

1. List of Subcontractors, suppliers and fabricators
2. Schedule of Values
3. Progress Schedule
4. Submittal Schedule keyed to project schedule
5. List of Contractor's key project personnel
6. Copies of permits and other communications from authorities
7. Contractor's Certificate of Insurance
8. Performance and Payment Bonds
9. Unit Price Schedule
10. Contractor's complete submittal log
11. Contractor's complete submittal schedule

C. Before final payment application, provide and complete the following:

1. Complete closeout requirements
2. Complete punch list items
3. Settle all claims
4. Transmit Record Documents to Architect
5. Prove that all taxes, fees and similar obligations have been paid
6. Remove of temporary facilities and surplus materials
7. Change lock cylinders or cores
8. Clean the Work
9. Submit Consent of Surety for final payment.

#### 1.14 PROCEDURES & CONTROLS

A. Preconstruction Conference: Require representatives of all major Subcontractors and suppliers to attend; notify Owner and Architect at least 72 hours in advance.

B. Progress Meetings: Hold regular weekly meetings with Owner and Architect, and meetings before preparation of payment requests. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by his own superintendent. An authorized representative of any Subcontractor or Subcontractors shall attend such meetings if his presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives.

1. As a prerequisite for monthly payments, ordering schedules, shop drawing schedule, and coordination meeting schedules shall be prepared and maintained by the Contractor and shall be reviewed and updated in a monthly basis, and a copy shall be submitted to the Owner's Representative and Architect.

2. To expedite construction progress on this project, the Contractor shall order all materials immediately after the approval of shop drawings and shall obtain a fixed date of delivery to the project site for all materials ordered which shall not impede or otherwise interfere with construction progress.

3. Scheduling shall be discussed with all concerned parties, and methods shall be presented by the Contractor which shall reflect construction completion not being deferred, at no additional expense to the Owner.

4. Project meetings shall be chaired by the Architect.

5. Project Meeting Notes: The Contractor shall be responsible for recording meeting minutes at each project meeting. The minutes shall incorporate the substance of all issues discussed, noting date of entry of each issue, the resolution, the party responsible for issue resolution, and the date of resolution. The meeting minutes will be distributed to all attendees and responsible parties at the next scheduled project meeting.

C. Daily Reports: Prepare daily reports recording all important information concerning events at the site for each project site. Submit to Architect weekly. Minimum required information contained in the daily report will be:

1. Manpower by trade
2. Work activity by trade
3. Equipment by trade
4. Material deliveries by trade
5. Weather conditions
6. All safety violations and accidents
7. Inspections if any

- D. Layout: Layout Work and be responsible for all lines, elevations, and measurements of the building, grading, utilities and other Work executed under the Contract.
- E. Project Limit Line: The boundaries of the site do not limit the responsibility of the Contractor to perform the Work in its entirety. Make utility connections as indicated. The Contractor's superintendent must be present whenever any Work is being performed.
- F. Matching: Where matching is indicated, the Architect shall be the sole and final judge of what is an acceptable match.
- G. Observation: Notify the Architect and authorities having jurisdiction at least thirty-six hours in advance of concealing any Work.
- H. Utilities: Prior to interrupting utilities, services or facilities, notify the utility owners and obtain their written approval.
- I. Furnishings, Fixtures, and Equipment: Cooperate and permit the Owner to install his furnishings and equipment during the progress of the Work. Owner's installation of furnishings or equipment does not signify Owner's acceptance of any portion of the Work.
- J. Clean-Up: Clean-up all waste at least once a week, remove from site regularly, and legally dispose of off-site.
- K. Installer's Acceptance of Conditions: All installers shall inspect substrates and conditions under which Work is to be executed and shall report in writing to the Contractor all conditions detrimental to the proper execution and completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected. Beginning Work means installer accepts previous Work and conditions.
- L. Documentation: The Contractor shall be responsible for providing and maintaining filing, reporting, Submittals, RFI's.

Payment Requisitions, Schedules, Change Proposals, Change Orders, and the like for the project.

M. Management and Financial Records: Management and financial records shall be maintained by the Contractor

N. Provide noise and dust control procedures in accordance with requirements of Section 01 50 00 – Temporary Facilities and Controls.

#### 1.15 SPECIAL PROJECT CONDITIONS

- A. The Contractor shall undertake every possible measure to prevent damage of any kind to any portion of existing surrounding properties or areas.
- B. The Contractor is required to exercise all possible care in the conduct of any Work which would affect surrounding properties and occupied areas and to be aware of the potential for damage. The Contractor shall be prepared to stop any Work immediately which is deemed to cause deleterious affects to adjacent areas.

C. The Contractor shall be held responsible for any damage to surrounding properties and occupied areas resulting from his failure to exercise care during the course of construction.

#### 1.16 PROTECTION OF EXISTING UTILITIES

A. The Contractor shall schedule, execute and pay all costs associated with implementation of all requirements related to disconnection or interruption of existing public or private utility services in accordance with requirements of local authorities having jurisdiction.

B. Protect existing utilities which remain from damage due to construction operations. Identify locations of utilities with temporary markers.

C. The Contractor shall be responsible for determining locations of underground structures and utilities, including but not limited to: water, sewer, gas, electric, telephone, internet and cable TV. Utility services to adjacent buildings shall be maintained without interruption, unless otherwise authorized in writing by the Architect. Utilities located in public ways surrounding the Project site shall be protected from damage related to the Work of this Section. All costs related to repair or replacement of damage to existing utilities not called for to be altered under the Work of this Contract shall be paid by the Contractor. No excavation in a public street or way, or in any public or private place, shall take place prior to verification of the location of all underground utilities by DIG SAFE.

D. Place markers to indicate locations of disconnected services and identify service lines and capping locations on Project Record Documents.

#### 1.17 WARRANTIES

A. The Work of this Contract, including Substantial Completion, will be completed in One Phase. The Contractor shall be responsible for providing full manufacturer warranties in accordance with requirements of individual trade Sections for specific product warranty requirements. The Contractor shall be responsible for providing manufacturer warranties, the Effective Starting Date of which, shall

commence upon Substantial Completion of the Work, as described in the Contract Documents, and shall run for the warranty period indicated in the respective trade Section.

B. Procurement: Where a warranty is required, do not purchase or subcontract for materials or Work until it has been determined that parties required to countersign warranties are willing to do so.

C. Warranty Forms: Submit written warranty to Owner through Architect for approval prior to execution. Furnish 2 copies of executed warranty to Owner for his records; furnish 2 additional conformed copies where required for maintenance manual.

D. Work Covered: Contractor shall remove and replace other Work of project which has been damaged as a result of failure of warranted Work or equipment, or which must be removed and replaced to provide access to Work under warranty. Unless otherwise specified, warranty shall cover full cost of replacement or repair, and shall not be pro-rated on basis of useful service life.

E. Warranty Extensions: Work repaired or replaced under warranty shall be warranted until the original warranty expiration date or for ninety days whichever is later in time.

#### 1.18 DELIVERY, STORAGE, HANDLING, & INSTALLATION CONDITIONS

A. Manufacturer's Instructions: Strictly comply with manufacturer's instructions and recommendations and prevent damage, deterioration and loss, including theft.

B. Minimize long-term storage of products at the site. Maintain environmental conditions, temperature, ventilation, and humidity within range permitted by manufacturers of materials and products used.

#### 1.19 LABELS

A. Labels, Trademarks, & Trade Names: Locate required labels on inconspicuous surfaces (not typically visible to the public). No manufacturer labels, nameplates, trademarks, or other identifying markings shall be located on surfaces visible to the public. Any such markings shall be removed and damage repaired, or item replaced, at the discretion of the Architect. Provide permanent data plate on each item of mechanical equipment stating manufacturer, model, serial number, capacity, ratings and all other essential data.

#### 1.20 MUNICIPAL POLICE SERVICES

A. The Contractor shall make all necessary arrangements with The City of Yuma Police Department in advance of times when regular off-duty, or reserve, police officers will be needed for traffic control protection, due to operations performed under this Contract. Officers shall be compensated, by the Contractor, in accordance with The City of Yuma wage rates for such services. Extend the Workman's compensation Insurance and Employer's Liability Insurance, required under the General Contract, to cover police used on the project.

#### 1.21 WELDING, CUTTING, AND BURNING PROCEDURES

##### A. PURPOSE

1. The purpose of this procedure is to provide minimum standards to prevent loss of life and property from fire during welding, cutting or burning processes involving the use of oxygen-fuel gas and electric arc cutting and welding equipment.

##### B. GENERAL REQUIREMENTS

1. In the performance of welding, cutting and burning operations, only approved equipment shall be used and the equipment shall be installed and operated in accordance with OSHA standards, the manufacturer's instructions, and nationally recognized good practice.

2. A "Hot Work" permit for welding, cutting, burning or spark producing operations shall not be issued unless the individual in charge of performing such operations is deemed capable of doing such work in a safe manner by the Contractor's Safety Representative. Demonstration of knowledge of fire safety requirements and this welding and cutting procedure in addition to the

equipment manufacturer's operational instructions shall constitute acceptable evidence of compliance.

3. A fire watch shall be provided by the Contractor or the Filed-Subcontractor's for their respective work to safeguard against the ignition of any material by the welding, cutting or burning operation, to make use of portable fire extinguishers or fire hose and to perform similar fire prevention and fire protection duties. The fire watch shall remain on the job at least 30 minutes after the "hot-work" including but not limited to welding or cutting operations have been completed to ensure that no fire exists. A signed inspection report attesting to that fact shall be filed and available for inspection by the local Fire Department.

4. A record shall be maintained by the responsible Contractor and Filed-Subcontractor Safety Representative of all locations where welding or cutting operations are performed. The record shall state the name of the assigned fire watch or watches and the length of time for which the fire watch standby was continued after work was completed (a minimum of 30 minutes). It shall include the date, time, and specific location at which work was done and describe the work, fire protection provided, and special precautions taken. Individual job authorizations shall be kept available always for inspection by the local Fire Department or the Owner's Representative. The assigned fire watch or fire watches shall sign the work authorization attesting to the fact that no fire existed after the work ceased and the standby period had passed.

5. Where welding, cutting or burning is done near walls, partitions, ceiling or roof of combustible construction, fire resistant shields or guards shall be provided to prevent ignition. When welding, cutting or burning is to be done on a metal wall, partition, ceiling, or roof, precautions shall be taken to prevent ignition of combustibles on the other side due to conduction of radiation. A fire watch shall be required on the other side of the exposed wall, partition, ceiling or roof if there is any danger of the welding, cutting or burning on one side to result in ignition of materials or structure on the unexposed side. Welding, cutting or burning shall not be attempted on a metal partition wall or on partitions of combustible sandwich-type panel construction.

#### C. FIRE SAFETY REQUIREMENTS

1. Cutting or welding operations shall be performed only in areas that have been protected against the ignition and spread of fire.

2. Within the confines of a Contractor and Filed-Subcontractor's work area welding, cutting or burning shall be done in specific areas designed and approved for such work as a maintenance shop, an outside location or a detached structure which shall be of noncombustible or fire resistive construction.

3. When work cannot be moved as in most construction or structural modification activity, the area shall be made fire safe by removing all combustible material within distance of 35 feet and all combustible material from beneath the location where welding, cutting or burning is to be performed.

4. When work cannot be relocated and combustible material cannot be feasibly relocated, all combustible material exposed within 35 feet horizontally or beneath the welding, cutting or burning operation or within 35 feet of exposed floor, ceiling or wall openings shall meet the following requirements:
  - a. Such combustible construction or material shall be protected from possible sparks, hot metal or oxidized by fire resistive shields or noncombustible covers.
  - b. Such floor, ceiling or wall openings shall be protected by fire resistive shields and openings or cracks in walls, floors or ducts shall be tightly covered to prevent the passage of sparks or slag to adjacent areas.
5. At least one portable fire extinguisher having a rating of not less than 4-A:60-B:C shall be kept at the location where welding, cutting or burning is done and at least one portable fire extinguisher having a rating of not less than 2-A:10-B:C shall be attached to all portable welding carts.
6. Welding, cutting or burning shall not be done in or near rooms or locations where flammable gases, liquids or vapors, lint dust or loose combustible stocks are present when sparks or hot metal from the welding, cutting or burning operations may cause ignition or explosion of such materials.
7. Welding, cutting or burning shall not be performed in the presence of explosive atmospheres or on containers, equipment or in hollow spaces or cavities which contain or have contained flammable fluids, gases or solids until these containers or equipment have been thoroughly cleaned, inverted or purged.
8. Sprinkler protection shall not be shut off while welding, cutting or burning work is being performed. When welding, cutting or burning work is being done close to automatic sprinkler heads, noncombustible board products or damp cloth guards shall be used to shield the individual heads, but shall be removed when the work is completed.
9. Where a sprinkler system will be impaired or rendered inoperative for any reason, this shall be noted in the application for permit so that all necessary precautions may be taken as required by the local Fire Department.
10. Hot tapping of other welding, cutting or burning on a flammable gas or liquid transmission or distribution utility pipe line shall be qualified to perform such work.

**PART 2 - PRODUCTS NOT USED**

**PART 3 - EXECUTION NOT USED**

**END OF SECTION 01 00 00**

**SECTION 01 26 00**  
**CONTRACT MODIFICATION PROCEDURES**

**PART I – GENERAL**

**1.01 RELATED DOCUMENTS**

A. All the Contract Documents, including Drawings, General Conditions, Supplementary Conditions, and all Sections of Division 1 - General Requirements, apply to the Work of this Section.

**1.02 DESCRIPTION OF WORK**

A. The Work of this Section shall include, but not be limited to, the following:

1. Administrative and procedural requirements for handling and processing Contract modifications.

**1.03 RELATED WORK SPECIFIED ELSEWHERE**

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Specifications Sections which directly relate to the Work of this Section include, but are not limited to, the following:

1. DIVISION 01 – GENERAL REQUIREMENTS; including all Sections contained therein
2. Section 02 41 13 – Selective Demolition
3. Section 05 50 00 – Metal Fabrications
4. DIVISION 06 – WOODS AND PLASTICS; including all Sections contained therein.
5. DIVISION 07 – THERMAL AND MOISTURE PROTECTION; including all Sections contained therein.
6. DIVISION 08 – DOORS AND WINDOWS; including all Sections contained therein.
7. DIVISION 09 – FINISHES; including all Sections contained therein.
8. DIVISION 10 – Including all sections contained therein.

**1.04 MINOR CHANGES IN THE WORK**

A. Supplemental instructions authorizing minor changes the Work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Architect on AIA form G710, Architects Supplemental Instructions.

**1.05 CHANGE ORDER PROPOSAL REQUESTS**

A. Prior to issuing instructions for changes in the Work which the Architect judges will require adjustment to the Contract Sum or Contract Time, the Architect may, at its discretion, request the Contractor to prepare an estimate of the amount of the adjustment.

B. Owner-Initiated Proposal Requests: The Architect will issue a detailed description of the proposed change and supplemental or revised Drawings and Specifications.

1. Respond to the request by submitting a proposal to the Architect for the Owner's review within 21 calendar days of receipt of the proposal request, unless a shorter period for response is indicated in the proposal request.
2. Include in the proposal, an estimate of cost necessary to execute the proposed change and a statement indicating the effect the proposed change, in the Work will have on the Contract time. Include the supporting data listed in paragraph F, below.
3. Proposal requests are not an instruction either to stop Work in progress, or to execute the proposed change. Continue with Work in progress that is not affected by the proposed change.

C. Contractor-Initiated Change Order Requests: When latent or other unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.

1. Notify the Architect in writing of proposed changes within 21 calendar days after the occurrence of the event of observance of the condition giving rise to the change proposal request.
2. Submit the change-order proposal request within 21 calendar days after delivering such notification to the Architect.
3. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
4. Comply with requirements in Section "Product Substitutions" if the proposed change in the Work requires the substitution of one product or system for a product or system specified.

D. No extensions of Contract Time nor increase in the Contract Sum will be considered if the additional time or additional cost is a consequence of the Contractor's failure to submit an estimate within the time stipulated, regardless of whether the proposal request or change order request was initiated by the Owner or the Contractor.

E. Proposal Request Form: Use AIA Document G709 for Change Order Proposal Requests.

## 1.06 CHANGE ORDERS

A. The following requirements shall apply to both Owner-initiated proposal requests and Contractor-initiated Change Order request.

1. Submit a complete and accurate Price to the Architect and the Construction Manager for review. Incomplete proposals will be returned to the Contractor without review, and shall be completed by the Contractor and returned to the Architect within the same time period specified above for submittal of proposals; there shall be no extension of time for such re-submittals.
2. The Architect and the Construction Manager will review and act on the Contractor's Proposal within 21 days of receipt. The Architect's review, at the Architects discretion,

may include consideration of Costs listed in Means "Construction Cost Data" or a similar data base, and/or on conversations with local manufacturers and suppliers.

3. Include applicable taxes, delivery charges, equipment rental, and amounts of trade, discounts.
4. Itemize Work which is to be performed by employees of the Contractor.
5. For Work which is not to be performed by employees of the Contractor, submit pricing on the letterhead of the proposed Subcontractor, fabricator or supplier.
6. Itemize General Conditions Work included in the proposed cost of the change; a lump sum or percentage of the cost will not be accepted.
7. Prices shall remain valid for a minimum of 90 days from the date of the initial pricing approval to execution of the Change Order by the Owner.

B. Consideration and Acceptance of Price Proposal: The following procedures shall apply to both Owner-Initiated proposal requests and Contractor-initiated Change Order requests:

1. Submit a complete and accurate Price to the Architect for review. Incomplete proposals will be returned to the Contractor without review and shall be completed by the Contractor and returned to the Architect within the same time: period specified above for submittal of proposals; there shall be no extension of time for such resubmittals.
2. The Architect will review and act on the Contractor's Proposal within 21 days of receipt. The Architect's review, at the Architects discretion, may include consideration of Costs listed in Means "Construction Cost Data" or a similar database, and/or on conversations with local manufacturers and suppliers.
3. Within 10 calendar days after receipt of the Architect's comments, make changes to the cost proposal in response to the Architects comments and resubmit for approval.
4. The Architect will promptly notify the Contractor whether the pricing is accepted or will direct the Contractor to make additional changes.
5. When the Contractor's proposal is approved by the Architect the Architect will prepare a Change Order for execution by the Owner, the Architect and the Contractor.

#### 1.07 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal, the Architect may issue a Construction Change Directive on AIA Form G714, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The Construction Change Directive will contain a description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time, in accordance with the General Conditions.

B. Documentation: If the Construction Change Directive is for Work which is to be compensated on the basis of Time and Materials, the Contractor shall maintain detailed daily records, verified with the Architect on a time and material basis of Work required by the Construction Change Directive.

1. After completion of the change, the Contractor shall submit an itemized account, including supporting data, as may be required by the Architect and Construction Manager, to substantiate cost and time adjustments to the Contract.

#### 1.08 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Change Order Proposal Request, the Architect will issue a Change Order for signatures of the Owner and Contractor on AIA Form G701, as provided in the Conditions of the Contract.
- B. The Contractor shall promptly execute the Change Order.

#### 1.09 PRE-INSTALLATION MEETING

- A. The General Contractor shall schedule a pre-installation meeting to establish compliance and expectation of Work, maintain optimum working conditions and coordinate the Work of this Section with related and adjacent Work. The meeting shall be attended by the General Contractor, Architect, and related Subcontractors.

#### **PART 2 - PRODUCTS NOT USED**

#### **PART 3 - EXECUTION NOT USED**

**END OF SECTION 01 26 00**

## **SECTION 01 33 00 SUBMITTAL PROCEDURES**

### **PART 1 GENERAL**

The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Proposed deviations from the contract requirements are to be clearly identified. Include within submittals items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

### **1.1 DEFINITIONS**

#### **1.1.1 Submittal Descriptions (SD)**

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

##### **SD-01 Preconstruction Submittals**

Submittals which are required prior to start of construction (work) or the start of the next major phase of the construction on a multi-phase contract. Includes schedules, tabular list of data, or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work, submitted prior to start of construction work or next major phase of construction. Certificates of insurance Surety bonds List of proposed Subcontractors, List of proposed products, Construction Progress Schedule, Submittal register, Schedule of prices, Health and safety plan, Work plan, Quality control(QC) plan, Environmental protection plan

##### **SD-02 Shop Drawings**

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work. Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project. Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

##### **SD-03 Product Data**

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work. Samples of warranty language when the contract requires extended product warranties.

#### SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

#### SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

#### SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.) Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site. Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation. Investigation reports. Daily logs and checklists. Final acceptance test and operational test procedure.

#### SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project. Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications. Text of posted operating instructions.

#### SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and concerning impedances, hazards and safety precautions.

#### SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or

instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and must state the test results; and indicate whether the material, product, or system has passed or failed the test. Factory test reports.

#### **SD-10 Operation and Maintenance Data**

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item. This data is intended to be incorporated in an operations and maintenance manual or control system.

#### **SD-11 Closeout Submittals**

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism. Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

#### **1.1.2 Approving Authority**

Office or designated person authorized to approve submittal.

#### **1.1.3 Work**

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, except those SD-01 Pre-Construction Submittals noted above, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

### **1.2 PREPARATION**

#### **1.2.1 Transmittal Form**

Contractor to provide a transmittal form for submittal review. Exercise special care to ensure proper listing of the specification paragraph and sheet number of the contract drawings pertinent to the data submitted for each item.

#### **1.2.2 Additional Instructions**

In addition to the requirements of this Section, additional instructions are specified in the attachment "INSTRUCTIONS TO CONTRACTORS FOR TRANSMITTAL REQUIREMENTS" located at the end of this section.

#### **1.2.3 Contractor Review**

The Contractor's quality control representative shall review the submittal listing at least every 30 days and take appropriate action to maintain an effective and updated system.

#### **1.2.3 Number of Copies**

The Contractor shall provide 5 sets of all submittals unless otherwise specified. The Contractor shall furnish one reproducible, unfolded copy of all

wiring and control diagrams and approved system layout drawings with the operating instructions called for under the various headings of the specifications for mechanical and electrical systems.

#### **1.2.4 Certificates of Compliance**

Any certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in the number of copies required by the above paragraph "Number of Copies." Each certificate shall be signed by an official authorized to certify in behalf of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the Contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

#### **1.2.5 Deviations**

For submittals which include proposed deviations requested by the Contractor, the column "variation" shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal.

a. Contractor-proposed deviations, including variations and other departures from the contract requirements, shall be noted/marked in red on each copy of the submittal data and shall be provided with a letter summarizing the proposed variation, deviation, or departure. Variations, deviations, or departures shall contain sufficient information to permit complete evaluation. Additional sheets may be used to fully explain why a variation, deviation, or departure is requested. At the minimum the information shall include:

1. An explanation in detail of the reason for the variation and how it differs from that specified;
  2. The cost difference; and
  3. How the variation will benefit The Housing Authority of The City of Yuma
- b. Any submittal annotated by a supplier or vendor with "Field Verify," "Select Color," or the like shall be accompanied by the Contractor's written response to the supplier's query.

### **1.3 INFORMATION ONLY SUBMITTALS**

Normally submittals for information only will not be returned. Approval of is not required on information only submittals.

### **1.4 VARIATIONS**

Variations from contract requirements require The Housing Authority of The City of Yuma approval.

#### **1.4.1 Considering Variations**

Discussion with Contracting Officer prior to submission will help ensure functional and quality requirements are met and minimize rejections and re-submittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal

Specifically point out variations from contract requirements in transmittal letters. Failure to point out deviations may result in the requiring rejection and removal of such work at no additional cost to the Owner.

#### **1.4.2 Proposing Variations**

Clearly mark the proposed variation in all documentation. Include proposed deviations requested by the Contractor. Set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Housing Authority of The City of Yuma reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

#### **1.4.3 Warranting That Variations Are Compatible**

When delivering a variation for approval, Contractor, warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

#### **1.4.4 Review Schedule Is Modified**

In addition to normal submittal review period, a period of 10 working days will be allowed for consideration by The Housing Authority of The City of Yuma of submittals with variations.

### **1.5 SUBMITTAL REGISTER**

Prepare and maintain submittal register, as the work progresses. A submittal register showing items of equipment and materials for which submittals are required by the specifications is provided as an attachment. This list may not be all inclusive and additional submittals may be required.

Thereafter, the Contractor is to track all submittals by maintaining a complete list, including completion of all data columns, including dates on which submittals are received and returned by the Government.

#### **1.5.1 Use of Submittal Register**

Submit submittal register. Submit with QC plan and project schedule. Verify that all submittals required for project are listed and add missing submittals. Coordinate and complete the following fields on the register submitted with the QC plan and the project schedule:

Column Activity Number: Activity number from the project schedule.

Column Contractor Submit Date: Scheduled date for approving authority to receive submittals.

Column Contractor Approval Date: Date Contractor needs approval of submittal.

Column Contractor Material: Date that Contractor needs material delivered to Contractor control.

#### **1.5.2 Contractor Use of Submittal Register**

Column Transmittal Number: Contractor assigned list of consecutive numbers.

Column Action Code : Date of action used to record Contractor's review when forwarding submittals to QC.

Column List date of submittal transmission.

Column List date approval received.

#### **1.5.3 Approving Authority Use of Submittal Register**

Update the following fields in the Government-furnished submittal register program or equivalent fields in program utilized by Contractor.

Column Transmittal Number: Contractor assigned list of consecutive numbers.

Column List date of submittal receipt.

Column X through X List Date related to review actions.

Column List date returned to Contractor.

#### **1.5.4 Government Review Action Codes**

"A" - "Approved as submitted"; "Completed"

"B" - "Approved, except as noted on drawings"; "Completed"

"C" - "Approved, resubmission required"; "Resubmit"

"D" - "Returned by correspondence"; "Completed"

"E" - "Disapproved (See attached)"; "Resubmit"

"F" - "Receipt acknowledged"; "Completed"

"X" - "Receipt acknowledged, does not comply"; "Resubmit"

#### **1.6 SCHEDULING**

Schedule and submit concurrently submittals covering component items forming a system or items that are interrelated. Include certifications to be submitted with the pertinent drawings at the same time.

a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential resubmittal of requirements.

b. Submittals called for by the contract documents will be listed on the register. If a submittal is called for but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the register or marked "N/A."

c. Re-submit register and annotate monthly by the Contractor with actual submission and approval dates. When all items on the register have been fully approved, no further re-submittal is required.

d. Carefully control procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

#### **1.7 GOVERNMENT APPROVING AUTHORITY**

a. Note date on which submittal was received.

b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.

c. Identify returned submittals with one of the actions defined in paragraph entitled, "Review Notations," of this section and with markings appropriate for action indicated.

#### **1.8 DISAPPROVED OR REJECTED SUBMITTALS**

Contractor shall make corrections required. If

the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the clause entitled, "Changes," is to be given to the Contracting Officer. Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the rejection and removal of such work at the Contractor's expense. If changes are necessary to submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

### **1.9 APPROVED/ACCEPTED SUBMITTALS**

The approval or acceptance of submittals is not be construed as a complete check, and indicates only that the general method of construction, materials, detailing and other information are satisfactory. Approval or acceptance will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work.

After submittals have been approved or accepted, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

#### **1.9.1 Previously Approved Submittals**

Complete submittals need not be submitted for items, products, or systems that have previously been approved.

### **1.10 APPROVED SAMPLES**

Approval of a sample is only for the characteristics or use named in such approval and is not be construed to change or modify any contract requirements. Before submitting samples, the Contractor to assure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those which may be damaged in testing, will be returned to the Contractor, at his expense, upon completion of the contract. Samples not approved will also be returned to the Contractor at its expense, if so requested. Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material. The Housing Authority of The City of Yuma reserves the right to disapprove any material or equipment which previously has proved unsatisfactory in service.. Samples failing to meet contract requirements will automatically void previous approvals. Contractor to replace such materials or equipment to meet contract requirements. Approval of the Contractor's samples does not relieve the Contractor of his responsibilities under the contract.

### **1.11 WITHHOLDING OF PAYMENT**

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

### **1.12 STAMPS**

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements is to be similar to the following:

**END OF SECTION 01 33 00**

**SECTION 02 41 00  
DEMOLITION**

**PART 1 GENERAL**

**1.1 PROJECT DESCRIPTION**

**1.1.1 General Requirements**

Do not begin demolition until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site; do not allow accumulations on pavements.

**1.2 ITEMS TO REMAIN IN PLACE**

Take necessary precautions to avoid damage to existing items to remain in place. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated.

**1.2.1 Existing Construction Limits and Protection** Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide protective measures to control accumulation and migration of dust and dirt. Remove dust, dirt, and debris from work areas daily.

**1.3 QUALITY ASSURANCE**

Submit timely notification of demolition to the Contracting Officer.

**1.3.1 Dust Control**

Prevent the spread of dust on pavements. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

**1.4 PROTECTION**

**1.4.1 Traffic Control Signs**

For pedestrian and driver safety in the area of removal work, use traffic barricades. Notify the Contracting Officer prior to beginning such work.

**1.5 EXISTING CONDITIONS**

Before beginning any demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer showing the condition of pavements. Photographs sized 4 inch will be acceptable as a record of existing conditions. SECTION 02 41 00 Page 1

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.1 EXISTING STRUCTURES TO BE REMOVED**

**3.1.1 Utilities and Related Equipment**

**3.1.1.1 General Requirements**

Do not interrupt existing utilities serving occupied or used facilities.

### 3.1.2 Paving and Slabs

Sawcut and remove pavements as indicated to a depth necessary to allow for the installation of new pavement. Provide neat sawcuts at limits of pavement removal as indicated.

## 3.2 DISPOSITION OF MATERIAL

### 3.2.1 Title to Materials

All materials removed shall become the property of the Contractor and shall be removed from property.

## 3.3 CLEANUP

Remove debris and rubbish and transport in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

## 3.4 DISPOSAL OF REMOVED MATERIALS

### 3.4.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other non-salvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified off the property.

### 3.4.2 Burning on Property

Burning of materials removed will not be permitted on property.

## **PART 2 - PRODUCTS NOT USED**

## **PART 3 - EXECUTION NOT USED**

**END OF SECTION 02 41 00**

**SECTION 03 11 13**  
**STRUCTURAL CAST-IN-PLACE CONCRETE FORMING**

**PART 1 GENERAL**

**1.1 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publication as referred to within the text by the basic designation only. Use current applicable versions.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)  
ACI 347 Guide to Formwork for Concrete

AMERICAN HARDBOARD ASSOCIATION (AHA)  
AHA A135.4 Basic Hardboard

APA - THE ENGINEERED WOOD ASSOCIATION (APA)  
APA L870 Voluntary Product Standard, PS 1-09, Structural Plywood

ASTM INTERNATIONAL (ASTM)  
ASTM C1077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

ASTM C31/C31M Standard Practice for Making and Curing Concrete Test Specimens in the Field  
ASTM C39/C39M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

INTERNATIONAL BUILDING CODE  
ICC

**1.2 SYSTEM DESCRIPTION**

The design, engineering, and construction of the formwork is the responsibility of the Contractor. Design formwork in accordance with methodology of ACI 347 for anticipated loads, lateral pressures, and stresses, and capable of withstanding the pressures resulting from placement and vibration of concrete. Comply with the tolerances specified in Section 03 30 00 CAST-IN-PLACE CONCRETE, paragraph CONSTRUCTION TOLERANCES. However, for surfaces with an ACI Class A surface designation, limit the allowable deflection for facing material between studs, for studs between walers and walers between bracing to 0.0025 times the span. Design the formwork as a complete system with consideration given to the effects of cementitious materials and mixture additives such as fly ash, cement type, plasticizers, accelerators, retarders, air entrainment, and others. Monitor the adequacy of formwork design and construction prior to and during concrete placement as part of the Contractor's approved Quality Submit design analysis and calculations for

form design and methodology used in the design sealed and signed by an engineer registered in the State of Arizona.

### 1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings  
Formwork

SD-03 Product Data  
Design  
Form Materials  
Form Releasing Agents

SD-04 Samples

On Site Sample

SD-06 Test Reports

Inspection  
Formwork Not Supporting Weight of Concrete

### 1.4 QUALITY ASSURANCE

On site sample shall be of sufficient size to contain joints and full allocation of reinforcing steel that will be used in the structure.

### 1.5 SUSTAINABLE DESIGN REQUIREMENTS

Refer to VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS, and Section 01 62 35 RECYCLED/RECOVERED MATERIALS for additional project requirements, including but not limited to performance and submittal requirements, that may apply to any product herein specified.

## PART 2 PRODUCTS

### 2.1 FORM MATERIALS

Submit manufacturer's data, including literature describing form materials, accessories, and form releasing agents. surface will not be exposed to view.

#### 2.1.1 Form Releasing Agents

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds. If special form liners are to be used, follow the recommendation of the form coating manufacturer. Submit manufacturer's recommendation on method and rate of application of form releasing agents.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Formwork

Forms shall be constructed true to the structural design and required alignment. Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03 30 00 CAST-IN-PLACE CONCRETE and conforming to construction tolerance given. Continuously monitor the alignment and stability of the forms during all phases to assure the finished product will meet the required surface class or classes specified. Failure of any supporting surface either due to surface texture, deflection or form collapse shall be the responsibility of the Contractor as will the replacement or correction of unsatisfactory surfaces. When forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be re-used if there is any evidence of defects which would impair the quality of the resulting concrete surface. All surfaces of used forms shall be cleaned of mortar and any other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a nonstaining bond breaker. Submit drawings showing details of formwork, joints, supports, studding and shoring, and sequence of form and shoring removal.

#### 3.2 CHAMFERING

All exposed joints, edges and external corners shall be chamfered by molding placed in the forms unless the drawings specifically state that chamfering is to be omitted or as otherwise specified. Chamfered joints shall not be permitted where earth or rockfill is placed in contact with concrete surfaces. Chamfered joints shall be terminated twelve inches outside the limit of the earth or rockfill so that the end of the chamfers will be clearly visible.

#### 3.3 COATING

The coating shall be used as recommended in the manufacturer's printed or written instructions.

#### 3.4 FORM REMOVAL

The minimal time required for concrete to reach a strength adequate for removal of formwork without risking the safety of workers or the quality of the concrete depends on a number of factors including, but not limited to, ambient temperature, concrete lift heights, type and amount of concrete admixture, and type and amount of cementitious material in the concrete. It is the responsibility of the Contractor to consider all applicable factors and leave the forms in place until it is safe to remove them. In any case forms shall not be removed unless the minimum time, minimum ambient temperature, and minimum compressive strength requirements below are met, except as otherwise directed or specifically authorized. When conditions are such as to justify the requirement, forms will be required to remain in place for a longer period. All removal shall be accomplished in a manner which will prevent damage to the concrete and ensure the complete safety of the structure. Where forms support more than one element, the forms shall not be removed until the form removal criteria are met by all supported elements. Form removal shall be scheduled so that all necessary repairs can be performed as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE

### 3.4.1 Formwork Not Supporting Weight of Concrete

Formwork for walls, columns, sides of beams, gravity structures, and other vertical type formwork not supporting the weight of concrete shall not be removed in less than 24 hours after concrete placement is completed.

### 3.4.2 Formwork Supporting Weight of Concrete

Formwork supporting weight of concrete and shoring shall not be removed until structural members have acquired sufficient strength to safely support their own weight and any construction or other superimposed loads to which the supported concrete may be subjected. As a minimum, forms shall be left in place until control concrete test cylinders indicate evidence the concrete has attained at least 75 percent of the compressive strength required for the structure in accordance with the quality and location requirements.

## 3.5 INSPECTION

Forms and embedded items shall be inspected in sufficient time prior to each concrete placement in order to certify to the Contracting Officer that they are ready to receive concrete. Submit field inspection reports for concrete forms and embedded items.

TABLE 1  
TOLERANCES FOR FORMED SURFACES

Use applicable.

- |   |  |
|---|--|
| 1. Variations from the plumb:                                       |  |
| a. In the lines and surfaces of columns, piers, walls and in arises | 1/4 inch in any 10 feet of length<br>Maximum for entire length -- 1 inch |

b. For exposed corner columns, control-joint grooves, and other conspicuous lines

1/4 inch in any 20 feet of length  
Maximum for entire length -- 1/2  
Inch

2. Variation for the level or from the grades indicated on the drawings:

a. In slab soffits, ceilings beam soffits, and in arises, measured before removal of supporting shores

1/4 inch in any 10 feet of length  
3/8 inch in any bay or in any 20 feet of length  
Maximum for entire length -- 3/4 inch

b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines

1/4 inch in any bay or in any 20 feet of length  
Maximum for entire length -- 1/2 inch

3. Variation of the linear building lines from established position in plan

1/2 inch in any 10 feet  
1 inch maximum

4. Variation of distance between walls, columns, partitions

1/4 inch per 10 feet of distance, but not more than 1/2 inch in any one bay, and not more than 1 inch total variation

5. Variation in the sizes and locations of sleeves, floor openings, and wall opening

Minus 1/4 inch, Plus 1/2 inch

6. Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls

Minus 1/4 inch, Plus 1/2 inch

7. Footings:

a. Variation of dimensions in plan

Minus 1/2 inch, plus 2 inches when formed or plus 3 inches when placed against unformed excavation

b. Misplacement of eccentricity

2 percent of the footing width in the direction of misplacement but not more than 2 inches

- c. Reduction in thickness                      Minus 5 percent of the specified thickness
  
- 8. Variation in steps:
  - a. In a flight of stairs                      Riser -- 1/8 inch  
    Tread -- 1/4 inch
  
  - b. In consecutive steps                      Riser -- 1/16 inch  
    Tread -- 1/8 inch

**END OF SECTION 03 11 13**

**SECTION 03 35 00  
CONCRETE FINISHING**

**PART 1 GENERAL**

**1.1 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publication as referred to within the text by the basic designation only. Use current applicable versions.

**AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)**

ACI 117 Specification for Tolerances for Concrete Construction and Materials and Commentary

ACI 305R Specification for Hot Weather Concreting.

**ASTM International (ASTM)**

ASTM C1059/C1059M Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete

ASTM C881/C881M Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

ASTM C940 Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory

**1.2 SUBMITTALS**

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Latex Bonding Compound

Epoxy Resin

**1.3 QUALITY ASSURANCE**

**1.3.1 Field Test Panels**

The quality and appearance is subject to the approval of the Contracting Officer. Formed or finished surfaces in the completed structure shall match the quality and appearance of the approved sample.

**PART 2 PRODUCTS**

**2.1 LATEX BONDING COMPOUND**

Latex bonding compound agents for bonding fresh to hardened concrete shall conform to ASTM C1059/C1059M. Submit samples as required.

## 2.2 EPOXY RESIN

Epoxy resin for use in repairs shall conform to ASTM C881/C881M, Type III, Grade I or II. Submit samples as required.

## PART 3 EXECUTION

### 3.1 FINISHING FORMED SURFACES

Forms, form materials, and form construction are specified in Section 03 11 13 STRUCTURAL CAST-IN-PLACE CONCRETE FORMING. Finishing of formed surfaces shall be as specified herein. Unless another type of architectural or special finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired. Other finishes shall be applied to the following structures or portions of structures:

#### TYPES OF FINISH STRUCTURE OR PORTION OF STRUCTURE

Grout-cleaned As noted.

Textured As noted.

Exposed aggregate As noted.

Sand-blast As noted.

Tooled As noted.

Maintain uniform color of the concrete by use of only one mixture without changes in materials or proportions for any structure or portion of structure that requires a Class A or B finish or is exposed to view, or on which a special finish is required. The form panels used to produce the finish shall be orderly in arrangement, with joints between panels planned in approved relation to openings, building corners, and other architectural features. The finished surface of sand-blasted, textured, tooled, and exposed aggregate finishes shall duplicate the preapproved sample panel. Forms shall not be reused if there is any evidence of surface wear or defects that would impair the quality of the surface.

### 3.2 Grout-Cleaned Finish

Any surfaces not scheduled to receive shall be given a grout-cleaned finish as described, as approved by the Contracting Officer and after all required curing, cleaning, and repairs have been completed. Surfaces to be grout-cleaned shall be moist cured for the required period of time before application of the grout-cleaned finish. Grout-cleaning shall be delayed until near the end of construction on all surfaces not to be painted in order to achieve uniformity of appearance and reduce the chance of discoloring caused by subsequent construction operations. The temperature of the air adjacent to the surface shall be not less than 40 degrees F for 24 hours prior to and 72 hours following the application of the finish. The finish for any area shall be completed in the same day, and the limits of a finished area shall be made at natural breaks in the finished surface. The

surface to receive grout-cleaned finish shall be thoroughly wetted to prevent absorption of water from the grout but shall have no free water present. The surface shall then be coated with grout. The grout shall be applied as soon as the surface of the concrete approaches surface dryness and shall be vigorously and thoroughly rubbed over the area with clean burlap pads, cork floats or stones, so as to fill all voids. The grout shall be composed of one part portland cement as used on the project, to two parts by volume of well-graded sand passing a 600- $\mu\text{m}$  (No. 30) sieve mixed with water to the consistency of thick paint. White portland cement shall be used for all or part of the cement as approved by the Contracting Officer to give the desired finish color. The applied coating shall be uniform, completely filling all pits, air bubbles, and surface voids. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, burlap pad, or other means. Then, after the surface whitens from drying (about 30 minutes at normal temperature) rub vigorously with clean burlap pads. Immediately after rubbing is completed, the finished surface shall be continuously moist cured for 72 hours. Burlap pads used for this operation shall be burlap stretched tightly around a board to prevent dishing the mortar in the voids.

### 3.3 REPAIRS

Except for major defects, as defined hereinafter, repair surface defects as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter shall be repaired as specified in paragraph Damp-Pack Mortar Repair below. Defects whose surface diameter is greater than their depth shall be repaired as specified in paragraph Repair of Major Defects below. Repairs shall be finished flush with adjacent surfaces and with the same surface texture. The cement used for all repairs shall be a blend of job cement with white cement proportioned so that the final color after curing and aging will be the same as the adjacent concrete. Concrete with excessive honeycomb, or other defects which affect the strength of the member, will be rejected. Repairs shall be demonstrated to be acceptable and free from cracks or loose or drummy areas at the completion of the contract. Repairs not meeting these requirements will be rejected and shall be replaced.

#### 3.3.1 Damp-Pack Mortar Repair

Form tie holes requiring repair and other defects, whose depth is at least as great as their surface diameter but not over 4 inches, shall be repaired by the damp-pack mortar method. Form tie holes shall be reamed and other similar defects shall be cut out to sound concrete. The void shall then be thoroughly cleaned, thoroughly wetted, brush-coated with a thin coat of neat cement grout and filled with mortar. Mortar shall be a stiff mix of 1 part portland cement to 2 parts fine aggregate passing the No. 16 mesh sieve, and minimum amount of water. Use only sufficient water to produce a mortar which, when used, will stick together on being molded into a ball by a slight pressure of the hands and will not exude water but will leave the hands damp. Mortar shall be mixed and allowed to stand for 30 to 45 minutes before use with remixing performed immediately prior to use. All holes shall be packed full. Damp-pack repairs shall be moist cured for at least 48 hours.

### 3.3.2 Repair of Major Defects

Major defects will be considered to be those more than 1/2 inch deep. Also included are any defects of any kind whose depth is over 4 inches or whose surface diameter is greater than their depth.

### 3.4 FINISHING UNFORMED SURFACES

The finish of all unformed surfaces shall meet the requirements of paragraph Tolerances in Section 03 30 00.00 10 CAST-IN-PLACE CONCRETE, when tested as specified herein.

#### 3.4.1 General

The ambient temperature of spaces adjacent to unformed surfaces being finished and of the base on which concrete will be placed shall be not less than 40 degrees F. In hot weather all requirements of Section 03 30 00 CAST-IN-PLACE CONCRETE paragraphs Hot Weather Requirements and Prevention of Plastic Shrinkage Cracking above shall be met. In hot weather when the rate of evaporation of surface moisture, as determined by use of Figure 2.1.5 of ACI 305R, may reasonably be expected to exceed 0.2 pounds per square foot per hour. Make provisions for windbreaks, shading, fog spraying, or wet covering with a light-colored material in advance of placement, and such protective measures shall be taken as quickly as finishing operations will allow. Unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, with additional finishing as specified below, and shall be true to the elevation shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings, properly consolidated, and left true and regular. Unless otherwise shown on the drawings, exterior surfaces shall be sloped for drainage. Where drains are provided, interior floors shall be evenly sloped to the drains. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or "jitterbugs" shall not be used for any surfaces. The dusting of surfaces with dry cement or other materials or the addition of any water during finishing shall not be permitted. If bleedwater is present prior to finishing, the excess water shall be carefully dragged off or removed by absorption with porous materials such as burlap. During finishing operations, extreme care shall be taken to prevent over finishing or working water into the surface; this can cause "crazing" (surface shrinkage cracks which appear after hardening) of the surface. Any slabs with surfaces which exhibit significant crazing shall be removed and replaced. During finishing operations, surfaces shall be checked with a 10 foot straightedge, applied in both directions at regular intervals while the concrete is still plastic, to detect high or low areas.

#### 3.4.2 Rough Slab Finish

As a first finishing operation for unformed surfaces and as final finish for slabs to receive mortar setting beds, the surface shall receive a rough slab finish prepared as follows. Areas indicated on the drawings shall receive only a rough slab finish. The concrete shall be uniformly placed

across the slab area, consolidated as previously specified, and then screeded with straightedge strikeoffs immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible. Side forms and screed rails shall be provided, rigidly supported, and set to exact line and grade. Allowable tolerances for finished surfaces apply only to the hardened concrete, not to forms or screed rails. Forms and screed rails shall be set true to line and grade. "Wet screeds" shall not be used.

### 3.4.3 Floated Finish

Slabs to receive more than a rough slab finish shall next be given a wood float finish. Areas as indicated on the drawings shall be given only a float finish. The screeding shall be followed immediately by darbying or bull floating before bleeding water is present, to bring the surface to a true, even plane. No water, cement, or mortar shall be added to the surface during the finishing operation. Then, after the concrete has stiffened so that it will withstand a man's weight without imprint of more than 1/4 inch and the water sheen has disappeared, it shall be floated to a true and even plane free of ridges. Perform floating by use of suitable hand floats or power driven equipment. Use sufficient pressure on the floats to bring a film of moisture to the surface. Hand floats shall be made of wood, magnesium, or aluminum. Lightweight concrete or concrete that exhibits stickiness shall be floated with a magnesium float. Care shall be taken to prevent over-finishing or incorporating water into the surface.

### 3.4.4 Non-Slip Finish

Construct non-slip floors in accordance with the following subparagraphs.

#### 3.4.4.1 Broomed

Areas as indicated on the drawings shall be given a broomed finish. After floating, the surface shall be lightly steel troweled, and then carefully scored by pulling a hair push-type broom across the surface. Brooming shall be transverse to traffic or at right angles to the slope of the slab. After the end of the curing period, the surface shall be vigorously broomed with a coarse fiber broom to remove all loose or semi-detached particles.

#### 3.4.6.2 Abrasive Aggregate

Areas as indicated on the drawings slab shall be given an abrasive aggregate finish. The concrete surface shall be given a float finish. Abrasive aggregate shall then immediately be uniformly sprinkled over the floated surface at a total rate of not less than 0.25 psf spread in two applications at right angles to each other. The surface shall then be troweled to a smooth, even finish that is uniform in texture and appearance and free from blemishes including trowels marks. Immediately after curing, cement paste and laitance covering the abrasive aggregate shall be removed by steel brushing, rubbing with abrasive stone, or sandblasting to expose the abrasive particles.

**END OF SECTION 03 35 00**

**SECTION 04 20 00**  
**STRUCTURAL MASONRY**

**PART 1 GENERAL**

**1.1 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Use current applicable versions.

**AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)**

ACI 318 Building Code Requirements for Structural Concrete and Commentary

ACI 530/530.1 Building Code Requirements and Specification for Masonry Structures and Related Commentaries

ACI SP-66 ACI Detailing Manual

**ASTM INTERNATIONAL (ASTM)**

ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

ASTM A641/A641M Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

ASTM A82/A82M Standard Specification for Steel Wire, Plain, for Concrete Reinforcement

ASTM C1019 Standard Test Method for Sampling and Testing Grout

ASTM C1142 Standard Specification for Extended Life Mortar for Unit Masonry

ASTM C129 Standard Specification for Nonloadbearing Concrete Masonry Units

ASTM C140 Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

ASTM C144 Standard Specification for Aggregate for Masonry Mortar

ASTM C150/C150M Standard Specification for Portland Cement

ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes

ASTM C270	Standard Specification for Mortar for Unit Masonry
ASTM C315	Clay Flue Linings ASTM C426. Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units
ASTM C476	Standard Specification for Grout for Masonry
ASTM C494/C494M	Standard Specification for Chemical Admixtures for Concrete
ASTM C55	Concrete Brick
ASTM C641	Staining Materials in Lightweight Concrete Aggregates
ASTM C780	Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C90	Loadbearing Concrete Masonry Units
ASTM C94/C94M	Standard Specification for Ready-Mixed Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM E119	Standard Test Methods for Fire Tests of Building Construction and Materials
	INTERNATIONAL CODE COUNCIL (ICC)
ICC IBC	International Building Code

## 1.2 SYSTEM DESCRIPTION

### 1.2.1 Design Requirements

#### 1.2.1.1 Unit Strength Method

Compute compressive strength of masonry system "Unit Strength Method", ACI 530/530.1. Submit calculations and certifications of unit and mortar strength.

#### 1.2.1.2 Seismic Requirement

In addition to design requirements of ICC IBC, provide additional seismic reinforcement as detailed on the drawings. The maximum spacing of reinforcing bars shall be 48 inches. Bond beams are required at the top of footings, at the bottom and top of openings, at roof and floor levels, and within 2 courses from the top of walls as indicated on the drawings.

#### 1.2.1.3 Special Inspection

Perform special inspections and testing for seismic-resisting systems and components in accordance with Section 01 45 35 SPECIAL INSPECTION FOR SEISMIC-RESISTING SYSTEMS.

#### 1.2.2 Additional Requirements

- a. Maintain at least one spare vibrator on site at all times.
- b. Provide bracing and scaffolding necessary for masonry work. Design bracing to resist wind pressure as required by local code.

#### 1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings  
Detail Drawings;

SD-03 Product Data  
Cement;  
Insulation;  
Cold Weather Installation;  
Water-Repellant Admixture;

SD-04 Samples  
Concrete Masonry Units (CMU);  
Concrete Brick  
Anchors, Ties, and Bar Positioners  
Expansion-Joint Materials  
Joint Reinforcement  
Insulation

SD-05 Design Data  
Pre-mixed Mortar  
Unit Strength Method

SD-06 Test Reports  
Field Testing of Mortar  
Field Testing of Grout  
Prism tests  
Fire-rated CMU  
Masonry Inspector Qualifications

SD-07 Certificates  
Concrete Brick  
Concrete Masonry Units (CMU)  
Anchors, Ties, and Bar Positioners  
Expansion-Joint Materials  
Joint Reinforcement

Insulation  
Precast Concrete Items  
Admixtures for Masonry Mortar  
Admixtures for Grout  
Insulation

SD-10 Operation and Maintenance Data  
Take-Back Program

## 1.4 QUALITY ASSURANCE

### 1.4.1 Sample Masonry Panels

After material samples are approved and prior to starting masonry work, construct sample masonry panels for each type and color of masonry required. At least 48 hours prior to constructing the sample panel or panels, submit written notification to the Contracting Officer.

#### 1.4.1.1 Configuration

Panels shall be L-shaped or otherwise configured to represent all of the wall elements. Panels shall be of the size necessary to demonstrate the acceptable level of workmanship for each type of masonry represented on the project. The minimum size of a straight panel or a leg of an L-shaped panel shall be 8 feet long by 4 feet high.

#### 1.4.1.2 Composition

Panels shall show full color range, texture, and bond pattern of the masonry work. The Contractor's method for mortar joint tooling; grouting of reinforced vertical cores, collar joints, bond beams, and lintels; positioning, securing, and lapping of reinforcing steel; positioning and lapping of joint reinforcement (including prefabricated corners); and cleaning of masonry work shall be demonstrated during the construction of the panels. Installation or application procedures for anchors, wall ties, CMU control joints, insulation, flashing, and weep holes shall be shown in the sample panels. The panels shall contain a stacked bond corner that includes a bond beam corner. Panels shall show installation of electrical boxes and conduit. Panels that represent reinforced masonry shall contain a 2 by 2 foot opening placed at least 2 feet above the panel base and 2 feet away from all free edges, corners, and control joints. Required reinforcing shall be provided around this opening as well as at wall corners and control joints.

#### 1.4.1.3 Construction Method

Where anchored veneer walls are required, demonstrate and receive approval for the method of construction; i.e., either bring up the two wythes together or separately, with the insulation and appropriate ties placed within the specified tolerances across the cavity. Temporary provisions shall be demonstrated to preclude mortar or grout droppings in the cavity and to provide a clear open air space of the dimensions shown on the drawings. Where masonry is to be grouted, demonstrate and receive approval on the method that will be used to bring up the masonry wythes; support the reinforcing bars; and grout cells, bond beams, lintels, and collar joints using the requirements specified herein. If sealer is specified to be applied to the masonry units, sealer shall be applied to the sample panels. Panels shall be built on a properly designed concrete foundation.

#### 1.4.1.4 Usage

The completed panels shall be used as the standard of workmanship for the type of masonry represented. Masonry work shall not commence until the sample panel for that type of masonry construction has been completed and approved. Panels shall be protected from the weather and construction operations until the masonry work has been completed and approved. After completion of the work, the sample panels, including all foundation concrete, shall become the property of the Contractor and shall be removed from the construction site.

#### 1.4.2 Masonry Inspector Qualifications

A qualified masonry inspector approved by the Contracting Officer shall perform inspection of the masonry work. Minimum qualifications for the masonry inspector shall be 5 years of reinforced masonry inspection experience or acceptance by a State, municipality, or other governmental body having a program of examining and certifying inspectors for reinforced masonry construction. The masonry inspector shall be present during preparation of masonry prisms, sampling and placing of masonry units, placement of reinforcement (including placement of dowels in footings and foundation walls), inspection of grout space, immediately prior to closing of cleanouts, and during grouting operations. The masonry inspector shall assure compliance with the drawings and specifications. The masonry inspector shall keep a complete record of all inspections and shall submit daily written reports to the Quality Control Supervisory Representative reporting the quality of masonry construction. Submit copies of masonry inspector reports.

#### 1.4.3 Detail Drawings

Submit detail drawings showing bar splice locations. Bent bars shall be identified on a bending diagram and shall be referenced and located on the drawings. Wall dimensions, bar clearances, and wall openings greater than one masonry unit in area shall be shown. No approval will be given to the shop drawings until the Contractor certifies that all openings, including those for mechanical and electrical service, are shown. If, during construction, additional masonry openings are required, the approved shop drawings shall be resubmitted with the additional openings shown along with the proposed changes. Location of these additional openings shall be clearly highlighted. The minimum scale for wall elevations shall be ¼ inch per foot. Reinforcement bending details shall conform to the requirements of ACI SP-66. Submit drawings including plans, elevations, and details of wall reinforcement; details of reinforcing bars at corners and wall intersections; offsets; tops, bottoms, and ends of walls; control and expansion joints; lintels; and wall openings.

### 1.5 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered, stored, handled, and protected to avoid chipping, breakage, and contact with soil or contaminating material. Store and prepare materials in already disturbed areas to minimize project site disturbance and size of project site.

#### 1.5.1 Masonry Units

Cover and protect moisture-controlled concrete masonry units and cementitious materials from precipitation. Conform to all handling and storage requirements of ASTM C90. Mark prefabricated lintels on top sides to show either the lintel schedule number or the number and size of top and

bottom bars.

#### 1.5.2 Reinforcement, Anchors, and Ties

Steel reinforcing bars, coated anchors, ties, and joint reinforcement shall be stored above the ground. Steel reinforcing bars and uncoated ties shall be free of loose mill scale and rust.

#### 1.5.3 Cementitious Materials, Sand and Aggregates

Cementitious and other packaged materials shall be delivered in unopened containers, plainly marked and labeled with manufacturers' names and brands. Cementitious material shall be stored in dry, weathertight enclosures or be completely covered. Cement shall be handled in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Store sand and aggregates in a manner to prevent contamination or segregation.

### 1.6 PROJECT/SITE CONDITIONS

Conform to ACI 530/530.1 for hot and cold weather masonry erection.

#### 1.6.1 Hot Weather Installation

Take the following precautions if masonry is erected when the ambient air temperature is more than 99 degrees F in the shade and the relative humidity is less than 50 percent or the ambient air temperature exceeds 90 degrees F and the wind velocity is more than 8 mph. All masonry materials shall be shaded from direct sunlight; mortar beds shall be spread no more than 4 feet ahead of masonry; masonry units shall be set within one minute of spreading mortar; and after erection, masonry shall be protected from direct exposure to wind and sun for 48 hours.

#### 1.6.2 Cold Weather Installation

Before erecting masonry when ambient temperature or mean daily air temperature falls below 40 degrees F or temperature of masonry units is below 40 degrees F, submit a written statement of proposed cold weather construction procedures for approval. Refer to sections "Protection" and "Completed Masonry and Masonry Not Being Worked On" for additional precautions for masonry erected in cold weather.

#### 1.6.3 SUSTAINABLE DESIGN REQUIREMENTS

Refer to Sections 01 33 31 VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS, and Section 01 62 35 RECYCLED/RECOVERED MATERIALS for additional project requirements, including but not limited to performance and submittal requirements, that may apply to any product herein specified.

## PART 2 PRODUCTS

### 2.1 GENERAL REQUIREMENTS

The source of materials which will affect the appearance of the finished work shall not be changed after the work has started except with Contracting Officer's approval. Submit sample of colored mortar with applicable masonry unit and one unit for each type of special shape. Units shall show the full range of color and texture. Submit test reports from an approved independent laboratory. Test reports on a previously tested material shall be certified as the same as that proposed for use

in this project. Submit certificates of compliance stating that the materials meet the specified requirements.

## 2.2 CONCRETE BRICK

Concrete brick shall conform to ASTM C55, Grade S. Concrete brick may be used where necessary for filling out in concrete masonry unit construction. Submit samples as specified.

## 2.3 CONCRETE MASONRY UNITS (CMU)

Submit samples and certificates as specified. Cement shall have a low alkali content and be of one brand. Units shall be of modular dimensions and air, water, or steam cured. Exposed surfaces of units shall be smooth, uniform fine textured sand finished. Exterior concrete masonry units shall have water-repellant admixture added during manufacture. Shrinkage of concrete masonry units shall not exceed 0.065 percent when tested in accordance with ASTM C426.

a. Hollow Load-Bearing Units: ASTM C90, made with lightweight aggregate.

Provide load-bearing units for exterior walls, foundation walls, load-bearing walls, shear walls, and partitions.

b. Hollow Non-Load-Bearing Units: ASTM C129, made with lightweight aggregate. Load-bearing units may be provided in lieu of non-load-bearing units.

### 2.3.1 Aggregates

Lightweight aggregates and blends of lightweight and heavier aggregates in proportions used in producing the units, shall comply with the following requirements when tested for stain-producing iron compounds in accordance with ASTM C641: by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light stain" classification. Use industrial waste by-products (air-cooled slag, cinders, or bottom ash), concrete, granulated slag, and expanded slag in aggregates.

### 2.3.2 Kinds and Shapes

Units shall be modular in size and shall include closer, jamb, header, lintel, and bond beam units and special shapes and sizes to complete the work as indicated.

Units used in exposed masonry surfaces in any one building shall have a uniform fine texture and a uniform color.

#### 2.3.2.1 Architectural Units

Units shall have patterned face shell. Face shell pattern shall be as shown. Units shall be integrally colored during manufacture. Color shall be as noted. Patterned face shell shall be properly aligned in the completed wall.

### 2.3.3 Fire-Rated CMU

Concrete masonry units used in fire-rated construction shown on the drawings shall be of minimum equivalent thickness for the fire rating indicated and the corresponding type of aggregates indicated in TABLE I. Units containing more than one of the aggregates listed in TABLE I will be rated on the aggregate requiring the greater minimum equivalent thickness to produce the required fire rating. Construction shall conform to ASTM E119.

## 2.4 PRECAST CONCRETE ITEMS

Trim, lintels, copings, splashblocks and door sills shall be factory-made units from a plant regularly engaged in producing precast concrete units. Unless otherwise indicated, concrete shall be 4,000 psi minimum conform in to Section 03 30 00.00 10 CAST-IN-PLACE CONCRETE using 1/2 inch to No. 4 nominal-size coarse aggregate, and minimum reinforcement shall be the reinforcement required for handling of the units. Clearance of 3/4 inch shall be maintained between reinforcement and faces of units. Unless precast-concrete items have been subjected during manufacture to saturated-steam pressure of at least 120 psi for at least 5 hours, the items, after casting, shall be either damp-cured for 24 hours or steam-cured and shall then be aged under cover for 28 days or longer. Cast-concrete members weighing over 80 pounds shall have built-in loops of galvanized wire or other approved provisions for lifting and anchoring. Units shall have beds and joints at right angles to the face, with sharp true arises and shall be cast with drip grooves on the underside where units overhang walls. Exposed-to-view surfaces shall be free of surface voids, spalls, cracks, and chipped or broken edges. Precast units exposed-to-view shall be of uniform appearance and color. Unless otherwise specified, units shall have a smooth dense finish. Prior to use, each item shall be wetted and inspected for crazing. Items showing evidence of dusting, spalling, crazing, or having surfaces treated with a protective coating will be rejected. Submit specified factory certificates.

#### 2.4.1 Lintels

Precast lintels, unless otherwise shown, shall be of a thickness equal to the wall and reinforced with two No. 4 bars for the full length. Top of lintels shall be labeled "TOP" or otherwise identified and each lintel shall be clearly marked to show location in the structure. In reinforced masonry, lintels shall conform to ACI 318 for flexural and shear strength and shall have at least 8 inches bearing at each end. Concrete shall have a minimum 28 day compressive strength of 3500 psi for conventionally reinforced lintels or 6000 psi for prestressed lintels using 1/2 inch to No. 4 nominal-size coarse aggregate. Reinforcement shall conform to ASTM A615/A615M Grade 60,000 psi. Limit lintel deflection due to dead plus live load to L/600 or 0.3 inches. Provide top and bottom bars for lintels over 36 inches in length.

#### 2.4.2 Sills and Copings

Sills and copings shall be cast with washes. Sills for windows having mullions shall be cast in sections with head joints at mullions and a 1/4 inch allowance for mortar joints. The ends of sills, except a 3/4 inch wide margin at exposed surfaces, shall be roughened for bond. Treads of door sills shall have rounded nosing. Reinforce sills as indicated on the drawings but not less than two No. 4 bars.

#### 2.4.3 Splash Blocks

Splash blocks shall be as detailed. Reinforcement shall be the manufacturer's standard.

#### 2.4.4 Flue Linings and Thimbles

ASTM C315, free from fractures. Sizes and shapes shall be as indicated.

### 2.5 MORTAR FOR STRUCTURAL MASONRY

ASTM C270, Type S. Strength (f<sub>m</sub>) as indicated. Test in accordance with ASTM C780. Use Type I or III portland cement. Do not use admixtures containing chlorides.

## 2.6 MASONRY MORTAR

Type M mortar shall conform to ASTM C270 and shall be used for foundation walls. Mortar Type S and N shall conform to the proportion specification of ASTM C270 except Type S cement-lime mortar proportions shall be 1 part cement, 1/2 part lime and 4-1/2 parts aggregate; Type N cement-lime mortar proportions shall be 1 part cement, 1 part lime and 6 parts aggregate.

Type N or S mortar shall be used for non-load-bearing, non-shear-wall interior masonry; and Type S for remaining masonry work; except where higher compressive strength is indicated on structural drawings. Pointing mortar in showers and kitchens shall contain ammonium stearate, or aluminum tri-stearate, or calcium stearate in an amount equal to 3 percent by weight of cement used. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source.

### 2.6.1 Admixtures for Masonry Mortar

In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C494/C494M, Type C. Submit the required certifications.

### 2.6.2 Hydrated Lime and Alternates

Hydrated lime shall conform to ASTM C207, Type S. Lime alternates which have a current ICBO, ICBO UBC, Evaluation Report number whose findings state it may be used as an alternate to lime for Type M, S and N mortars will be deemed acceptable provided the user follows the manufacturer's proportions and mixing instructions as set forth in the ICBO report.

### 2.6.3 Cement

Portland cement shall conform to ASTM C150/C150M, Type I, or III. Containers shall bear complete instructions for proportioning and mixing to obtain the required types of mortar. Incorporate to the maximum extent, without conflicting with other requirements of this section, up to 40 percent fly ash, up to 70 percent slag, up to 10 percent cenospheres, and up to 10 percent silica fume. Additives shall conform to requirements in Section 03 30 00 CAST-IN-PLACE CONCRETE.

### 2.6.4 Pre-Mixed Mortar

Pre-mixed mortar shall conform to ASTM C1142, Type RS. Submit pre-mixed mortar composition.

### 2.6.5 Sand and Water

Sand shall conform to ASTM C144. Water shall be clean, potable, and free from substances which could adversely affect the mortar.

## 2.7 WATER-REPELLANT ADMIXTURE

Polymeric type formulated to reduce porosity and water penetration and water absorption of the mortar and masonry units required to provide for the exterior single-wythe masonry wall water penetration resistance.

## 2.8 GROUT AND READY-MIXED GROUT

Grout shall conform to ASTM C476, fine and coarse, as specified for use. Cement used in grout shall have a low alkali content. Grout slump shall be between 8 and 10 inches. Minimum grout strength shall be 2000 psi in 28 days, as tested by ASTM C1019. Use grout subject to the limitations of Table III. Do not change proportions and do not use materials with different physical or chemical characteristics in grout for the work unless additional evidence is furnished that the grout meets the specified requirements. Ready-Mixed grout shall conform to ASTM C94/C94M.

#### 2.8.1 Admixtures for Grout

In cold weather, a non-chloride based accelerating admixture may be used subject to approval; accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C494/C494M, Type C. In general, air-entrainment, anti-freeze or chloride admixtures shall not be used except as approved by the Contracting Officer. Submit required certifications.

#### 2.8.2 Grout Barriers

Grout barriers for vertical cores shall consist of fine mesh wire, fiberglass, or expanded metal.

### 2.9 ANCHORS, TIES, AND BAR POSITIONERS

Anchors and ties shall be fabricated without drips or crimps and shall be zinc-coated in accordance with ASTM A153/A153M, Class B-2. Steel wire used for anchors and ties shall be fabricated from steel wire conforming to ASTM A82/A82M. Wire ties or anchors in exterior walls shall conform to ASTM A641/A641M. Joint reinforcement in interior walls, and in exterior or interior walls exposed to moist environment shall conform to ASTM A641/A641M; coordinate with paragraph JOINT REINFORCEMENT below. Anchors and ties shall be sized to provide a minimum of 5/8 inch mortar cover from either face. Submit two anchors, ties and bar positioners of each type used, as samples.

#### 2.9.1 Wire Mesh Ties

Wire mesh for tying 4 inch thick concrete masonry unit partitions to other intersecting masonry partitions shall be 1/2 inch mesh of minimum 16 gauge steel wire. Minimum lengths shall be not less than 12 inches.

#### 2.9.2 Wall Ties

Provide wall ties rectangular-shaped or Z-shaped fabricated of 3/16 inch diameter zinc-coated steel wire. Rectangular wall ties shall be no less than 4 inches wide. Wall ties may also be of a continuous type conforming to paragraph JOINT REINFORCEMENT.

#### 2.9.3 Dovetail Anchors

Provide dovetail anchors of the flexible wire type, 3/16 inch diameter zinc-coated steel wire, triangular shaped, and attached to a 12 gauge or heavier steel dovetail section. Use these anchors for anchorage of veneer wythes or composite-wall facings extending over the face of concrete columns, beams, or walls. Fill cells within vertical planes of these anchors solid with grout for full height of walls or partitions, or solid units may be used. Dovetail slots are specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

#### 2.9.4 Bar Positioners

Bar positioners, used to prevent displacement of reinforcing bars during the course of construction, shall be factory fabricated from 9 gauge steel wire or equivalent, and coated with a hot-dip galvanized finish. Not more than one wire shall cross the cell.

#### 2.10 JOINT REINFORCEMENT

Joint reinforcement shall be factory fabricated from steel wire conforming to ASTM A82/A82M, welded construction. Tack welding will not be acceptable in reinforcement used for wall ties. Wire shall have zinc coating conforming to ASTM A153/A153M, Class B-2. All wires shall be a minimum of 9 gauge. Reinforcement shall be ladder type design, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units. Joint reinforcement shall be placed a minimum of 5/8 inch cover from either face. The distance between crosswires shall not exceed 16 inches. Joint reinforcement for straight runs shall be furnished in flat sections not less than 10 feet long. Joint reinforcement shall be provided with factory formed corners and intersections. Submit one piece of each type used, including corner and wall intersection pieces, showing at least two cross wires.

#### 2.11 REINFORCING STEEL BARS AND RODS

Reinforcing steel bars and rods shall conform to ASTM A615/A615M, Grade 60.

#### 2.12 RIGID BOARD-TYPE INSULATION

Provide rigid board-type insulation. Submit certificate attesting that the polyurethane or polyisocyanurate insulation furnished for the project contains recovered material, and showing an estimated percent of such recovered material.

#### 2.13 EXPANSION-JOINT MATERIALS

Backer rod and sealant shall be adequate to accommodate joint compression equal to 50 percent of the width of the joint. The backer rod shall be compressible rod stock of polyethylene foam, polyurethane foam, butyl rubber foam, or other flexible, nonabsorptive material as recommended by the sealant manufacturer. Sealant shall conform to Section 07 92 00 JOINT SEALANTS, and shall be penetrating with a maximum volatile organic compound (VOC) content of 600 grams/liter. Submit one piece of each type of material used.

#### 2.14 THROUGH WALL FLASHING

Provide Through Wall Flashing as specified in Section 07 60 00 FLASHING AND SHEET METAL. Provide one of the following types except that flashing indicated to terminate in reglets shall be metal or coated-metal flashing and except that the material shall be one which is not adversely affected by dampproofing material and except stainless steel shall be provided where exposed or where masonry bears on the flashing.

a. Coated-Copper Flashing: 7 ounce, electrolytic copper sheet, uniformly coated on both sides with acidproof, alkaliproof, elastic bituminous compound. Factory apply coating to a weight of not less than 6 ounces/square foot (approximately 3 ounces/square foot on each side).

- b. Stainless Steel Flashing: ASTM A167, Type 301, 302, 304, or 316, 0.015 inch thick, No. 2D finish. Provide with factory-fabricated deformations that mechanically bond flashing against horizontal movement in all directions. Deformations shall consist of dimples, diagonal corrugations, or a combination of dimples and transverse corrugations.
- c. Reinforced Membrane Flashing: Polyester film core with a reinforcing fiberglass scrim bonded to one side. The membrane shall be impervious to moisture, flexible, and not affected by caustic alkalis. The material, after being exposed for not less than 1/2 hour to a temperature of 32 degrees F, shall show no cracking when, at that temperature, it is bent 180 degrees over a 1/16 inch diameter mandrel and then bent at the same point over the same size mandrel in the opposite direction 360 degrees.

### 2.15 WEEP HOLE VENTILATORS

Weep hole ventilators shall be prefabricated aluminum, plastic or wood blocking sized to form the proper size opening in head joints. Provide aluminum and plastic inserts with grill or screen-type openings designed to allow the passage of moisture from cavities and to prevent the entrance or SECTION 04 20 00. Ventilators shall be sized to match modular construction with a standard 3/8 inch mortar joint.

## PART 3 EXECUTION

### 3.1 PREPARATION

Prior to start of work, masonry inspector shall verify the applicable conditions as set forth in ACI 530/530.1, inspection. The Contracting Officer will serve as inspector or will select a masonry inspector.

#### 3.1.1 Protection

Ice or snow formed on the masonry bed shall be thawed by the application of heat. Heat shall be applied carefully until the top surface of the masonry is dry to the touch. Sections of masonry deemed frozen and damaged shall be removed before continuing construction of those sections.

a. Air Temperature 40 to 32 Degrees F. Sand or mixing water shall be heated to produce mortar temperatures between 40 and 120 degrees F

b. Air Temperature 32 to 25 Degrees F. Sand and mixing water shall be heated to produce mortar temperatures between 40 and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing.

c. Air Temperature 25 to 20 Degrees F. Sand and mixing water shall be heated to provide mortar temperatures between 40 and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing. Sources of heat shall be used on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 15 mph.

d. Air Temperature 20 Degrees F and below. Sand and mixing water shall be heated to provide mortar temperatures between 40 and 120 degrees F. Enclosure and auxiliary heat shall be provided to maintain air temperature above 32 degrees F. Temperature of units when laid shall not be less than 20 degrees F.

#### 3.1.2 Completed Masonry and Masonry Not Being Worked On

- a. Mean daily air temperature 40 to 32 degrees F. Masonry shall be protected from rain or snow for 24 hours by covering with weather-resistive membrane.
- b. Mean daily air temperature 32 to 25 degrees F. Masonry shall be completely covered with weather-resistant membrane for 24 hours.
- c. Mean Daily Air Temperature 25 to 20 degrees F. Masonry shall be completely covered with insulating blankets or equally protected for 24 hours.
- d. Mean Daily Temperature 20 degrees F and Below. Masonry temperature shall be maintained above 32 degrees F for 24 hours by enclosure and supplementary heat, by electric heating blankets, infrared heat lamps, or other approved methods.

### 3.1.3 Stains

Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.

### 3.1.4 Loads

Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed. Provide temporary bracing as required.

### 3.1.5 Surfaces

Clean surfaces on which masonry is to be placed of laitance, dust, dirt, oil, organic matter, or other foreign materials and slightly roughen to provide a surface texture with a depth of at least 1/8 inch. Sandblast, if necessary, to remove laitance from pores and to expose the aggregate.

## 3.2 LAYING MASONRY UNITS

- a. Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching. Masonry units shall be laid in running bond pattern. Facing courses shall be level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances shall be plus or minus 1/2 inch. Each unit shall be adjusted to its final position while mortar is still soft and plastic.
- b. Units that have been disturbed after the mortar has stiffened shall be removed, cleaned, and relaid with fresh mortar. Air spaces, cavities, chases, expansion joints, and spaces to be grouted shall be kept free from mortar and other debris. Units used in exposed masonry surfaces shall be selected from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work. Vertical joints shall be kept plumb.
- c. Units being laid and surfaces to receive units shall be free of water film and frost. Solid units shall be laid in a nonfurrowed full bed of mortar. Mortar for veneer wythes shall be beveled and sloped toward the center of the wythe from the cavity side. Units shall be shoved into place so that the vertical joints are tight. Vertical joints of brick and the vertical face shells of concrete masonry units, except where indicated at control, expansion, and isolation joints, shall be completely filled with mortar. Mortar will be permitted to protrude up to 1/2 inch into the space or cells to be grouted. Means shall be provided to prevent mortar from dropping into the space below.
- d. In double wythe construction, the inner wythe may be brought up not more than 16 inches ahead of the outer wythe. Collar joints shall be filled with mortar or grout during the laying of the facing wythe, and filling shall not lag the laying of the facing wythe by more than 8 inches.

### 3.2.1 Forms and Shores

Provide bracing and scaffolding as required. Design bracing to resist wind pressure as required by local codes. Forms and shores shall be sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout. Supporting forms and shores shall not be removed in less than 10 days.

### 3.2.2 Reinforced Concrete Masonry Units Walls

Where vertical reinforcement occurs, fill cores solid with grout. Lay units in such a manner as to preserve the unobstructed vertical continuity of cores to be filled. Embed the adjacent webs in mortar to prevent leakage of grout. Remove mortar fins protruding from joints before placing grout. Minimum clear dimensions of vertical cores shall be 2 by 3 inches. Position reinforcing accurately as indicated before placing grout. As masonry work progresses, secure vertical reinforcing in place at vertical intervals not to exceed 160 bar diameters. Use puddling rod or vibrator to consolidate the grout. Minimum clear distance between masonry and vertical reinforcement shall be not less than 1/2 inch. Unless indicated or specified otherwise, form splices by lapping bars not less than 40 bar diameters and wire tying them together.

### 3.2.3 Concrete Masonry Units

Units in piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout shall be full bedded in mortar under both face shells and webs. Other units shall be full bedded under both face shells. Head joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the face shell. Foundation walls below grade shall be grouted solid. Jamb units shall be of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved. Double walls shall be stiffened at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of the double wall. Walls and partitions shall be adequately reinforced for support of wall-hung plumbing fixtures when chair carriers are not specified.

#### 3.2.3.1 Solid Units

Completely fill bed, head, and collar joints with mortar.

#### 3.2.3.2 Hollow Units

Lay hollow units as specified for concrete masonry units.

#### 3.2.3.3 Cavity Walls

Provide a continuous cavity as indicated. Securely tie the two wythes together with horizontal joint reinforcement. Bevel mortar beds away from cavity to prevent projection into cavity when bricks are shoved in place. Keep cavities clear and clean of mortar droppings. At the bottom of cavity walls, in the course immediately above the through-wall flashing, temporarily omit one brick every 4 feet. With a hose and clean water, wash all mortar droppings and debris out of the cavity through the temporary openings at least twice each day masonry is laid, and more often when required to keep the cavities clean. Fill in the openings with bricks and mortar after the wall is complete and the cavity has been inspected and found clean. Provide weep holes of open head joints spaced 24

inches o.c. at base of wall and vertical obstructions (e.g. lintels). Cavity face of interior wythe shall be dampproofed in accordance with Section 07 11 13  
 BITUMINOUS DAMPPROOFING.

### 3.2.4 Tolerances

Lay masonry plumb, true to line, with courses level. Keep bond pattern plumb throughout. Square corners unless noted otherwise. Except for walls constructed of prefaced concrete masonry units, lay masonry within the following tolerances (plus or minus unless otherwise noted):

TABLE II TOLERANCES

Variation from the plumb in the lines and surfaces of columns, walls and arises

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In adjacent masonry units	1/8 inch
In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch

Variations from the plumb for external corners, expansion joints, and other conspicuous lines

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In 20 feet	1/4 inch
In 40 feet or more	1/2 inch

Variations from the level for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines

---

In 20 feet	1/4 inch
In 40 feet or more	1/2 inch

Variation from level for bed joints and top surfaces of bearing walls

---

In 10 feet	1/4 inch
In 40 feet or more	1/2 inch

Variations from horizontal lines

---

In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch

Variations in cross sectional dimensions of columns and in thickness of walls

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Minus	1/4 inch
-------	----------

Plus

1/2 inch

### 3.2.5 Cutting and Fitting

Full units of the proper size shall be used wherever possible, in lieu of cut units. Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Wet cut units, before being placed in the work, shall be dried to the same surface-dry appearance as uncut units being laid in the wall. Cut edges shall be clean, true and sharp. Openings in the masonry shall be made carefully so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Reinforced masonry lintels shall be provided above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

### 3.2.6 Jointing

Joints shall be tooled when the mortar is thumbprint hard. Horizontal joints shall be tooled last. Joints shall be brushed to remove all loose and excess mortar. Mortar joints shall be finished as follows:

#### 3.2.6.1 Flush Joints

Joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas shall be flush cut. Flush cut joints shall be made by cutting off the mortar flush with the face of the wall. Joints in unpared masonry walls below grade shall be pointed tight. Flush joints for architectural units, such as fluted units, shall completely fill both the head and bed joints.

#### 3.2.6.2 Tooled Joints

Joints in exposed exterior and interior masonry surfaces shall be tooled slightly concave. Joints shall be tooled with a jointer slightly larger than the joint width so that complete contact is made along the edges of the unit. Tooling shall be performed so that the mortar is compressed and the joint surface is sealed. Jointer of sufficient length shall be used to obtain a straight and true mortar joint.

#### 3.2.6.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch. On the exterior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch.

### 3.2.7 Joint Widths

Joint widths shall be as follows:

#### 3.2.7.1 Concrete Masonry Units

Concrete masonry units shall have 3/8 inch joints, except for prefaced concrete masonry units.

### 3.2.8 Embedded Items

Fill spaces around built-in items with mortar. Point openings around flush-mount electrical outlet boxes in wet locations with mortar. Embed anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in as the masonry work progresses. Fully embed anchors, ties and joint reinforcement in the mortar. Fill cells receiving anchor bolts and cells of the first course below bearing plates with grout.

### 3.2.9 Unfinished Work

Step back unfinished work for joining with new work. Tooothing may be resorted to only when specifically approved. Remove loose mortar and thoroughly clean the exposed joints before laying new work.

### 3.2.10 Masonry Wall Intersections

Masonry bond each course at corners and elsewhere as shown. Masonry walls shall be anchored or tied together at corners and intersections with bond beam reinforcement and prefabricated corner or tee pieces of joint reinforcement as shown.

### 3.2.11 Partitions

Partitions shall be continuous from floor to underside of floor or roof deck where shown. Openings in firewalls around joists or other structural members shall be filled as indicated or approved. Where suspended ceilings on both sides of partitions are indicated, the partitions other than those shown to be continuous may be stopped approximately 4 inches above the ceiling level. An isolation joint shall be placed in the intersection between partitions and structural or exterior walls as shown. Interior partitions having 4 inch nominal thick units shall be tied to intersecting partitions of 4 inch units, 5 inches into partitions of 6 inch units, and 7 inches into partitions of 8 inch or thicker units. Cells within vertical plane of ties shall be filled solid with grout for full height of partition or solid masonry units may be used. Interior partitions having masonry walls over 4 inches thick shall be tied together with joint reinforcement. Partitions containing joint reinforcement shall be provided with prefabricated pieces at corners and intersections or partitions.

## 3.3 ANCHORED VENEER CONSTRUCTION

Completely separate the inner and outer wythes by a continuous airspace as indicated. Lay up both the inner and the outer wythes together except when adjustable joint reinforcement assemblies are approved for use. When both wythes are not brought up together, through-wall flashings shall be protected from damage until they are fully enclosed in the wall. The airspace between the wythes shall be kept clear and free of mortar droppings by temporary wood strips laid on the wall ties and carefully lifted out before placing the next row of ties. A coarse gravel or drainage material shall be placed behind the weep holes in the cavity to a minimum depth of 4 inches of coarse aggregate or 10 inches of drainage material to keep mortar droppings from plugging the weep holes.

## 3.4 WEEP HOLES

Wherever through-wall flashing occurs, provide weep holes to drain flashing to exterior at acceptable locations as indicated on drawings. Weep holes shall be clear round holes not less than 1/4 inch in diameter at 24 inches o.c. Weep holes shall be provided not more than 24 inches on centers in mortar joints of the exterior wythe above wall flashing, over foundations,

bond beams, and any other horizontal interruptions of the cavity. Weep holes shall be perfectly horizontal or slightly canted downward to encourage water drainage outward and not inward. Weep holes shall be formed by placing short lengths of well-greased No. 10, 5/16 inch nominal diameter, braided cotton sash cord in the mortar and withdrawing the cords after the wall has been completed. Weep holes may be constructed using weep hole ventilators. Other approved methods may be used for providing weep holes. Weep holes shall be kept free of mortar and other obstructions.

### 3.5 COMPOSITE WALLS

Tie masonry wythes together with joint reinforcement or with unit wall ties. Anchor facing to concrete backing with wire dovetail anchors set in slots built in the face of the concrete as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE. Anchor or tie the facing wythe to the backup at a maximum spacing of 16 inches on center vertically and 24 inches on center horizontally. Unit ties shall be spaced not over 24 inches on centers horizontally, in courses not over 16 inches apart vertically, staggered in alternate courses. Ties shall be laid not closer than 5/8 inch to either masonry face. Ties shall not extend through control joints. Collar joints between masonry facing and masonry backup shall be filled solidly with grout.

### 3.6 MORTAR MIX

Mix mortar in a mechanically operated mortar mixer for at least 3 minutes, but not more than 5 minutes. Measure ingredients for mortar by volume. Ingredients not in containers, such as sand, shall be accurately measured by the use of measuring boxes. Mix water with the dry ingredients in sufficient amount to provide a workable mixture which will adhere to the vertical surfaces of masonry units. Retemper mortar that has stiffened because of loss of water through evaporation by adding water to restore the proper consistency and workability. Discard mortar that has reached its initial set or that has not been used within 2.5 hours after mixing.

### 3.7 REINFORCING STEEL

Clean reinforcement of loose, flaky rust, scale, grease, mortar, grout, or other coating which might destroy or reduce its bond prior to placing grout. Bars with kinks or bends not shown on the drawings shall not be used. Reinforcement shall be placed prior to grouting. Unless otherwise indicated, vertical wall reinforcement shall extend to within 2 inches of tops of walls.

#### 3.7.1 Positioning Bars

Vertical bars shall be accurately placed within the cells at the positions indicated on the drawings. A minimum clearance of 1/2 inch shall be maintained between the bars and masonry units. Minimum clearance between parallel bars shall be one diameter of the reinforcement. Vertical reinforcing may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement. Column and pilaster ties shall be wired in position around the vertical steel. Ties shall be in contact with the vertical reinforcement and shall not be placed in horizontal bed joints.

#### 3.7.2 Splices

Bars shall be lapped a minimum of 48 diameters of the reinforcement. Welded or mechanical connections where specifically approved, shall develop at least 125 percent of the specified yield strength of the reinforcement.

### 3.8 JOINT REINFORCEMENT INSTALLATION

Joint reinforcement shall be installed at 16 inches on center or as indicated. Reinforcement shall be lapped not less than 6 inches. Prefabricated sections shall be installed at corners and wall intersections. The longitudinal wires of joint reinforcement shall be placed to provide not less than 5/8 inch cover to either face of the unit.

### 3.9 PLACING GROUT

Fill cells containing reinforcing bars with grout. Hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces shall be filled solid with grout. Cells under lintel bearings on each side of openings shall be filled solid with grout for full height of openings.

Walls below grade, lintels, and bond beams shall be filled solid with grout. Units other than open end units may require grouting each course to preclude voids in the units. Grout not in place within 1-1/2 hours after water is first added to the batch shall be discarded. Sufficient time shall be allowed between grout lifts to preclude displacement or cracking of face shells of masonry units. If blowouts, flow outs, misalignment, or cracking of face shells should occur during construction, the wall shall be torn down and rebuilt.

#### 3.9.1 Vertical Grout Barriers for Fully Grouted Walls

Provide grout barriers not more than 30 feet apart, or as required, to limit the horizontal flow of grout for each pour.

#### 3.9.2 Horizontal Grout Barriers

Embed grout barriers in mortar below cells of hollow units receiving grout.

#### 3.9.3 Grout Holes and Cleanouts

##### 3.9.3.1 Grout Holes

Provide grouting holes in slabs and other in-place overhead construction. Locate holes over vertical reinforcing bars or as required to facilitate grout fill in bond beams. Provide additional openings spaced not more than 16 inches on centers where grouting of all hollow unit masonry is indicated. Openings shall not be less than 4 inches in diameter or 3 by 4 inches in horizontal dimensions. Upon completion of grouting operations, plug and finish grouting holes to match surrounding surfaces.

##### 3.9.3.2 Cleanouts for Hollow Unit Masonry Construction

Provide cleanout holes at the bottom of every pour in cores containing vertical reinforcement when the height of the grout pour exceeds 5 feet. Where all cells are to be grouted, construct cleanout courses using bond beam units in an inverted position to permit cleaning of all cells. Provide cleanout holes at a maximum spacing of 32 inches where all cells are to be filled with grout. Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Cleanouts shall not be less than 3 by 4 inch openings cut from one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Cleanout holes shall not be closed until masonry work, reinforcement, and final cleaning of the grout spaces have been completed

and inspected. For walls which will be exposed to view, close cleanout holes in an approved manner to match surrounding masonry.

### 3.9.4 Grouting Equipment

#### 3.9.4.1 Grout Pumps

Pumping through aluminum tubes will not be permitted. Operate pumps to produce a continuous stream of grout without air pockets, segregation, or contamination. Upon completion of each day's pumping, remove waste materials and debris from the equipment, and dispose of outside the masonry.

#### 3.9.4.2 Vibrators

Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout. Maintain at least one spare vibrator at the site at all times. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine.

Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation.

### 3.9.5 Grout Placement

Lay masonry to the top of a pour before placing grout. Grout shall not be placed in hollow unit masonry until mortar joints have set for at least 24 hours. Grout shall be placed using a hand bucket, concrete hopper, or grout pump to completely fill the grout spaces without segregation of the aggregates. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. The height of grout pours and type of grout used shall be limited by the dimensions of grout spaces as indicated in Table III. Low-lift grout methods may be used on pours up to and including 5 feet in height.

#### 3.9.5.1 Low-Lift Method

Grout shall be placed at a rate that will not cause displacement of the masonry due to hydrostatic pressure of the grout. Mortar protruding more than 1/2 inch into the grout space shall be removed before beginning the grouting operation. Grout pours 12 inches or less in height shall be consolidated by mechanical vibration or by puddling. Grout pours over 12 inches in height shall be consolidated by mechanical vibration and reconsolidated by mechanical vibration after initial water loss and settlement has occurred. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. Low-lift grout shall be limited to 5 feet maximum grout pour height.

### 3.10 BOND BEAMS

Bond beams shall be filled with grout and reinforced as indicated on the drawings. Grout barriers shall be installed under bond beam units to retain the grout as required. Reinforcement shall be continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated on the drawings. Where splices are required for continuity, reinforcement shall be lapped 48 bar diameters. A minimum clearance of 1/2 inch shall be maintained between reinforcement and interior faces of units.

### 3.11 CONTROL JOINTS

Control joints shall be provided as indicated and shall be constructed by using sash jamb units with control joint key in accordance with the details shown on the drawings. Sash jamb units shall have a 3/4 by 3/4 inch groove near the center at end of each unit. The vertical mortar joint at control joint locations shall be continuous, including through all bond beams.

This shall be accomplished by utilizing half blocks in alternating courses on each side of the joint. The control joint key shall be interrupted in courses containing continuous bond beam steel. In single wythe exterior masonry walls, the exterior control joints shall be raked to a depth of 3/4 inch; backer rod and sealant shall be installed in accordance with Section 07 92 00 JOINT SEALANTS. Exposed interior control joints shall be raked to a depth of 1/4 inch. Concealed control joints shall be flush cut.

### 3.12 JOINTS SHOWN ON THE DRAWINGS

- a. Concrete masonry veneer joints
- b. will be located, detailed, and constructed as shown on the drawings. Keep joints free of mortar and other debris.

### 3.13 LINTELS

#### 3.13.1 Masonry Lintels

Construct masonry lintels with lintel units filled solid with grout in all courses and reinforced with a minimum of two No. 4 bars in the bottom course unless otherwise indicated on the drawings. Lintel reinforcement shall extend beyond each side of masonry opening 40 bar diameters or 24 inches, whichever is greater. Reinforcing bars shall be supported in place prior to grouting and shall be located 1/2 inch above the bottom inside surface of the lintel unit.

#### 3.13.2 Precast Concrete and Steel Lintels

Construct precast concrete and steel lintels as shown on the drawings. Lintels shall be set in a full bed of mortar with faces plumb and true. Steel and precast lintels shall have a minimum bearing length of 8 inches unless otherwise indicated on the drawings.

### 3.14 SILLS AND COPINGS

Sills and copings shall be set in a full bed of mortar with faces plumb and true.

### 3.15 ANCHORAGE TO CONCRETE AND STRUCTURAL STEEL

#### 3.15.1 Anchorage to Concrete

Anchorage of masonry to the face of concrete columns, beams, or walls shall be with dovetail anchors or mechanically attached strap-type anchors spaced not over 16 inches on centers vertically and 24 inches on center horizontally.

#### 3.15.2 Anchorage to Structural Steel

Masonry shall be anchored to vertical structural steel framing with adjustable steel wire anchors spaced not over 16 inches on centers vertically, and if applicable, not over 24 inches on centers horizontally.

### 3.16 INSULATION

Anchored veneer walls shall be insulated, where shown, by installing board-type insulation on the cavity side of the inner wythe. Board type insulation shall be applied directly to the masonry or thru-wall flashing with adhesive. Insulation shall be neatly fitted between obstructions without

impaling of insulation on ties or anchors. The insulation shall be applied in parallel courses with vertical joints breaking midway over the course below and shall be applied in moderate contact with adjoining units without forcing, and shall be cut to fit neatly against adjoining surfaces. Where indicated in cavities behind stone veneer, board type insulation shall be faced with drainage composite board specified in section 07 13 53 ELASTOMERIC SHEET WATERPROOFING.

### 3.17 SPLASH BLOCKS

Locate splash blocks as indicated.

### 3.18 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, completely remove mortar and grout daubs or splashings from masonry-unit surfaces that will be exposed or painted. Before completion of the work, defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Immediately after grout work is completed, scum and stains which have percolated through the masonry work shall be removed using a high pressure stream of water and a stiff bristled brush. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

#### 3.18.1 Dry-Brushing

- a. Exposed concrete masonry unit
- b. Shall be dry-brushed at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

### 3.19 BEARING PLATES

Set bearing plates for beams, joists, joist girders and similar structural members to the proper line and elevation with damp-pack bedding mortar, except where non-shrink grout is indicated. Bedding mortar and non-shrink grout shall be as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

### 3.20 PROTECTION

Protect facing materials against staining. Cover top of walls with nonstaining waterproof covering or membrane when work is not in progress.

Covering of the top of the unfinished walls shall continue until the wall is waterproofed with a complete roof or parapet system. Covering shall extend a minimum of 2 feet down on each side of the wall and shall be held securely in place. Before starting or resuming, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

### 3.21 WASTE MANAGEMENT

Manage waste according to the Waste Management Plan and as follows. Minimize water used to wash mixing equipment. Use trigger operated spray nozzles for water hoses.

#### 3.21.1 Separate and Recycle Waste

Place materials defined as hazardous or toxic waste in designated containers. Fold up metal banding, flatten, and place in designated area for recycling. Collect wood packing shims and pallets and place in designated area. Use leftover mixed mortar as where lower strength mortar meets the requirements for bulk fill. Separate masonry waste and place in designated area for use as structural fill. Separate selected masonry waste and excess for landscape uses, either whole or crushed as ground cover.

### 3.21.2 Take-Back Program

Collect information from manufacturer for take-back program options. Set aside scrap and packaging to be returned to manufacturer for recycling into new product. When such a service is not available, local recyclers shall be sought after to reclaim the materials. Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse.

## 3.22 TEST REPORTS

### 3.22.1 Field Testing of Mortar

Take two specimens of mortar each day. Spread a layer of mortar 1/2 to 5/8 inch thick on the masonry units and allowed to stand for one minute. Prepare and test the specimens for compressive strength in accordance with ASTM C780. Include results in daily report.

### 3.22.2 Field Testing of Grout

Field sampling and testing of grout shall be in accordance with the applicable provisions of ASTM C1019. Two specimens of grout per day shall be sampled and tested. Each specimen shall have a minimum ultimate compressive strength of 2000 psi at 28 days. Include results in daily report.

**END OF SECTION 04 20 00**

**SECTION 06 10 00**  
**ROUGH CARPENTRY**

PART 1 GENERAL

1.1 REFERENCES

1.1.1 General Requirements

The publications listed below form a part of this specification to the extent referenced. The publication as referred to within the text by the basic designation only. Use current applicable versions.

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)

AF&PA T10	Wood Frame Construction Manual for One- and Two-Family Dwellings
AF&PA T101	National Design Specification (NDS) for Wood Construction

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA BOOK AWPA M2	AWPA Book of Standards Standard for Inspection of Treated Wood Products
AWPA M6 AWPA P17 AWPA P18 AWPA P5	Brands Used on Forest Products Fire Retardant Formulations Nonpressure Preservatives Standard for Waterborne Preservatives
AWPA T1	Use Category System: Processing and Treatment Standard
AWPA U1	Use Category System: User Specification for Treated Wood

ASME INTERNATIONAL (ASME)

ASME B18.2.1	Square and Hex Bolts and Screws(Inch Series)
ASME B18.2.2 ASME B18.5.2.1M	Standard for Square and Hex Nuts Metric Round Head Short Square Neck Bolts

ASME B18.5.2.2M Metric Round Head Square Neck Bolts

ASME B18.6.1 Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM D 1435 Standard Practice for Outdoor Weathering of Plastics

ASTM D 1972 Standard Practice for Generic Marking of Plastic Products

ASTM D 198 Standard Test Methods of Static Tests of Lumber in Structural Sizes

ASTM D 2344/D 2344M Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates

ASTM D 2898 Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing

ASTM D 6108 Standard Test Method for Compressive Properties of Plastic Lumber and Shapes

ASTM D 6109 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products

ASTM D 6111 Standard Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement

ASTM D 6117 Standard Test Methods for Mechanical Fasteners in Plastic Lumber and Shapes

ASTM D 696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30

degrees C With a Vitreous Silica Dilatometer

ASTM F 547

Nails for Use with Wood and  
Wood-Base Materials

FM 4435

FM GLOVAL (FM)  
Roof Perimeter Flashing

GS-36

GREEN SEAL (GS)  
Commercial Adhesives

ICC IBC

INTERNATIONAL CODE COUNCIL (ICC)  
International Building Code.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)  
SCAQMD Rule 1168 Adhesive and Sealant Applications

## 1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Nailers and Nailing Strips

Drawings of field erection details, including materials and methods of fastening nailers in conformance with Factory Mutual wind uplift rated systems specified in other Sections of these specifications.

SD-03 Product Data

Composite Wood

Fire-retardant Treatment

SD-06 Test Reports

Preservative-treated lumber and plywood

SD-07 Certificates

Certificates of grade

Manufacturer's certificates (approved by an American Lumber Standards approved agency) attesting that lumber and material not normally grade marked meet the specified requirements. Certificate of Inspection for grade marked material by an American Lumber Standards Committee (ALSC) recognized inspection agency prior to shipment.

Preservative treatment.

#### SD-11 Closeout Submittals

Urea Formaldehyde.

### 1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Adhere to requirements for stacking, lifting, bracing, cutting, notching, and special fastening requirements. Remove defective and damaged materials and provide new materials. Store separated reusable wood waste convenient to cutting station and area of work.

### 1.4 GRADING AND MARKING

#### 1.4.1 Preservative-Treated Lumber and Plywood

The Contractor shall be responsible for the quality of treated wood products. Each treated piece shall be inspected in accordance with AWWA M2 and permanently marked or branded, by the producer, in accordance with AWWA M6. The Contractor shall provide Contracting Officer's Representative with the inspection report of an approved independent inspection agency that offered products comply with applicable AWWA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWWA treatment standards.

#### 1.4.2 Fire-Retardant Treated Lumber

Mark each piece in accordance with AWWA M6, except pieces that are to be natural or transparent finished. In addition, exterior fire-retardant lumber shall be distinguished by a permanent penetrating blue stain. Labels of a nationally recognized independent testing agency will be accepted as evidence of conformance to the fire-retardant requirements of AWWA M6.

#### 1.4.3 Plastic Products

Label plastic products to be incorporated into the project in accordance with ASTM D 1972, or provide product data indicating polymeric information in the Operation and Maintenance Manual.

- a. Type 1: Polyethylene Terephthalate (PET, PETE).
- b. Type 2: High Density Polyethylene (HDPE).
- c. Type 3: Vinyl (Polyvinyl Chloride or PVC).
- d. Type 4: Low Density Polyethylene (LDPE).
- e. Type 5: Polypropylene (PP).
- f. Type 6: Polystyrene (PS).
- g. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

### 1.5 MOISTURE CONTENT

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products shall be as follows at the time of delivery to the job site:

- a. Lumber and board, 19 percent maximum
- b. Materials other than lumber; moisture content shall be in accordance with standard under which the product is produced.

### 1.6 PRESERVATIVE TREATMENT

Treat wood products with waterborne wood preservatives conforming to AWPA P5. Pressure treatment of wood products shall conform to the requirements of AWPA BOOK Use Category System Standards U1 and T1. Pressure-treated wood products shall not contain arsenic, chromium, or other agents classified as carcinogenic, probably carcinogenic, or possibly carcinogenic to humans (compounds in Groups 1, 2A, or 2B) by the International Agency for Research on Cancer (IARC), Lyon, France. Pressure-treated wood products shall not exceed the limits of the U.S. EPA's Toxic Characteristic Leaching Procedure (TCLP), and shall not be classified as hazardous waste. Submit certification from treating plant stating chemicals and process used and net amount of preservatives retained are in conformance with specified standards.

- a. 0.25 pcf intended for above ground use.
- b. 0.40 pcf intended for ground contact and fresh water use. 0.60 pcf intended for Ammoniacal Copper Quaternary Compound (ACQ)-treated foundations. All wood shall be air or kiln dried after treatment. Specific treatments shall be verified by the report of an approved independent inspection agency, or the AWPA Quality Mark on each piece. Do not incise surfaces of lumber that will be exposed. Minimize cutting and avoid breathing sawdust. Brush coat areas that are cut or drilled after treatment with either the same preservative used in the treatment or with a 2 percent copper naphthenate solution. Plastic lumber shall not be preservative treated. The following items shall be preservative treated:
  1. Wood items when the bottoms of such items are 24 inches or less from the earth underneath.
  2. Wood members that are in contact with water.

3. Wood members that are less than 24 inches from the ground, nailers that are set into or in contact with concrete or masonry.
4. Edge strips, curbs, and cants for roof decks.

#### 1.6.1 New Construction

Use a boron-based preservative conforming to AWWA P18, sodium silicate wood mineralization process, or Ammoniacal Copper Quaternary Compound to treat wood. Use boron-based preservatives for above-ground applications only.

#### 1.7 FIRE-RETARDANT TREATMENT

Fire-retardant treated wood shall be pressure treated with fire retardants conforming to AWWA P17. Fire retardant treatment of wood products shall conform to the requirements of AWWA U1, Commodity Specification H and AWWA T1, Section H. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material shall bear identification of the testing agency to indicate performance in accordance with such rating. Treated materials to be exposed to rain wetting shall be subjected to an accelerated weathering technique in accordance with ASTM D 2898 prior to being tested. Such items which will not be inside a building, and such items which will be exposed to heat or high humidity, shall receive exterior fire-retardant treatment. Fire-retardant-treated wood products shall be free of halogens, sulfates, ammonium phosphate, and formaldehyde.

#### 1.8 QUALITY ASSURANCE

##### 1.8.1 Certificates of Grade

Submit certificates attesting that products meet the grade requirements specified in lieu of grade markings where appearance is important and grade marks will deface material.

##### 1.8.2 Humidity Requirements

Sequence work to minimize use of temporary HVAC to dry out building and control humidity.

##### 1.8.3 Composite Wood Performance

Composite wood intended for use in exterior applications shall have no fading or discoloration and no change in dimensional stability as tested in accordance with ASTM D 1435 for a period of 5 years.

#### 1.9 ENVIRONMENTAL REQUIREMENTS

During and immediately after installation of treated wood and at interior spaces, provide temporary ventilation.

Composite wood materials to have no added Urea Formaldehyde in the binding agent or preservative treatment.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Virgin Lumber

Lumber fabricated from old growth timber is not permitted. Avoid companies who buy, sell, or use old growth timber in their operations, when possible. Lumber shall be FSC-certified.

#### 2.1.2 Composite Wood

Composite wood shall contain a minimum of 75 percent recycled content, with a minimum of 25 percent post-consumer recycled content. Mixed plastics and cellulose lumber shall contain a minimum of 100 percent recycled content, with a minimum of 50 percent post-consumer recycled content. HDPE/fiberglass lumber shall contain a minimum of 95 percent recycled content with a minimum of 75 percent post-consumer recycled content. Other mixed resin lumber shall contain a minimum of 95 percent recycled content with a minimum of 50 percent post-consumer recycled content.

##### 2.1.2.1 Shear Parallel to Length

Maximum 21,000 psi in accordance with ASTM D 2344/D 2344M.

##### 2.1.2.2 Density

ASTM D 6111.

##### 2.1.2.3 Compressive Strength

- a. Secant Modulus: Minimum 270,000 psi in accordance with ASTM D 6108.
- b. Stress at 3 percent strain: Minimum 21,500 psi in accordance with ASTM D 6108.

##### 2.1.2.4 Flexural Strength

Minimum 22,000 psi in accordance with ASTM D 6109.

##### 2.1.2.5 Tensile Strength

Minimum 21,250 psi in accordance with ASTM D 198.

##### 2.1.2.6 Coefficient of Thermal Expansion

Maximum 0.000080 in/in/degree F in accordance with ASTM D 696.

#### 2.1.2.7 Screw Withdrawal

350 lbs in accordance with ASTM D 6117.

#### 2.1.2.8 Nail Withdrawal

150 lbs in accordance with ASTM D 6117.

### 2.2 OTHER MATERIALS

#### 2.2.1 Miscellaneous Wood Members

##### 2.2.1.1 Nonstress Graded Members

Members shall include grounds and nailing strips. Members shall be in accordance with TABLE I for the species used. Sizes shall be as follows unless otherwise shown:

Member	Size Inch
Nailing strips	1 x 3 or 1 x 4 when used as shingle base or interior finish, otherwise 2 inch stock.

##### 2.2.1.2 Blocking

Blocking shall be standard or number 2 grade.

##### 2.2.2 Adhesives

Comply with applicable regulations regarding toxic and hazardous materials, GS-36, SCAQMD Rule 1168, and as specified. Use water-based adhesives with maximum VOC content of 15 grams/liter for all interior applications. Interior adhesives, sealants, primers and sealants used as filler must meet low emitting materials requirements.

### 2.3 ROUGH HARDWARE

Unless otherwise indicated or specified, rough hardware shall be of the type and size necessary for the project requirements. Sizes, types, and spacing of fastenings of manufactured building materials shall be as recommended by the product manufacturer unless otherwise indicated or specified. Fasteners shall be fabricated from 100 percent re-melted steel.. Fasteners may contain post-consumer or post-industrial recycled content. Rough hardware exposed to the weather or

embedded in or in contact with preservative treated wood, exterior masonry, or concrete walls or slabs shall be zinc-coated. Nails and fastenings for fire-retardant treated lumber and woodwork exposed to the weather shall be copper alloy.

#### 2.3.1 Bolts, Nuts, Studs, and Rivets

ASME B18.2.1, ASME B18.5.2.1M, ASME B18.5.2.2M and ASME B18.2.2.

#### 2.3.2 Anchor Bolts

ASTM A307, size as indicated, complete with nuts and washers.

#### 2.3.3 Expansion Shields

CID A-A-1923, CID A-A-1924, and CID A-A-1925. Except as shown otherwise, maximum size of devices shall be 3/8 inch.

#### 2.3.4 Lag Screws and Lag Bolts

ASME B18.2.1.

#### 2.3.5 Wood Screws

ASME B18.6.1.

#### 2.3.6 Nails

ASTM F 547, size and type best suited for purpose. In general, 8-penny or larger nails shall be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails shall be used for nailing through 2 inch thick lumber. Nails used with treated lumber and sheathing shall be galvanized. Nailing shall be in accordance with the recommended nailing schedule contained in AF&PA T10. Where detailed nailing requirements are not specified, nail size and spacing shall be sufficient to develop an adequate strength for the connection. The connection's strength shall be verified against the nail capacity tables in AF&PA T101. Reasonable judgment backed by experience shall ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector shall be used.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Conform to AF&PA T10 and install in accordance with the National Association of Home Builders (NAHB) Advanced Framing Techniques: Optimum Value Engineering, unless otherwise indicated or specified. Select lumber sizes to minimize waste. Fit rough carpentry, set accurately to the required lines and levels, and secure in place in a rigid manner. Provide

adequate support as appropriate to the application, climate, and modulus of elasticity of the product. Provide as necessary for the proper completion of the work. Spiking and nailing not indicated or specified otherwise shall be in accordance with the Nailing Schedule contained in ICC IBC; perform bolting in an approved manner. Spikes, nails, and bolts shall be drawn up tight.

### 3.1.1 Composite Wood

In conjunction with above requirements, follow manufacturer's recommendations for composite wood installation, including requirements for structural support, thermal movement, working, fastening, and finishing. Use standard woodworking tools, including carbide tips, coarse saw blades, and routers with aggressive cutters. Follow manufacturer's recommendations for repair by melting.

## 3.2 MISCELLANEOUS

### 3.2.1 Edge Strips, Curbs, and Cants

Provide sizes and configurations indicated or specified and anchored securely to continuous construction.

#### 3.2.1.1 Roof Edge Strips

Provide at perimeter of roof, around openings through roof, and where roofs abut walls, curbs, and other vertical surfaces. Except where indicated otherwise, nailers shall be 6 inches wide and the same thickness as the insulation. Anchor nailers securely to underlying construction. Anchor perimeter nailers in accordance with FM 4435.

#### 3.2.1.2 Cants and Curbs

Provide wood cant strips, curbs for scuttles and ventilators, and wood nailers bolted to tops of concrete or masonry curbs and at expansion joints, as indicated, specified, or necessary and of lumber.

### 3.2.2 Temporary Closures

Provide with hinged doors and padlocks and install during construction at exterior doorways and other ground level openings that are not otherwise closed. Cover windows and other unprotected openings with polyethylene or other approved material, stretched on wood frames. Provide dustproof barrier partitions to isolate areas as directed.

## 3.3 WASTE MANAGEMENT

In accordance with the Waste Management Plan and as specified. Clearly separate damaged wood and other scrap lumber for acceptable alternative uses on site, including bracing, blocking, cripples, ties, and shims. Separate treated, stained, painted, and contaminated wood and place in designated area for hazardous materials. Dispose of according to local regulations.

**END OF SECTION 06 10 00**

**SECTION 06 15 20**  
**PLASTIC LUMBER YARD VINYL TRELLIS**

PART 1 GENERAL

1.1 REFERENCES

1.1.1 General Requirements

The publications listed below form a part of this specification to the extent referenced. The publication as referred to within the text by the basic designation only. Use current applicable versions.

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)

AF&PA T10	Wood Frame Construction Manual for One- and Two-Family Dwellings
AF&PA T101	National Design Specification (NDS) for Wood Construction

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA BOOK AWPA M2	AWPA Book of Standards Standard for Inspection of Treated Wood Products
AWPA M6 AWPA P17 AWPA P18 AWPA P5	Brands Used on Forest Products Fire Retardant Formulations Nonpressure Preservatives Standard for Waterborne Preservatives
AWPA T1	Use Category System: Processing and Treatment Standard
AWPA U1	Use Category System: User Specification for Treated Wood

ASME INTERNATIONAL (ASME)

ASME B18.2.1	Square and Hex Bolts and Screws(Inch Series)
ASME B18.2.2 ASME B18.5.2.1M	Standard for Square and Hex Nuts Metric Round Head Short Square Neck Bolts

ASME B18.5.2.2M Metric Round Head Square Neck Bolts

ASME B18.6.1 Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM D 1494-22 Standard Test Method for Diffuse Light Transmission Factor of Reinforced Plastic Panels

ASTM D 3678-19 Standard Specification for Rigid Poly Vinyl Chloride) PVC) Interior-Profile Extrusions.

ASTM D3579-21 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding.

ASTM D 3841-21 Standard Specification for Glass-Fiber-Reinforced Polyester Plastic Panels

ASTM D 4058-17 Standard Specification for Chlorinated Polyethylene CPE) Sheeting for Concealed Water-Containment Membrane

ASTM D 4226-19e1 Standard Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products

ASTM D4477-22 Standard Specification for Rigid (Unplasticized) Poly (Vinyl Chloride)(PVC) Soffit

ASTM D 4495-21 Standard Test Method for Impact Resistance of Poly(Vinyl Chloride) (PVC) Rigid Profiles by Means of a Falling Weight.

ASTM D 4551-22 Standard Specification for Poly (Vinyl Chloride)(PVC) Plastic Flexible Concealed Water-Containment Membrane.

ASTM 4726-18 Standard Specification for Rigid Poly(Vinyl Chloride)(PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors.

ASTM D4756-15	Standard Practice for Installation for Rigid Poly (Vinyl Chloride) (PVC) Siding and Soffit
ASTM D 4803-18	Standard Test Method for Predicting Heat Buildup in PVC Building Products
ASTM D 5206-19	Standard Test Method for Wind load Resistance of Rigid Plastic Siding.
ASTM D 5319-22	Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
ASTM D 5926-15	Standard Specification for Poly(Vinyl Chloride) (PVC) Gaskets for Drain, Waste and Vent (DMV), Sewer, Sanitary, and Storm Plumbing Systems.
ASTM D 7793-21	Standard Specification for Insulated Vinyl Siding
ASTM D 1435	Standard Practice for Outdoor Weathering of Plastics
ASTM D 1972	Standard Practice for Generic Marking of Plastic Products
ASTM D 198	Standard Test Methods of Static Tests of Lumber in Structural Sizes
ASTM D 2344/D 2344M	Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates
ASTM D 2898	Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
ASTM D 6108	Standard Test Method for Compressive Properties of Plastic Lumber and Shapes
ASTM D 6109	Standard Test Methods for Flexural

Properties of Unreinforced and Reinforced  
Plastic Lumber and Related Products

ASTM D 6111

Standard Test Method for Bulk  
Density and Specific Gravity of Plastic  
Lumber and Shapes by Displacement

ASTM D 6117

Standard Test Methods for  
Mechanical Fasteners in Plastic Lumber and  
Shapes

ASTM D 696

Standard Test Method for  
Coefficient of Linear Thermal Expansion of  
Plastics Between -30 degrees C and 30  
degrees C With a Vitreous Silica Dilatometer

ASTM F 547

Nails for Use with Wood and  
Wood-Base Materials

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC

International Building Code.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168

Adhesive and Sealant Applications

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL  
PROCEDURES:

SD-02 Shop Drawings

Vinyl Hollow Rail Pergola/Trellis

Drawings of field erection details, including materials and methods of fastening nailers in  
conformance with Factory Mutual wind uplift rated systems specified in other Sections of these  
specifications.

SD-03 Product Data

Manufacture Plastic Lumber Yard specification for this specific project.

Plastic Lumber Yard manufacture paint instructions.

#### SD-07 Certificates

Warranty

#### SD-11 Closeout Submittals

Maintenance manual

Warranty

### 1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Adhere to requirements for stacking, lifting, bracing, cutting, notching, and special fastening requirements. Remove defective and damaged materials and provide new materials.

## PART 2 PRODUCTS

### 2.1 MATERIALS

2.1.1 Pre-Fabricated new vinyl 2x8 hollow rain with 2x8 pergola ends open trellis by Plastic Lumber Yard @ 16" P.C. Follow drawings for details.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Follow engineered shop drawings for installation including anchoring to existing structure.

**END OF SECTION 06 15 20**

**SECTION 07 44 00**  
**RAINSCREEN WALL SYSTEM**

PART 1 GENERAL

SUMMARY

A. Provide air and moisture barrier, continuous noncombustible mineral wool insulation, sub-construction, recycled glass carrier board, primer, base coat, reinforcing mesh, and masonry veneer adhesive for vertical above grade exterior walls.

B. Related Sections

1. Section 03 30 00: Cast-in-Place Concrete
2. Section 04 22 00: Concrete Unit Masonry
3. Section 04 71 00: Manufactured Brick Masonry
4. Section 05 40 00: Cold-Formed Metal Framing
5. Section 06 16 00: Sheathing
6. Section 07 21 00: Thermal Insulation
7. Section 07 26 00: Vapor Retarders
8. Section 07 27 00: Air Barriers
9. Section 07 50 00: Membrane Roofing
10. Section 07 62 00: Sheet Metal Flashing and Trim
11. Section 07 80 00: Fire and Smoke Protection
12. Section 07 90 00: Joint Protection
13. Section 08 10 00: Doors and Frames
14. Section 08 50 00: Windows

SUBMITTALS

- A. Manufacturer's specifications, details, installation instructions and product data
- B. Manufacturer's code compliance certification
- C. Manufacturer's standard warranty
- D. Applicator's industry training credentials
- E. Samples for approval as directed by architect or owner
- F. Prepare and submit project-specific engineering calculations
- G. Prepare and submit project-specific shop drawings

1.1 REFERENCES

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

REFERENCES

AAMA Standards

AAMA 509 Voluntary Test and Classification Method for Drained and Back-Ventilated  
Rainscreen Wall Cladding Systems

#### ANSI Standards

- A118.4 Specifications for Modified Dry-Set Cement Mortars
- A118.7 Specifications for High Performance Cement Grouts for Tile Installation

#### ASHRAE Standards

- ASHRAE 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings

#### ASTM Standards

- A370-19 Standard Test Methods and Definitions for Mechanical Testing of Steel Products
- C150 Standard Specification for Portland Cement
- C482 Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste
- C612 Standard Specification for Mineral Fiber Block and Board Thermal insulation
- C1088 Standard Specification for Thin Veneer Brick Units Made from Clay or Shale
- C1177 Specification for Glass Mat Gypsum for Use as Sheathing
- E84 Test Method for Surface Burning Characteristics of Building Materials
- E119 Method for Fire Tests of Building Construction and Materials
- E283 Standard Test Method of Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences across the Specimen
- E330 Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
- E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
- E2178 Standard Test Method for Air Permeance of Building Materials
- E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
- E2570 Standard Test Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage

#### International Building Codes

- IECC International Energy Conservation Code
- ICC International Building Code

#### ICC Evaluation Service (ICC-ES), Acceptance Criteria (AC)

- AC491 Self-drilling Tapping Screws Used with Aluminum
- AC118 Tapping Screw Fasteners Used in Steel-to-steel Connections

#### NFPA Standards

- NFPA 220 Standard on Types of Building Construction
- NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components

#### DESIGN REQUIREMENTS

NOTE: Coordinate this section with other material specification sections and detail drawings as applicable.

A. Allowable deflection normal to the plane of the wall for back-up wall construction: L/400

B. Comply with allowable whole building air leakage requirements.

C. Conform with applicable design wind pressure requirements.

D. Conform with fire-resistive design requirements.

E. Comply with applicable U-value requirements.

F. Wind load and building height

1. Design for maximum allowable deflection of  $L/400$ , or stiffer when required by veneer manufacturer, local building code, or design professional. Maximum allowable stud spacing: 16 inches (406mm) on center. System can achieve ultimate wind load capacity of: +120 / -90 lb/ft<sup>2</sup> (+5.75 / -4.31 kPa).
2. Design for wind load in conformance with code requirements.
3. The system is intended for use on vertical above grade walls up to 6-stories or 72ft (22m) in height, whichever is less.

G. Joints

1. Provide joints where they exist in the supporting wall construction - at expansion, control, and cold joints, at changes in support construction (e.g., masonry to frame wall), at junctures with dissimilar construction, at different substrates, at floor lines in multi-story wall construction, at changes in building height and other areas of stress concentration, and within areas of not greater than 144 ft<sup>2</sup> (13.4m<sup>2</sup>) with length or height not exceeding 18 ft (5.5m) for thin brick and with length/height or height/length ratio not greater than 2-1/2 to 1. Dark colored veneer units may require closer spacing due to increased thermal movement. Consult with design professional. Do not bridge expansion joints, control joints, or cold joints in wall construction with adhered masonry veneer. Size joints to correspond with anticipated movement. Align terminating edges of masonry veneer/carrier board with joint edges of through wall expansion joints and similar joints in construction.
2. Provide grout or pointing mortar for all masonry veneer joints (open joints are not permitted).
3. Provide minimum 1/2 inch (13 mm) wide perimeter sealant joints at all penetrations through the rainscreen system (windows, doors, mechanical, electrical, and plumbing penetrations, etc.).
4. Specify compatible backer rod and sealant or bond breaker and sealant to ensure two-sided adhesion.
5. Maintain air barrier continuity across the joints to prevent excess air leakage and water infiltration at joints.
6. Size joints in accordance with anticipated movement
7. Indicate location of joints, accessories, and accessory type on architectural drawings

H. Grade Condition

1. Do not install below grade or for use on surfaces subject to continuous or intermittent water immersion or hydrostatic pressure. Provide minimum 6-inch (152mm) clearance above grade or as required by code.

#### I. Insulation Thickness

1. Standard mineral wool thickness up to 7 inches (178mm).
2. Custom mineral wool thickness available where required by code or design documents.

#### J. Sub-Construction

1. Aluminum (ALUM) and Stainless Steel (SS) brackets
2. Bracket sizes, heights, spacing, and layout determined by design pressures on the project.

#### K. Masonry Veneer Size Limits Based on IBC and IRC

1. Maximum thickness: 5/8 inch (16mm); thicker units permitted if dimensioned for application by the thin set method (consult with veneer unit manufacturer)
2. Maximum allowable weight: 15 lb/ft<sup>2</sup> (70 kg/m<sup>2</sup>)
3. Maximum size: not to exceed 36 inches (914mm) in any face dimension and not more than 5 ft<sup>2</sup> (0.46m<sup>2</sup>)

### 1.5 PERFORMANCE REQUIREMENTS

#### A. Air and Moisture Barrier

1. Vapor permeable air and moisture barrier: material air leakage less than 0.004 cfm/ft<sup>2</sup> (0.02 L/s/m<sup>2</sup>) when tested in accordance with ASTM E2178.
2. Vapor permeable air and moisture barrier: assembly air leakage less than 0.00 cfm/ft<sup>2</sup> (0.2 L/s/m<sup>2</sup>) when tested in accordance with ASTM E2357.
3. Water-resistive barrier in conformance with physical requirements of ASTM E2570

#### B. Insulation

1. Non-combustible mineral wool insulation as defined by NFPA 220 in compliance with ASTM C612 Type IVA requirements with 0 flame spread and 0 smoke development when measured in accordance with ASTM E84

#### C. Intumescent Tape

1. Nominal 75 lb/ft<sup>3</sup> (1200 kg/m<sup>3</sup>) flexible intumescent material of exfoliated graphite that foams up under influence of pressure and temperature

**NOTE:** select one fire break method. Refer to applicable code for metal fire breaks

#### D. Fire Break

1. Metal Fire Break - Minimum 0.38mm corrosion resistant metal of sufficient dimension to overlap inner face of carrier board by minimum 10mm (~3/8in)

2. Composite Fire Break - Mineral Wool – Nominal 6 lb/ft<sup>3</sup> (96kg/m<sup>3</sup>) density, minimum 4 in (~100mm) tall non-combustible mineral wool insulation lamella strip (fibers oriented perpendicular to wall), faced with intumescent tape, nominal 75 lb/ft<sup>3</sup> (1200 kg/m<sup>3</sup>) flexible intumescent material of exfoliated graphite that foams up under influence of pressure and temperature

3. Dual Barrier Fire Break - Nominal 6 lb/ft<sup>3</sup> (96kg/m<sup>3</sup>) density, minimum 4 in (~100mm) tall non-combustible mineral wool insulation lamella strip (fibers oriented perpendicular to wall), cut for compression fit between vertical T-Profiles, and combined with metal fire break, minimum 0.38mm corrosion resistant metal of sufficient dimension to overlap inner face of carrier board by minimum 10mm (~3/8in), faced with minimum 50mm (2in) tall intumescent tape

#### E. Sub-Construction

1. 2.5mm (~1/8in) Large - Fixed Point (FP) and 2.0mm (~1/16in) Small - Gliding Point (GP), Type 304 stainless steel wall brackets conforming to strength class S230 per EN 10088-2

2. 4.2mm (~3/16in) Large – Fixed Point (FP) and 3.2mm (~1/8in) Small – Gliding Point (GP) wall brackets, quality EN AW-6063 T66 aluminum, tolerance in accordance with EN 755-9 and 6005A-T5 aluminum, tolerance in accordance with ASTM A370-19

3. Minimum 2.0mm (~1/8in) Type 6063 T-66 or 6005A-T5 aluminium alloy T-Profiles and L-Profiles. EN AW-6063 T66 per EN 755-2, or 6005A-T6 with minimum tensile strength of 35534 psi (245 N/mm<sup>2</sup>) and 6005A-T5 aluminum, tolerance in accordance with ASTM A370-19

#### F. Carrier Board

1. Nominal ½ inch (12mm) carrier board made of expanded glass granulate with nominal density of 31.2 lb/ft<sup>3</sup> (500 kg/m<sup>3</sup>) and thermal conductivity of 0.052 BTU/h·ft·°F (0.09 W/m·K) consisting of 90%+ recycled glass content

### 1.6 QUALITY ASSURANCE

#### A. Manufacturer Requirements

1. Air and moisture barrier, insulated wall cladding, and architectural finish system manufacturer for a minimum of thirty-five (35) years
2. Manufacturing facilities: ISO 9001 Certified Quality System and certified Environmental Management System

#### B. Contractor Requirements

1. Engaged in application of similar systems for a minimum of three (3) years
2. Knowledgeable in the proper use rainscreen systems.
3. Employ skilled mechanics who are experienced and knowledgeable in air and moisture barrier, curtain wall and rainscreen wall application, thin brick masonry veneer application, and familiar with the requirements of the specified work
4. Successful completion of minimum of three (3) projects of similar size and complexity to the specified project

5. Provide the proper equipment, manpower and supervision on the job site to install the system.
  6. Provide engineering calculations to verify conformance with project wind load resistance requirements and adequacy of attachment to back-up wall construction.
  7. Provide shop drawings with details at joints, seams, penetrations, and connections at foundation and roofing for air barrier continuity; spacing, layout and connections of sub-construction components; location and type of fire breaks; layout, connections, and joint spacing between wall sections; sill flashing, copings, jamb closures, and joint sealant type(s), size and locations
- C. Insulation Board Manufacturer Requirements
1. Mineral wool board manufacturer for a minimum of 30 years
- D. Masonry Veneer Manufacturer Requirements
1. Provide masonry veneer units in conformance with the IBC and IRC size, weight, and durability requirements.
  2. Provide masonry veneer units in conformance with ASTM C1088 of type and quality suitable for environmental exposure conditions of project and certify suitability in writing.
  3. Provide masonry veneer units that comply with minimum 50 lb/in<sup>2</sup> (0.345 N/mm<sup>2</sup>) shear bond strength when tested in accordance with ASTM C482.
- E. Mock-up Testing
1. Partial installation 12'-0" x building height mock up sample. Install moisture barrier and exterior cladding /window wall assembly with specified tools and materials and test air and water infiltration and structural performance in accordance with ASTM E283, ASTM E331 and ASTM.
- F. Inspections
1. Provide independent third-party inspection where required by code or contract documents
  2. Conduct inspections in accordance with code requirements and contract documents

## 1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product. Store cartons and bundles of material inside in a dry area until ready for use on pallets. Store off the ground on pallets in a dry location out of direct sunlight during installation.
- B. Store portland cement-based products in a dry area off the ground out of direct sunlight
- C. Store wet products (pail products) in a dry area and protect from extreme heat, 90 degrees F , freezing, and direct sunlight
- D. Store sealant (cartridge and sausage products) in a cool (less than 80 degrees F dry area. Protect from heat, freezing, moisture, and direct sunlight. Store away from sources of ignition.

E. Store accessories (mesh, tapes, fabrics, and pvc components in cartons) flat, off the ground in a dry location. Protect from direct sunlight. Store mesh roll cartons flat (not upright).

#### 1.8 PROJECT/SITE CONDITIONS

- A. Provide a secure staging area for storage of sub-structure components, carrier board, and accessories, to protect from damage
- B. Provide supplementary heat for installation of portland cement based (bagged products) and coating (pail products) and sealant (cartridge and sausage products) in temperatures less than 40F
- C. Provide supplementary heat for installation of sub-construction in temperatures less than 25F
- D. Maintain ambient and surface temperatures between 45 and 85 °F during application and drying period of masonry veneer adhesive – not less than 24 hours.
- E. Provide protection of surrounding areas and adjacent surfaces from application of products

#### 1.9 COORDINATION/SCHEDULING

The work in this section requires close coordination with related sections and trades. Sequence work to provide protection of construction materials from weather deterioration

- A. Provide site grading such that the wall cladding assembly terminates above grade a minimum of 6 inches (152 mm)
- B. Coordinate installation of foundation waterproofing, roofing membrane, windows, doors, and other wall penetrations to provide a continuously connected air and moisture barrier
- C. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall
- D. Schedule work such that the air and moisture barrier is exposed to weather no longer than 180 days
- E. Install window and door head flashing immediately after windows and doors are installed
- F. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior
- G. Install sheet metal flashing and trim closures at terminations with windows, doors, and similar through wall penetrations
- H. Install sub-construction after air and moisture barrier is completely dry
- I. Install fire breaks at floor lines, openings, and other required locations
- J. Install continuous insulation between or over sub-construction

K. Install sill flashings, copings, jamb closures, and sealant immediately after installation of the finished wall assembly

L. Provide airtight and watertight seals to the air and moisture barrier at the plane of the air/moisture barrier and at penetrations through the wall to the cladding assembly

#### 1.10 WARRANTY

A. Provide manufacturer's standard warranty.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

A. Provide air and moisture barrier, sub-construction, carrier board, primer, base coat, reinforcing mesh, masonry veneer adhesive, and accessories from single source manufacturer or approved supplier

B. The following are acceptable manufacturers:

1. Sto Corp. or approved equal – air and moisture barrier, sub-construction, carrier board, primer, base coat, reinforcing mesh, masonry veneer adhesive, and accessories
2. Owens-Corning or approved equal – mineral wool insulation, mineral wool floor line fire barrier
3. Rolf Kuhn or approved equal – flexible intumescent tape

#### 2.2 AIR AND MOISTURE BARRIER

1. Joint Treatment, Rough Opening Protection, and Static Transition Detail Components:

a. Install as per manufacturer's instruction.

2. Air and Moisture Barrier Coating

a. Install as per manufacturer's instruction.

3. Static or Dynamic Transition detail component.

1. Install as per manufacturer's instructions.

#### 2.3 INSULATION BOARD

A. Mineral wool insulation board in conformance with ASTM C612, Type IVA requirements, nominal 4.5 lb/ft<sup>3</sup> density and R-4.3 per inch

## 2.4 FLOOR LINE FIRE STOP

Note: a, b, and c are acceptable alternatives.

- a. Metal fire break. Minimum 0.38mm corrosion resistant metal or sufficient dimension to overlap inner face of carrier board by minimum 10mm.
- b. intumescent strip with adhesive backing field applied over insulation)
- c. Mineral wool insulation board in conformance with ASTM C612, Type IVA requirements, nominal .0 lb/ft<sup>3</sup> density and R-4.3 per inch with glass fibers oriented perpendicular to the plane of the wall.

## 2.5 SUB-CONSTRUCTION

A. Stainless-steel (SS) or aluminum (ALUM) wall brackets, aluminum T-profiles, and aluminum L-profiles capable of complying with ANSI/ASHRAE 90.1-2016 and IECC-2018.

B. Steel Classification: Structural Steel (SS)

1. Bracket – SS, material properties grade 304 or 316TI steel

C. Aluminum Classification: Aluminum (ALUM)

1. Bracket – ALUM, material properties are 6063-T66 aluminum
2. T-Profile, material properties are 6063-T66 or 6005A-T5 aluminum
3. L-Profile, material properties are 6063-T66 or 6005A-T5 aluminum

D. Spacing: Comply with Professional Engineer's project specific calculations for wall brackets and profiles

E. Wall Brackets

1. Bracket – Stainless-steel wall bracket. All brackets have a spring finger for insertion of T or L Profiles. Brackets range in depth from 40mm to 360mm, in 20mm increments (~1-9/16" - ~14 3/16") in (~13/16") increments. Brackets provide 30mm (~1-3/16") adjustability. Large Brackets (FP) transfer dead loads and wind loads to primary structure. Small Brackets (GP) transfer only wind loads to the primary structure.

2. Bracket –Aluminum wall bracket. A thermal break accessory is available with the brackets to minimize thermal bridging effects. Brackets range in depth from 40mm to 320mm, in 20mm increments (~1 9/16" - ~12 5/8") in (~13/16") increments. Brackets provide 30mm (~1 3/16") adjustability. Large Brackets (FP) transfer dead loads and wind loads to the primary structure. Small Brackets (GP) transfer only wind loads to the primary structure.

3. Bracket –Free from thermal bridges and maximizes thickness of insulation that can be used in the wall assembly. Brackets range in depth from 200mm to 360mm, in 10mm increments (~7-7/8" – ~14-3/16") in (~3/8") increments. Brackets provide 30mm (~1 3/16") adjustability. Large Brackets (FP) transfer dead loads and wind loads to the primary structure. Small Brackets (GP) transfer only wind loads to the primary structure.

F. Support Profiles are aluminum rails/profiles. The profiles are the supporting sub-construction of the specified wall cladding. StoVentro or approved equal L-Profiles are acceptable for use where the cladding panel fastener to edge distance design allows and used to stiffen outside corners at cantilevered sections. Install as per manufacturer's weight support allowances.

#### G. Thermal isolation

1. Provide thermal break accessories that isolates the wall bracket from thermal bridging effects of the primary structure, in two sizes to match the footprint of the large or small bracket as per manufacturer's instructions.

#### H. Fasteners and Sub-construction attachment to exterior building wall:

1. Attachment to steel studs. Performance to meet AC491 and AC118
2. Attachment to concrete, grout-fill CMU, and wood exterior building walls. Install as per manufacturer's instructions.

### 2.6 CARRIER BOARD

A. Lightweight composite board made of recycled glass granulate for use in masonry veneer facades or approved equal.

### 2.7 ACCESSORIES

- A. Support of insulation board at base of wall.
- B. Edge Protection and Roof Vent profiles with integral glass fiber reinforcing mesh for protecting exposed ends and edges of 12mm carrier board.
- C. Aluminum L Rail Profile for protecting exposed ends and edges of 12 mm carrier board.
- D. Mesh Corner Bead Standard with integral glass fiber reinforcing mesh for outside corner reinforcement.
- E. Façade Screw – 3/16” x 1in flat head fasteners for carrier board to T-profile connection. ¼” x 1-1/8 inch flat head fasteners for carrier board to steel stud connection. Refer to engineering drawings.
- F. Ventilation Profile for ventilation at base of wall.
- G. Stainless Steel flashing, trim and corners.
- H. Aluminum Trims and accessories.
- I. Stainless Steel fasteners for mounting brackets to steel stud, wood stud, concrete masonry back-up wall construction.
- J. Fasteners, impaling pins or other attachment devices for mounting insulation, floor line fire break materials.

### 2.8 PRIMER

Primer component is required over Carrier Board prior to the installation of base coat and mesh.

- A. Acrylic based primer.

### 2.9 BASE COAT

## A. Base Coat

### 2.10 REINFORCING MESHES

A. nominal 6 oz/yd<sup>2</sup> (203 g/m<sup>2</sup>) glass fiber reinforcing mesh treated for compatibility with installed system.

### 2.11 MASONRY VENEER ADHESIVE

A. Polymer modified Portland cement adhesive mortar for masonry veneer in conformance with ANSI 118.4

### 2.12 MASONRY VENEER GROUT / POINTING MORTAR

A. Polymer modified portland cement grout in conformance with ANSI 118.7

### 2.13 JOB MIXED INGREDIENTS

A. Water – clean and potable

B. Portland cement – Type I in conformance with ASTM C150

### 2.14 MIXING

A. Mix with a clean, rust-free high speed mixer to a uniform consistency

B. Mix with a slow speed electric drill and paddle. Pour water into a clean mixing container. Mix while slowly adding the product to the water. Mix as per manufacture recommendations, allow to set for approximately 5 minutes, achieve a uniform, lump-free consistency. Avoid retempering. Do not overmix. Keep mix ratio consistent

C. Grout / Pointing Mortar – mix in conformance with manufacturer's written instructions

D. Mix only as much material as can readily be used

E. Do not use anti-freeze compounds or other additives

## PART 3 EXECUTION

### 3.1 ENGINEERING AND SHOP DRAWINGS

A. Cladding sub-contractor shall provide shop drawings with details at joints, seams, penetrations, and connections at foundation and roofing for air barrier continuity; spacing, layout and connections of sub-construction components (including fixed or sliding point brackets) and connections (fixed or sliding point); location and type of fire breaks; layout, connections, and joint spacing between wall sections; sill flashing, copings, jamb closures, and joint sealant type(s)

### 3.2 ACCEPTABLE INSTALLERS

A. Prequalify under Quality Assurance requirements of this specification (section 1.6 B)

### 3.3 EXAMINATION

- A. Inspect all surfaces to receive the wall system. Surfaces must be fully cured, structurally sound, clean, dry and free of frost, damage, and all bond inhibiting materials, including dirt, dust, efflorescence, form oil and other foreign matter.
- B. Inspect sheathing surfaces for compliance with this specification, the applicable building code, and manufacturer requirements.
- C. Inspect surface plane for compliance with tolerance of not greater than ¼ inch in 10 feet [6mm in 3.0m] deviation in plane.
- D. Report deviations from the requirements of project specifications or other conditions that might adversely affect the air and moisture barrier, sub-construction, insulation board, carrier board, or masonry venner installation to the General Contractor. Do not start work until deviations are corrected.

### 3.4 SURFACE PREPARATION

- A. Remove surface contaminants, repair cracks, spalls or damage in concrete and concrete masonry surfaces and level concrete and masonry surfaces to comply with required tolerances. Repair holes, gaps, over-driven fasteners in sheathing surfaces, and replace damaged sheathing
- B. Repair cracks, spalls or damage in concrete and concrete masonry surfaces and level concrete and masonry surfaces to comply with required tolerances
- C. Apply conditioner as required by spray or roller to chalking or excessively absorptive surfaces or pressure wash to remove surface chalkiness
- D. Remove fasteners that are not anchored into supporting construction and seal holes with air barrier material
- E. Seal over-driven fasteners with air barrier material and install additional fasteners as needed to comply with fastener spacing requirement
- F. Fill large gaps between sheathing or voids around pipe, conduit, scupper, and similar penetrations with spray foam and shave flush with surface.
- G. Replace weather-damaged sheathing and repair or replace damaged or cracked sheathing

### 3.5 INSTALLATION

The air/moisture barrier described below is one set of materials in the air barrier system and the moisture protection for the structure. Installation of the air/moisture barrier must be integrated with flashing and other air and moisture barrier materials to ensure that where water is likely to penetrate the wall assembly, it will be drained to the exterior at the source of the leak. Proper air barrier connections and integration of the air/moisture barrier through proper sequencing of work and coordination of trades is necessary for a complete air barrier system and complete moisture protection.

- A. Air/Moisture Barrier Installation over Exterior or Exposure I Wood-Based Sheathing (Plywood and OSB), Glass Mat Faced Gypsum Sheathing in Compliance with ASTM C1177, and Concrete, or Concrete Masonry (CMU) Wall Construction
  - 1. Transition Detailing
  - 2. Rough Opening Protection
  - 3. Sheathing Joint Treatment.

4. Air/Moisture Barrier Coating Installation. Apply coating to the prepared substrate using airless spray equipment that pumps a minimum 1 gallon (3.8 L) per minute. Suggested tip size is .029. Pressure and tip size may vary depending on equipment used. Spray uniformly at thickness of approximately:

- 50 wet mils to achieve minimum 30 mil DFT
- 66 wet mils where 40 mil DFT is specified

If necessary, allow material to set slightly (up to 1 hour depending on weather and substrate conditions), and double back with a second pass to achieve total thickness.

Alternatively, apply in two coats, allowing the first coat to fully dry.

CMU surfaces may require back rolling of the first pass with a 3/4 or 1 inch (19 or 25 mm) synthetic nap roller depending on porosity, joint profile, trueness of the wall surface, and other variables that may exist.

Avoid excess build-up of wet material to prevent sag, especially on non-porous surfaces and during cold or damp weather. A VOID AND PINHOLE SURFACE must be achieved for the coating to properly function as an air and moisture barrier on CMU (and other wall surfaces).

5. Air/Moisture Barrier Connections. Coordinate installation of connecting air barrier components with other trades to provide a continuous air tight membrane. Coordinate installation of flashing and other moisture protection components with other trades to achieve complete moisture protection such that water is directed to the exterior, not into the wall assembly, and drained to the exterior at sources of leaks windows, doors and similar penetrations through the wall assembly). Splice-in head flashings above windows, doors, floor lines, roof/sidewall step flashing, and similar locations to achieve shingle lap of the air/moisture barrier such that water is directed to the exterior.

Consult with window and doors manufacture for installation requirements to maintain air barrier continuity and for head, jamb, sill flashing and perimeter sealant requirements needed to prevent leaks into the wall assembly.

#### B. Sub-construction installation.

1. Install in strict accordance with manufacturer's installation instructions and engineering shop drawings.
2. Level, plumb and in alignment with building features including corners, off-sets, and penetrations.
3. Install wall brackets as per engineering shop drawings.
4. Establish and re-establish and restart bracket locations using laser or chalk-line at penetrations and other obstructions to establish alignment.
5. Thermally isolate aluminum wall brackets by inserting thermal isolation materials between wall brackets and substrate.
6. Provide a 10mm gap between profiles/rails for expansion when multiple lengths of profiles are installed.

#### C. Carrier Board Installation.

1. Determine the size and layout of carrier boards from project specific shop drawings.
2. Fasten carrier boards

3. All carrier boards should be installed in a staggered/running bond layout. At openings, cut the carrier board to an L-shape.
4. Cut boards as per manufacturer instructions.
5. Use edge protection profiles on exposed edge. After primer installation.
6. Stiffen outside corners.
7. At cantilever install as per Engineered shop drawings.

#### D. Primer Installation

1. Apply with brush, roller or proper spray equipment to the carrier board surface to prepare the surface.

#### E. Base coat and reinforcing mesh installation.

1. Apply mesh at corners of windows, doors, and all penetrations through the system as per manufacture's recommendations.

#### F. Masonry Veneer Installation.

1. Mark layout lines in accordance with planning, pattern, size of grout joints, location of expansion joints and other start and stopping points of the installation and aesthetics.
2. Use the proper size notched trowel for application.
3. Spread the adhesive with flat side of the trowel to "wet-out" the prepared substrate. Then use the notched side of the trowel to spread additional adhesive with ribbons of adhesive oriented horizontally. Apply in a small area and immediately install thin brick before a "skin" forms on the adhesive. If adhesive skins, remove and discard the skinned adhesive, and re-apply fresh adhesive.
4. Just prior to placing units "back-butter" the units by applying fresh adhesive onto the back of the units in a thin layer with the flat side of the trowel, or with a margin trowel sit "wets out" the surface.
5. Immediately place units slightly offset from their final position in the freshly applied wall adhesive, then slide into place while applying firm pressure to fully bed the units in the adhesive so no voids exist in the adhesive. Use a straight edge to check for evenness of the surface when installing thin brick.
6. As units are placed, periodically remove a unit to verify full contact of adhesive with the substrate and the back of the unit, and full embedment (no voids) in the adhesive.
7. Before the adhesive dries scrape out any excess mortar in the grout joints or on the surface of the units. Allow to cure for at least 24 hours before grouting/pointing.

#### G. Grouting/Pointing Mortar Installation

1. Use an ANSI 118.7 compliant grout or pointing mortar in conformance with the manufacture's instruction.

### 3.6 PROTECTION

- A. Provide protection of installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry.

B. Provide protection of installed materials from water infiltration, mechanical or other damage during and after construction.

### 3.7 CLEARING, REPAIR AND MAINTENANCE.

A. Clean and maintain the finished wall surface for a fresh appearance and to prevent water entry into and behind the system. Repair cracks, impact damage, spalls or delamination promptly.

B. Maintain adjacent components of construction such as sealants, windows, doors, and flashing, to prevent water entry into or behind the wall cladding assembly.

C. Refer to manufacture for detailed information on maintenance and restoration – cleaning, recoating, resurfacing and refinishing, or re-cladding.

D. Attic Stock: as part of the contract documents, purchase and leave with the owner [50.] of thin brick units of specific texture and color, which will be used later in case finish has to be repaired after the installation is complete.

**END OF SECTION 07 44 00**

**SECTION 07 60 00  
FLASHING AND SHEET METAL**

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M            Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM B221                    Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

ASTM B32                     Standard Specification for Solder Metal

ASTM D41/D41M            Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION  
(SMACNA)

SMACNA 1793                Architectural Sheet Metal Manual, 6th Edition

1.2 GENERAL REQUIREMENTS

Finished sheet metalwork will form a weathertight construction without waves, warps, buckles, fastening stresses or distortion, which allows for expansion and contraction. Sheet metal mechanic is responsible for cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades. Coordinate installation of sheet metal items used in conjunction with roofing with roofing work to permit continuous roofing operations.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Gutters

Downspouts  
Base flashing  
Counterflashing  
Reglets

Indicate thicknesses, dimensions, fastenings and anchoring methods, expansion joints, and other provisions necessary for thermal expansion and contraction. Scaled manufacturer's catalog data may be submitted for factory fabricated items.

SD-11 Closeout Submittals

Quality Control Plan

Submit for sheet metal work in accordance with paragraph entitled "Field Quality Control."

#### 1.4 DELIVERY, HANDLING, AND STORAGE

Package and protect materials during shipment. Uncrate and inspect materials for damage, dampness, and wet-storage stains upon delivery to the job site. Remove from the site and replace damaged materials that cannot be restored to like-new condition. Handle sheet metal items to avoid damage to surfaces, edges, and ends. Store materials in dry, weather-tight, ventilated areas until immediately before installation.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

Furnish sheet metal items in 8 to 10 foot lengths. Single pieces less than 8 feet long may be used to connect to factory-fabricated inside and outside corners, and at ends of runs. Factory fabricate corner pieces with minimum 12 inch legs. Provide accessories and other items essential to complete the sheet metal installation. Provide accessories made of the same or compatible materials as the items to which they are applied. Fabricate sheet metal items of the materials specified below and to the gage, thickness, or weight shown in Table I at the end of this section. Provide sheet metal items with mill finish unless specified otherwise. Where more than one material is listed for a particular item in Table I, each is acceptable and may be used except as follows:

##### 2.1.1 Exposed Sheet Metal Items

Must be of the same material. Consider the following as exposed sheet metal: gutters, including hangers; downspouts; gravel stops and fascias; cap, base, and eave flashings and related accessories.

## 2.1.2 Steel Sheet, Zinc-Coated (Galvanized) ASTM A653/A653M.

### 2.1.2.1 Finish

Exposed exterior items of zinc-coated steel sheet must have a baked-on, factory-applied color coating of polyvinylidene fluoride or other equivalent fluorocarbon coating applied after metal substrates have been cleaned and pretreated. Provide finish coating dry-film thickness of 0.8 to 1.3 mils and color as indicated.

## 2.1.3 Aluminum Alloy, Extruded Bars, Rods, Shapes, and Tubes ASTM B221.

## 2.1.4 Solder ASTM B32, 95-5 tin-antimony.

## 2.1.5 Asphalt Primer ASTM D41/D41M.

## 2.1.6 Fasteners

Use the same metal or a metal compatible with the item fastened. Use stainless steel fasteners to fasten dissimilar materials.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Workmanship

Make lines and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction. Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793, Architectural Sheet Metal Manual. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight. Join sheet metal items together as shown in Table II.

#### 3.1.2 Nailing

Confine nailing of sheet metal generally to sheet metal having a maximum width of 18 inch. Confine nailing of flashing to one edge only. Space nails evenly not over 3 inch on center and approximately 1/2 inch from edge unless otherwise specified or indicated. Face nailing will not be permitted. Where sheet metal is applied to other than wood surfaces, include in shop drawings, the locations for sleepers and nailing strips required to secure the work.

### 3.1.3 Cleats

Provide cleats for sheet metal 18 inch and over in width. Space cleats evenly not over 12 inch on center unless otherwise specified or indicated. Unless otherwise specified, provide cleats of 2 inch wide by 3 inch long and of the same material and thickness as the sheet metal being installed. Where the fastening is to be made to concrete or masonry, use screws and drive in expansion shields set in concrete or masonry. Pretin cleats for soldered seams.

### 3.1.4 Bolts, Rivets, and Screws

Install bolts, rivets, and screws where indicated or required. Provide compatible washers where required to protect surface of sheet metal and to provide a watertight connection.

### 3.1.5 Seams

Straight and uniform in width and height with no solder showing on the face.

#### 3.1.5.1 Flat-lock Seams

Finish not less than 3/4 inch wide.

#### 3.1.5.2 Lap Seams

Finish soldered seams not less than one inch wide. Overlap seams not soldered, not less than 3 inch.

#### 3.1.5.3 Loose-Lock Expansion Seams

Not less than 3 inch wide; provide minimum one inch movement within the joint. Completely fill the joints with the specified sealant, applied at not less than 1/8 inch thick bed.

### 3.1.6 Protection from Contact with Dissimilar Materials

#### 3.1.6.1 Copper or Copper-bearing Alloys

Paint with heavy-bodied bituminous paint surfaces in contact with dissimilar metal, or separate the surfaces by means of moistureproof building felts.

#### 3.1.6.2 Aluminum

Do not allow aluminum surfaces in direct contact with other metals except stainless steel, zinc, or zinc coating. Where aluminum contacts another metal, paint the dissimilar metal with a primer followed by two coats of aluminum paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.

### 3.1.6.3 Metal Surfaces

Paint surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

### 3.1.6.4 Wood or Other Absorptive Materials

Paint surfaces that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

### 3.1.7 Expansion and Contraction

Provide expansion and contraction joints at not more than 32 foot intervals for aluminum and at not more than 40 foot intervals for other metals. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval. Space joints evenly. Join extruded aluminum gravel stops and fascias by expansion and contraction joints spaced not more than 12 feet apart.

### 3.1.8 Base Flashing

Extend up vertical surfaces of the flashing not less than 8 inch and not less than 4 inch under the roof covering. Where finish wall coverings form a counterflashing, extend the vertical leg of the flashing up behind the applied wall covering not less than 6 inch. Overlap the flashing strips with the previously laid flashing not less than 3 inch. Fasten the strips at their upper edge to the deck. Horizontal flashing at vertical surfaces must extend vertically above the roof surface and fastened at their upper edge to the deck a minimum of 6 inch on center with hex headed, galvanized shielded screws a minimum of 2-inch lap of any surface. Extend the metal flashings onto the roof covering not less than 4.5 inch at the lower side of vertical surfaces extending through the roof decks. Install and fit the flashings so as to be completely weathertight. Provide factory-fabricated base flashing for interior and exterior corners. Do not use metal base flashing on built-up roofing.

### 3.1.9 Counterflashing

Except where indicated or specified otherwise, insert counterflashing in reglets located from 9 to 10 inch above roof decks, extend down vertical surfaces over upturned vertical leg of base flashings not less than 3 inch. Fold the exposed edges of counterflashings 1/2 inch. Where stepped counterflashings are required, they may be installed in short lengths a minimum 8 inch by 10 inch or may be of the preformed one-piece type. Provide end laps in counterflashings not less than 3 inch and make it weathertight with plastic cement. Do not make lengths of metal counterflashings exceed 10 feet. Form the flashings to the required shapes before installation. Factory-form the corners not less than 12 inch from the angle. Secure the flashings in the reglets with lead wedges and space not more than 18 inch apart; on short runs, place wedges closer together. Fill caulked-type reglets or raked joints which receive counterflashing with caulking compound. Turn up the concealed edge of counterflashings

built into masonry walls not less than 1/4 inch and extend not less than 2 inch into the walls. Install counterflashing to provide a spring action against base flashing.

### 3.1.10 Metal Reglets

Provide factory fabricated caulked type or friction type reglets with a minimum opening of 1/4 inch and a depth of 1 1/4 inch, as approved.

#### 3.1.10.1 Friction Reglets

Provide with flashing receiving slots not less than 5/8 inch deep, one inch jointing tongues, and upper and lower anchoring flanges installed at 24 inch maximum snaplock receiver. Insert the flashing the full depth of the slot and lock by indentations made with a dull-pointed tool, wedges, and filled with a sealant. For friction reglets, install flashing snaplock receivers at 24 inch on center maximum. When the flashing has been inserted the full depth, caulk the slot and lock with wedges and fill with sealant.

### 3.1.11 Gutters

The hung type of shape indicated and supported on underside by brackets that permit free thermal movement of the gutter. Provide gutters in sizes indicated complete with mitered corners, end caps, outlets, brackets, and other accessories necessary for installation. Bead with hemmed edge or reinforce the outer edge of gutter with a stiffening bar not less than 3/4 by 3/16 inch of material compatible with gutter. Fabricate gutters in sections not less than 8 feet. Lap the sections a minimum of one inch in the direction of flow or provide with concealed splice plate 6 inch minimum. Join the gutters by riveted and soldered joints. Provide expansion-type slip joints midway between outlets. Install gutters below slope line of the roof so that snow and ice can slide clear. Support gutters by continuous cleats. Adjust gutters to slope uniformly to outlets, with high points occurring midway between outlets. Fabricate hangers and fastenings from metals.

### 3.1.12 Downspouts

Space supports for downspouts according to the manufacturer's recommendation for the masonry substrate. Types, shapes and sizes are indicated. Provide complete including elbows and offsets. Provide downspouts in approximately 10 foot lengths. Provide end joints to telescope not less than 1/2 inch and lock longitudinal joints. Provide gutter outlets with wire ball strainers for each outlet. Provide strainers to fit tightly into outlets and be of the same material used for gutters. Keep downspouts not less than one inch away from walls. Fasten to the walls at top, bottom, and at an intermediate point not to exceed 5 feet on center with leader straps or concealed rack-and-pin type fasteners. Form straps and fasteners of metal compatible with the downspouts.

#### 3.1.12.1 Terminations

Neatly fit into the drainage connection the downspouts terminating in drainage lines and fill the joints with a portland cement mortar cap sloped away from the downspout.

### 3.2 PAINTING

Field-paint sheet metal for separation of dissimilar materials.

### 3.3 CLEANING

Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris, and scrub-clean. Free the exposed metal surfaces of dents, creases, waves, scratch marks, and solder or weld marks.

### 3.4 REPAIRS TO FINISH

Scratches, abrasions, and minor surface defects of finish may be repaired in accordance with the manufacturer's printed instructions and as approved. Repair damaged surfaces caused by scratches, blemishes, and variations of color and surface texture. Replace items which cannot be repaired.

### 3.5 FIELD QUALITY CONTROL

Establish and maintain a Quality Control Plan for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Remove work that is not in compliance with the contract and replace or correct. Include quality control, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.
- b. Verification that specified material is provided and installed.
- c. Inspection of sheet metalwork, for proper size(s) and thickness(es), fastening and joining, and proper installation.

#### 3.5.1 Procedure

Submit for approval prior to start of roofing work. Include a checklist of points to be observed. Document the actual quality control observations and inspections. Furnish a copy of the documentation to the Construction Daily Report.

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES

Sheet Metal Items	Zinc-Coated Steel, U.S. Std. Gage
Cover.....	24
Covering on minor flat, pitched or curved surfaces.....	-
Downspouts and leaders.....	24
Strainers, wire diameter or gage....	-
Flashings:	
Base.....	24
Cap (Counter-flashing)	26
Stepped.....	-
Sheets, smooth.....	24
Edge strip.....	-
Gutters:	
Gutter section.....	24
Continuous cleat.....	24
Reglets (c).....	-

TABLE II. SHEET METAL JOINTS  
 TYPE OF JOINT

Item Designation	Zinc-Coated Steel and Stainless Steel	Remarks
Flashings Base	One inch 3 inch lap for expansion joint	Fill each metal expansion joint with a joint sealing compound.
Reglets	Butt joint	Seal reglet groove with joint sealing compound.
Eave	One inch flat locked, cleated One inch loose locked, expansion joint cleated	Same as base flashing.
Stepped	3 inch lap	---
Edge strip	Butt	---
Gravel stops:		
Sheet, smooth	Butt with 1/4 inch space	Use sheet flashing backup plate.
Gutters	1.5 inch lap, riveted and soldered	

**SECTION 07 60 00**

**END OF SECTION 07 60 00**

**SECTION 07 92 00  
JOINT SEALANTS**

**PART 1 GENERAL**

**1.1 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publication as referred to within the text by the basic designation only. Use current applicable versions.

**ASTM INTERNATIONAL (ASTM)**

ASTM C 1311	Standard Specification for Solvent Release Agents
ASTM C 509	Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C 734	Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
ASTM C 919	Use of Sealants in Acoustical Applications
ASTM C 920	Standard Specification for Elastomeric Joint Sealants
ASTM D 1056 Expanded Rubber	Standard Specification for Flexible Cellular Materials - Sponge or
ASTM D 1667	Flexible Cellular Materials – Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D 217	Cone Penetration of Lubricating Grease
ASTM E 84 Materials	Standard Test Method for Surface Burning Characteristics of Building

**1.2 SUBMITTALS**

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sealants  
Primers  
Bond breakers  
Backstops

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). Provide a copy of the Material Safety Data Sheet for each solvent, primer or sealant material.

#### SD-07 Certificates

##### Sealant

Certificates of compliance stating that the materials conform to the specified requirements.

### 1.3 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 40 and 90 degrees F.

### 1.4 DELIVERY AND STORAGE

Deliver materials to the job site in unopened manufacturers' external shipping containers, with brand names, date of manufacture, color, and material designation clearly marked thereon. Label elastomeric sealant containers to identify type, class, grade, and use. Carefully handle and store materials to prevent inclusion of foreign materials or subjection to sustained temperatures exceeding 90 degrees F or less than 0 degrees F.

### 1.5 QUALITY ASSURANCE

#### 1.5.1 Compatibility with Substrate

Verify that each of the sealants are compatible for use with joint substrates.

#### 1.5.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

### 1.6 SPECIAL WARRANTY

Guarantee sealant joint against failure of sealant and against water penetration through each sealed joint for five years.

## PART 2 PRODUCTS

### 2.1 SEALANTS

Provide sealant that has been tested and found suitable for the substrates to which it will be applied.

#### 2.1.1 Interior Sealant

Provide ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT.

Location(s) sealant for the following: Color to be selected by Owner

- a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface-mounted equipment and fixtures, and similar items.
- b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.
- c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.
- d. Joints between edge members for acoustical tile and adjoining vertical surfaces.
- e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.
- f. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where nonplaner tile surfaces meet.
- g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.
- h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.

#### 2.1.2 Exterior Sealant

For joints in vertical surfaces, provide ASTM C 920, Type S or M, Grade NS, Class 25, Use NT.

For joints in horizontal surfaces, provide ASTM C 920, Type S or M, Grade P, Class 25, Use T.

4

Provide location(s) of sealant as follows: Color to be selected by Owner.

- a. Joints and recesses formed where frames Match adjacent and subsills of windows, doors, louvers, surface color and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.
- b. Joints between new and existing exterior masonry walls.
- c. Masonry joints where shelf angles occur.
- d. Expansion and control joints.

- e. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.
- f. Voids where items pass through exterior walls.
- g. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.
- h. Metal-to-metal joints where sealant is indicated or specified.
- i. Joints between ends of gravel stops, fascias, copings, and adjacent walls.

### 2.1.3 Floor Joint Sealant

ASTM C 920, Type S or M, Grade P, Class 25, Use T.

Provide location(s) of sealant as follows: Color to be selected by Owner.

- a. Seats of metal thresholds for exterior doors.
- b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.

### 2.1.4 Acoustical Sealant

Rubber or polymer-based acoustical sealant conforming to ASTM C 919 must have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84. Acoustical sealant must have a consistency of 250 to 310 when tested in accordance with ASTM D 217, and must remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C 734, and must be non-staining.

### 2.1.5 Preformed Sealant

Provide preformed sealant of polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealant capable of sealing out moisture, air and dust when installed as recommended by the manufacturer. At temperatures from minus 30 to plus 160 degrees F, the sealant must be non-bleeding and no loss of adhesion.

#### 2.1.5.1 Tape

Tape sealant: Provide cross-section dimensions as recommended by manufacturer.

#### 2.1.5.2 Bead

Bead sealant: Provide cross-section dimensions as recommended by manufacturer.

#### 2.1.5.3 Foam Strip

Provide foam strip of polyurethane foam; with cross-section dimensions as indicated. Provide foam strip capable of sealing out moisture, air, and dust when installed and compressed as recommended by the manufacturer. Service temperature must be minus 40 to plus 275 degrees F. Furnish untreated strips with adhesive to hold them in place. Do not allow adhesive to stain or bleed into adjacent finishes. Saturate treated strips with butylene waterproofing or impregnated with asphalt.

### 2.2 PRIMERS

Provide a nonstaining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

### 2.3 BOND BREAKERS

Provide the type and consistency recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

### 2.4 BACKSTOPS

Provide glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Provide 25 to 33 percent oversized backing for closed cell and 40 to 50 percent oversized backing for open cell material, unless otherwise indicated. Make backstop material compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

#### 2.4.1 Rubber

Conform to ASTM D 1056, Type 1, open cell, or Type 2, closed cell, Class A, round cross section for cellular rubber sponge backing.

#### 2.4.2 PVC

Conform to ASTM D 1667, Grade VO 12, open-cell foam, round cross section for Polyvinyl chloride (PVC) backing.

#### 2.4.3 Synthetic Rubber

Conform to ASTM C 509, Option I, Type I preformed rods or tubes for Synthetic rubber backing.

#### 2.4.4 Neoprene

Conform to ASTM D 1056, closed cell expanded neoprene cord Type 2, Class C, Grade 2C2 for Neoprene backing.

#### 2.4.5 Butyl Rubber Based

Provide Butyl Rubber Based Sealants of single component, solvent release, color as selected, conforming to ASTM C 1311.

#### 2.4.6 Silicon Rubber Base

Provide Silicon Rubber Based Sealants of single component, solvent release, color as selected, conforming to ASTM C 920, Non-sag, Type S, Grade NS, Class 25.

### 2.5 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer except for aluminum and bronze surfaces that will be in contact with sealant.

## PART 3 EXECUTION

### 3.1 SURFACE PREPARATION

Clean surfaces from dirt frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Remove oil and grease with solvent. Surfaces must be wiped dry with clean cloths. When resealing an existing joint, remove existing caulk or sealant prior to applying new sealant. For surface types not listed below, contact sealant manufacturer for specific recommendations.

#### 3.1.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finish work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue-free solvent.

#### 3.1.2 Aluminum or Bronze Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive just prior to sealant application. For removing protective coatings and final cleaning, use nonstaining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

### 3.1.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing. Remove laitance, efflorescence and loose mortar from the joint cavity.

### 3.1.4 Wood Surfaces

Keep wood surfaces to be in contact with sealants free of splinters and sawdust or other loose particles.

## 3.2 SEALANT PREPARATION

Do not add liquids, solvents, or powders to the sealant. Mix multicomponent elastomeric sealants in accordance with manufacturer's instructions.

## 3.3 APPLICATION

### 3.3.1 Joint Width-To-Depth Ratios

#### a. Acceptable Ratios:

JOINT WIDTH	JOINT DEPTH	
	Minimum	Maximum
For metal, glass, or other nonporous surfaces:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch	1/2 of width	Equal to width
For wood, concrete, masonry, stone:		
1/4 inch (minimum)	1/4 inch	1/4 inch
Over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
Over 1/2 inch to 2 inch	1/2 inch	5/8 inch
Over 2 inch.	(As recommended by sealant manufacturer)	

b. Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding is not required on metal surfaces.

### 3.3.2 Masking Tape

Place masking tape on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Remove masking tape within 10 minutes after joint has been filled and tooled.

### 3.3.3 Backstops

Install backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide a joint of the depth specified. Install backstops in the following locations:

a. Where indicated.

b. Where backstop is not indicated but joint cavities exceed the acceptable maximum depths specified in paragraph entitled, "Joint Width-to-Depth Ratios".

### 3.3.4 Primer

Immediately prior to application of the sealant, clean out loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

### 3.3.5 Bond Breaker

Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used, to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.

### 3.3.6 Sealants

Provide a sealant compatible with the material(s) to which it is applied. Do not use a sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the gun. Apply the sealant in accordance with the manufacturer's printed instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Make sealant uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply sealant, and tool smooth as specified. Apply sealer over the sealant when and as specified by the sealant manufacturer.

### 3.4 PROTECTION AND CLEANING

#### 3.4.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.

#### 3.4.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

a. Masonry and Other Porous Surfaces: Immediately scrape off fresh sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant manufacturer. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding.

b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent-moistened cloth.

**END OF SECTION 07 92 00**

**SECTION 08 15 00**  
**WINDOWS**

# Dual Action Window Opening Control Device (WOCD) Application / Aplicación de la placa de control de apertura de la ventana (WOCD) de doble accionamiento



for Andersen® 100 Series Single-Hung and Gliding Windows

para las ventanas de la serie 100 de guillotina simple y corredizas Andersen®

**Thank you for choosing Andersen. / Gracias por elegir Andersen.**

For questions call 1-888-888-7020. For more information and/or guides visit [andersenwindows.com](http://andersenwindows.com).

**Please leave the safety information sheet with the building owner and a copy with the occupant in the dwelling where the window opening control device will be installed.**

Si tiene alguna pregunta llame al 1-888-888-7020. Para obtener más información y/o guías, visite [andersenwindows.com](http://andersenwindows.com).

**Deje la hoja de información de seguridad con el propietario del edificio y una copia con el ocupante en la vivienda donde se instalará la placa de control de apertura de la ventana.**

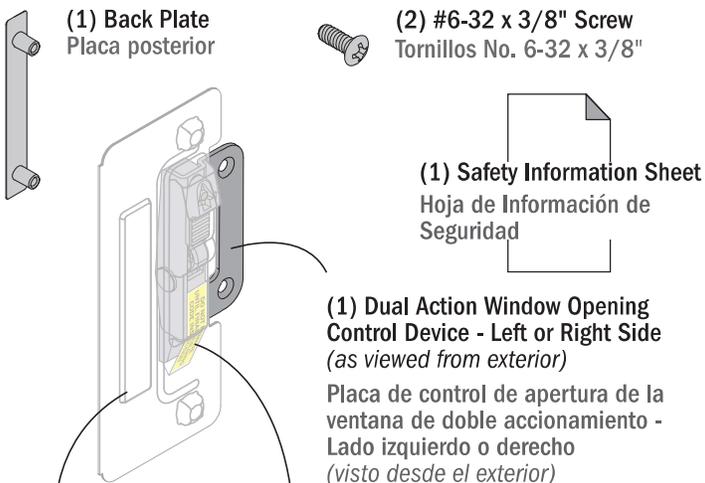
- **Consult building and fire codes for your jurisdiction before installing window opening control device. Contact local building code department or fire department for specific applicable codes.**

*Consulte los códigos de construcción y de incendios de su jurisdicción antes de instalar la placa de control de apertura de la ventana. Póngase en contacto con el departamento de códigos de construcción local o el departamento de bomberos para conocer los códigos específicos aplicables.*

- **Read guide from beginning to end before starting installation. Read all warnings and cautions during unit installation. Failure to follow these instructions may result in the window opening control device being ineffective in preventing accidental falls through an open window.**

*Lea completamente la guía antes de comenzar la instalación. Lea y respete todas las advertencias y precauciones durante la instalación de la unidad. Si no se siguen estas instrucciones, la placa de control de apertura de la ventana puede ser ineficaz para prevenir caídas por una ventana abierta.*

## Parts Included / Partes incluidas



**Protective Cover**  
Remove after construction.

**Cubierta Protectora**  
(retire después de la construcción).

**Inspection Label**  
Etiqueta de inspección

**DO NOT** remove inspection label until final building code official inspection.

No retire la etiqueta de inspección hasta que se realice la inspección oficial del código de construcción.

## Tools Needed / Herramientas Necesarias

- Safety Glasses / Lentes de seguridad
- Drill/Driver / Taladro/destornillador
- 1/16" Drill Bit / Broca para taladro de 1/16"
- 3/16" Drill Bit / Broca para taladro de 3/16"
- Pencil / Lápiz
- Tape Measure / Cinta métrica
- Phillips Screwdriver / Destornillador Phillips

*Instruction guide shown with window opening control device protective cover and inspection label removed for clarity.*

*Se muestra la guía de instrucciones con la cubierta protectora del dispositivo de control de apertura de la ventana y la etiqueta de inspección retirada para mayor claridad.*

- **For Single-Hung Window opening control device application, go to page 2.**  
**Para la aplicación de la placa de control de apertura de la ventana de guillotina simple, consulte la página 2.**
- **For Gliding Window opening control device application, go to page 6.**  
**Para la aplicación de la placa de control de apertura de la ventana corrediza, consulte la página 6.**

## IMPORTANT / IMPORTANTE

Window Opening Control Devices (WOCD) shall be installed such that the release mechanism is in conformance with local building and fire code requirements.

La Placa de control de apertura de la ventana (WOCD) deberá ser instalada de tal manera que el mecanismo de liberación cumpla con los códigos locales de construcción e incendio.

## ⚠ WARNING / ADVERTENCIA

Use caution when working at elevated heights and around window and door openings. Follow manufacturers' instructions for ladders and scaffolding. Failure to do so could result in injury or death.

Sea cauteloso al trabajar en lugares elevados y cerca de las aberturas de puertas y ventanas. Siga las instrucciones del fabricante para el uso de escaleras y/o andamios. De no hacerlo así, podrían producirse lesiones o la muerte.

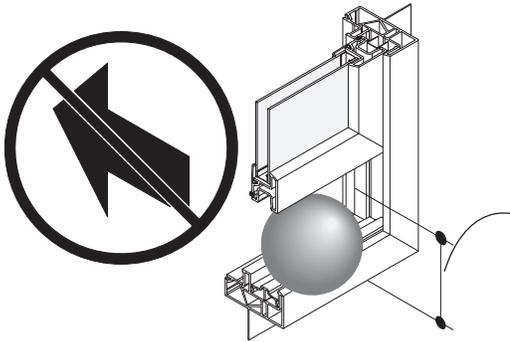
## ⚠ WARNING / ADVERTENCIA

Follow manufacturers' instructions for hand or power tools. Always wear safety glasses. Failure to do so could result in injury, product or property damage.

Siga las instrucciones del fabricante para el uso de herramientas manuales y eléctricas. Utilice siempre lentes de seguridad. De no hacerlo así, podrían producirse lesiones personales, daños al producto y/o a la propiedad.

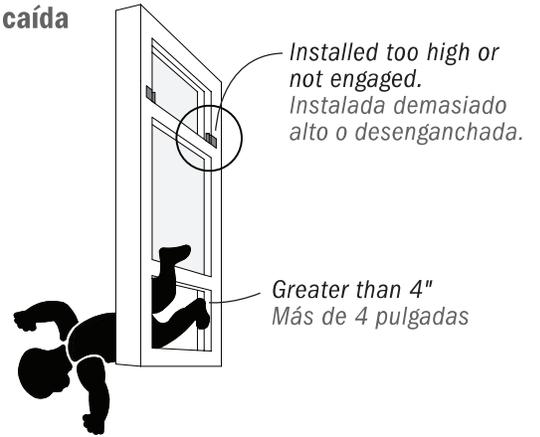
# ⚠ WARNING / ADVERTENCIA

## Possible Fall Hazard / Posible riesgo de caída



Less than 4" so that a rigid sphere can not pass through any space at the lowest opening portion in the window opening.

Menos de 4", de manera que una esfera rígida no pueda pasar a través de ningún espacio en la parte más baja de la apertura de la ventana.



Young children may fall out of the window if the opening control device is not installed correctly. Install the device so that a rigid 4.0 inch (102 mm) diameter sphere does not pass through any space at the lowest opening portion in the window opening after the window opening control device (WOCD) is in place and engaged.

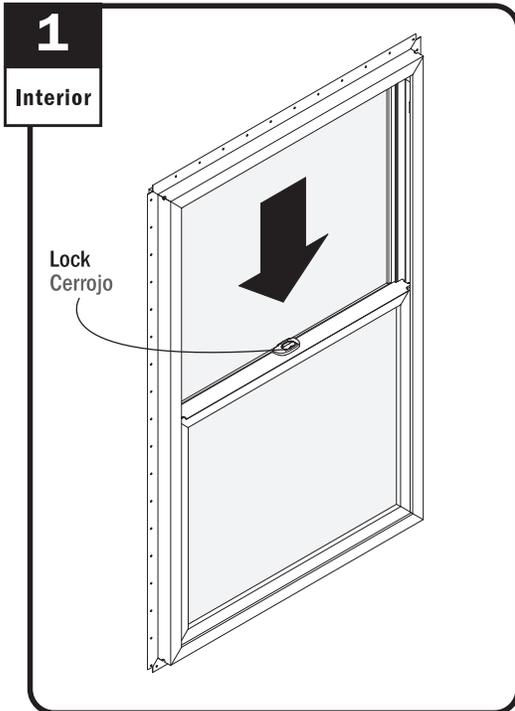
Los niños pequeños pueden caerse por la ventana si la placa de control de apertura no está instalada correctamente. Instale el dispositivo de manera tal que una esfera rígida de 4.0 pulgadas (102 mm) de diámetro no pase a través de ningún espacio en la parte más baja de la apertura de la ventana, después de que la placa de control de apertura de la ventana (WOCD) esté en su lugar y enganchada.

Young children may fall out of the window if all instructions are not followed:

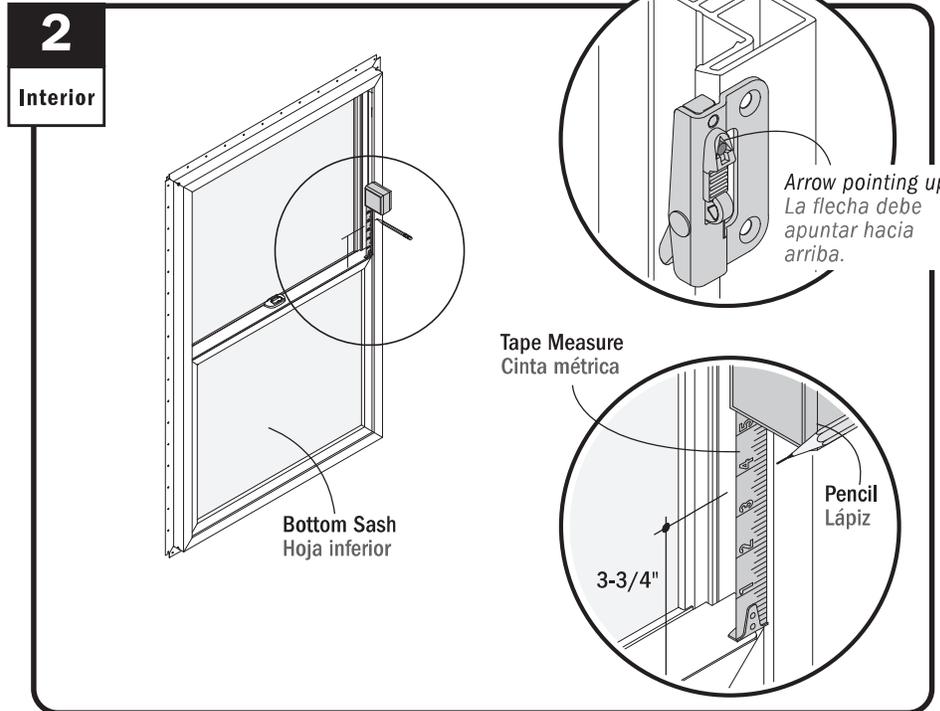
- Use recommended materials and techniques.
- Make sure the window opening control device is securely attached to the window as directed.
- Make sure that the window frame is in good condition.

Los niños pequeños pueden caerse por la ventana si no se siguen todas las instrucciones:

- Use los materiales y las técnicas recomendados.
- Asegúrese de que la placa de control de apertura de la ventana se encuentre ajustada firmemente a la ventana.
- Asegúrese de que el marco de la ventana se encuentre en buenas condiciones.



Close and lock window.  
Cierre y bloquee la ventana.

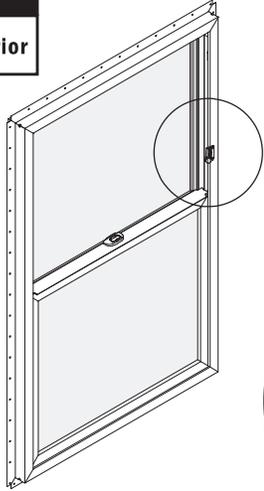


Verify correct side (left or right) to apply window opening control device. Measure up 3-3/4" from top of bottom sash meeting rail and mark on frame.  
Verifique el lado correcto (izquierda, derecha o ambos) para aplicar la placa de control de apertura de la ventana. Mida 3-3/4" desde la parte superior de la hoja inferior que se une con el riel y marque en el marco.

- ▶ Left side window opening control device installation shown in steps.
- ▶ Se muestran los pasos de la instalación de la placa de control de apertura de la ventana del lado izquierdo.

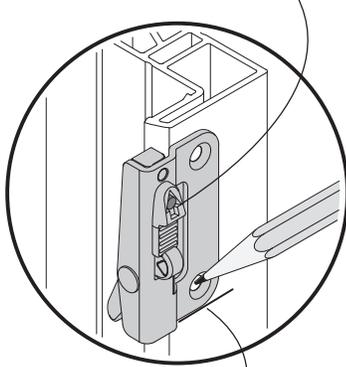
3

Interior



Window Opening Control Device  
Placa de control de apertura de la ventana

Arrow pointing up.  
La flecha debe apuntar hacia arriba.

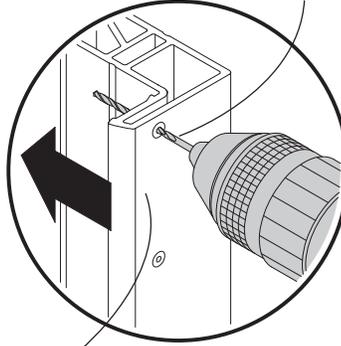


Pencil Mark  
Marca de lápiz

CAUTION / PRECAUCIÓN

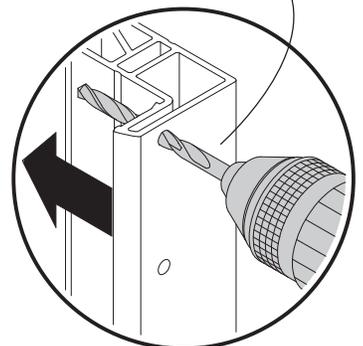
Drill through frame interior lip only.  
Taladre únicamente a través del borde interior del marco.

1/16" Drill Bit  
Broca para taladro de 1/16"



Frame Interior Lip  
Borde interior del marco

3/16" Drill Bit  
Broca para taladro de 3/16"

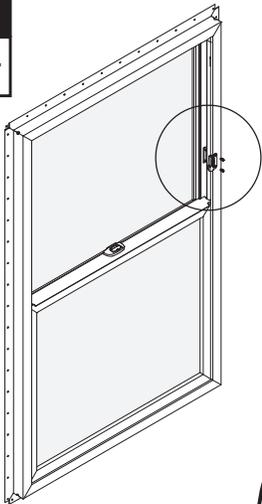


Position window opening control device tight to window frame with bottom edge on pencil mark (arrow pointing up). Mark hole locations and pre-drill 1/16" holes, as shown. Enlarge hole with a 3/16" drill bit. Remove drilling debris.

Coloque la placa de control de apertura de la ventana de manera firme contra el marco con el borde inferior sobre la marca de lápiz (la flecha debe apuntar hacia arriba). Marque las ubicaciones de los orificios y pretaladre orificios de 1/16", como se muestra. Agrande el orificio con una broca para taladro de 3/16". Retire los fragmentos de la perforación.

4

Interior



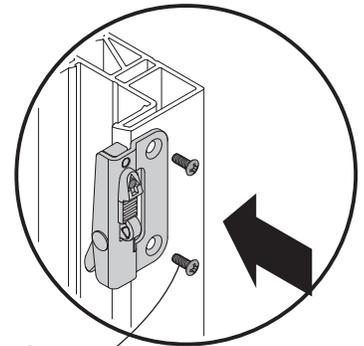
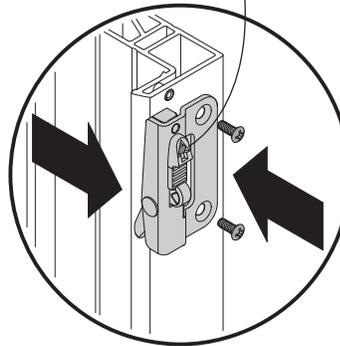
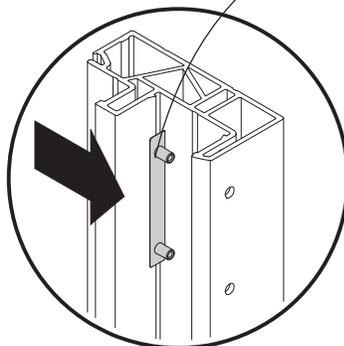
CAUTION / PRECAUCIÓN

Do not over drive screws. Product damage may result.  
No ajuste demasiado los tornillos.  
El producto se puede dañar.

Window Opening Control Device  
Placa de control de apertura de la ventana

Arrow pointing up.  
La flecha debe apuntar hacia arriba.

Back Plate  
Placa posterior



Screw  
Tornillo

Position back plate to frame as shown. Position window opening control device at hole locations and fasten with 2 screws.

Coloque la placa posterior en el marco, como se muestra. Coloque la placa de control de apertura de la ventana en las ubicaciones de los orificios y ajuste con 2 tornillos.

5

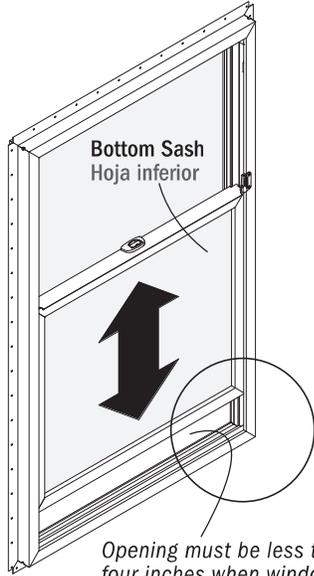
Interior

**⚠ WARNING / ADVERTENCIA**

This window opening control device is not a security device that provides intrusion protection. Esta placa de control de apertura de la ventana no es un dispositivo de seguridad que brinda protección contra intrusos.

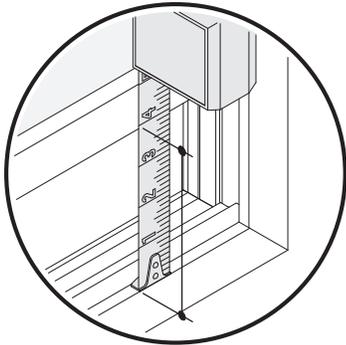
**IMPORTANT / IMPORTANTE**

Leave product safety information sheet behind for occupant. Esta hoja de información sobre la seguridad del producto debe ser entregada al ocupante de la vivienda.



Opening must be less than four inches when window opening control device is engaged.

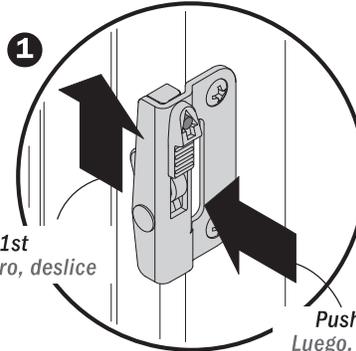
La apertura debe tener menos de cuatro pulgadas cuando la placa de control de apertura de la ventana está enganchada.



**To Disengage Dual Action Window Opening Control Device  
Para desenganchar la placa de control de apertura de la ventana de doble accionamiento**

1

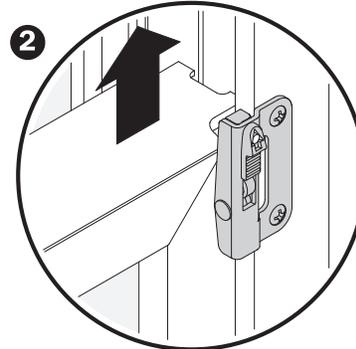
Slide 1st  
Primero, deslice



Push 2nd  
Luego, empuje

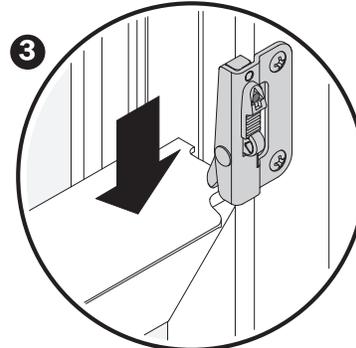
To fully open bottom sash, disengage window opening control device.  
Para abrir completamente la hoja inferior, desenganche la placa de control de apertura de la ventana.

2



Raise bottom sash  
Levante la hoja inferior

3



Lower bottom sash. Window opening control device resets automatically.  
Baje la hoja inferior. La placa de control de apertura de la ventana vuelve a su posición inicial automáticamente.

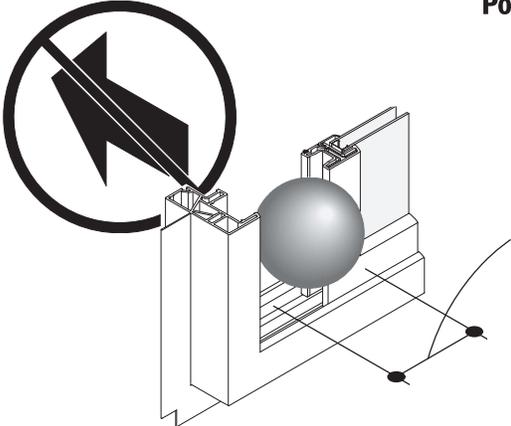
Verify correct window opening control device operation. Window opening control device should automatically re-engage when closing bottom sash. Clear opening must be less than 4 inches when window opening control device is engaged.

Verifique que la placa de control de apertura de la ventana funcione correctamente. Cuando la hoja inferior se cierra, la placa de control de apertura de la ventana debe volver a engancharse automáticamente. La apertura libre de obstáculos debe ser inferior a 4 pulgadas cuando la placa de control de apertura de la ventana está enganchada.

- ▶ Window opening control device application is complete.  
La aplicación de la placa de control de apertura de la ventana se ha completado.
- ▶ This window opening control device was tested to and complies with the requirements of ASTM F2090, versions 2008, 2010, 2013, and 2017.  
Esta placa de control de apertura de ventana fue probada y cumple con los requisitos de ASTM F2090, versiones 2008, 2010, 2013 y 2017.

# ! WARNING / ADVERTENCIA

## Possible Fall Hazard / Posible riesgo de caída



Less than 4" so that a rigid sphere can not pass through any space at the lowest opening portion in the window opening.  
Menos de 4", de manera que una esfera rígida no pueda pasar a través de ningún espacio en la parte más baja de la apertura de la ventana.



Greater than 4"  
Más de 4 pulgadas

Installed too far over.  
Instalada demasiado lejos.

Young children may fall out of the window if the opening control device is not installed correctly. Install the device so that a rigid 4.0 inch (102 mm) diameter sphere does not pass through any space at the lowest opening portion in the window opening after the window opening control device (W OCD) is in place and engaged.

Los niños pequeños pueden caerse por la ventana si la placa de control de apertura no está instalada correctamente. Instale el dispositivo de manera tal que una esfera rígida de 4.0 pulgadas (102 mm) de diámetro no pase a través de ningún espacio en la parte más baja de la apertura de la ventana, después de que la placa de control de apertura de la ventana (W OCD) esté en su lugar y enganchada.

Young children may fall out of the window if all instructions are not followed:

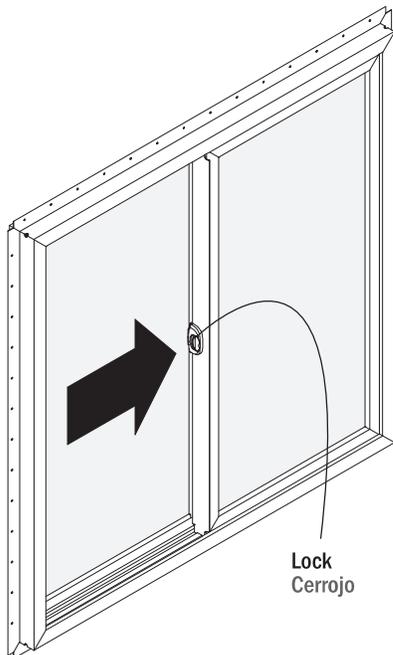
- Use recommended materials and techniques.
- Make sure the window opening control device is securely attached to the window as directed.
- Make sure that the window frame is in good condition.

Los niños pequeños pueden caerse por la ventana si no se siguen todas las instrucciones:

- Use los materiales y las técnicas recomendados.
- Asegúrese de que la placa de control de apertura de la ventana se encuentre ajustada firmemente a la ventana.
- Asegúrese de que el marco de la ventana se encuentre en buenas condiciones.

1

Interior

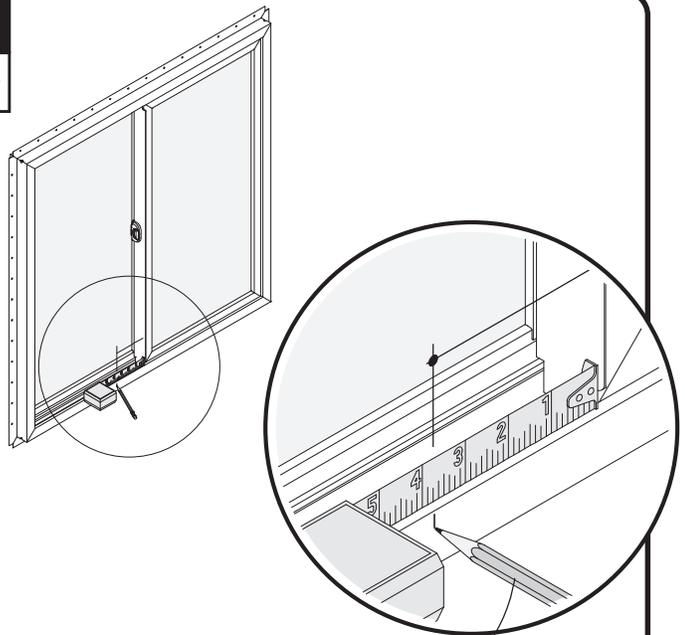


Lock  
Cerrojo

Close and lock window.  
Cierre y bloquee la ventana.

2

Interior



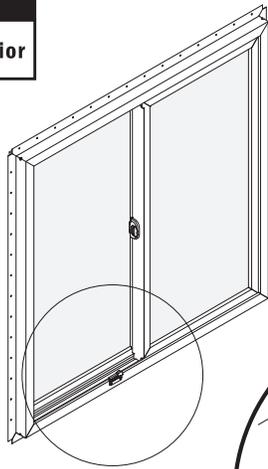
Pencil  
Lápiz

Measure over 3-3/4" from edge of operating sash meeting stile and mark as shown.  
Mida 3-3/4" desde el borde del montaje de la hoja operativa y realice una marca como se muestra.

- ▶ Active-stationary gliding window shown in steps.
- ▶ Se muestra en pasos la ventana corrediza activa-fija.

3

Interior



Window Opening Control Device  
Placa de control de apertura de la ventana

Arrow pointing away from venting sash.  
*La flecha no debe estar apuntando hacia la hoja de ventilación.*

1/16" Drill Bit  
Broca para taladro de 1/16"

3/16" Drill Bit  
Broca para taladro de 3/16"

Window Frame  
Marco de la ventana

Pencil  
Lápiz

Pencil Mark  
Marca de lápiz

Position window opening control device tight to window frame on pencil mark. Mark hole locations and pre-drill 1/16" holes, as shown. Enlarge holes with a 3/16" drill bit.

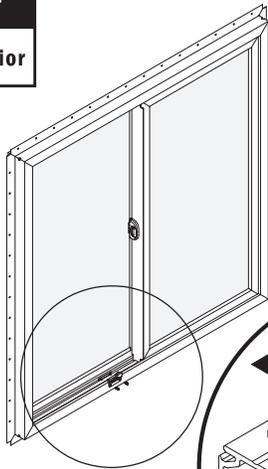
Coloque la placa de control de apertura de la ventana firme contra el marco de la ventana sobre la marca de lápiz. Marque las ubicaciones de los orificios y pretaladre orificios de 1/16", como se muestra. Agrande los orificios con una broca para taladro de 3/16".

4

Interior

**CAUTION / PRECAUCIÓN**

Do not over drive screws. Product damage may result.  
No ajuste demasiado los tornillos.  
El producto se puede dañar.



Back Plate  
Placa posterior

Window Opening Control Device  
Placa de control de apertura de la ventana

Screw  
Tornillo

Position back plate to frame as shown. Position window opening control device at hole locations and fasten with 2 screws.

Coloque la placa posterior en el marco, como se muestra. Coloque la placa de control de apertura de la ventana en las ubicaciones de los orificios y ajuste con 2 tornillos.

5

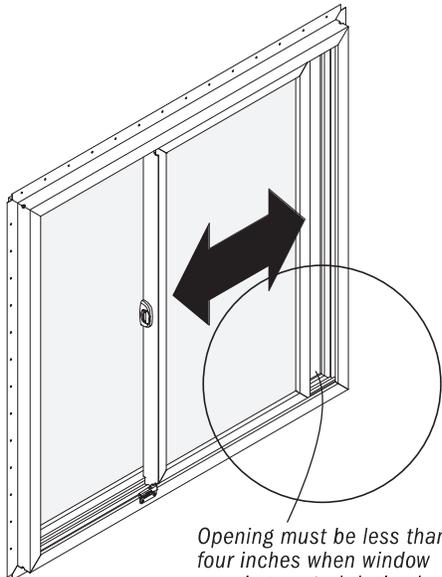
Interior

**⚠ WARNING / ADVERTENCIA**

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Esta placa de control de apertura de la ventana no es un dispositivo de seguridad que brinda protección contra intrusos.

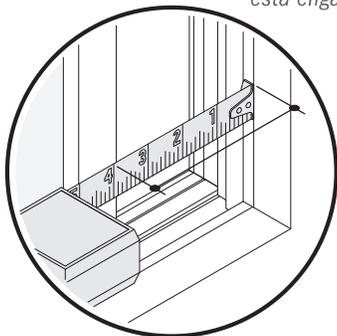
**IMPORTANT / IMPORTANTE**

Leave product safety information sheet behind for occupant.  
Esta hoja de información sobre la seguridad del producto debe ser entregada al ocupante de la vivienda.

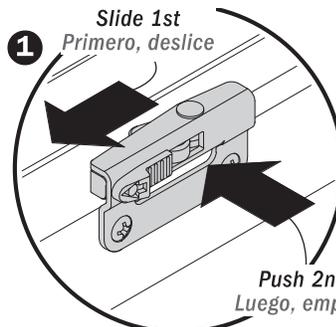


Opening must be less than four inches when window opening control device is engaged.

La apertura debe tener menos de cuatro pulgadas cuando la placa de control de apertura de la ventana está enganchada.



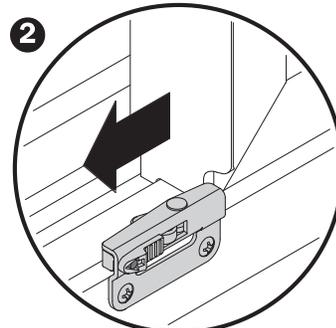
**To Disengage Dual Action Window Opening Control Device  
Para desenganchar la placa de control de apertura de la ventana de doble accionamiento**



Slide 1st  
Primero, deslice

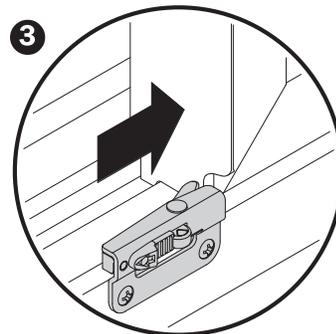
To fully open sash, disengage window opening control device.  
Para abrir completamente la hoja, desenganche la placa de control de apertura de la ventana.

Push 2nd  
Luego, empuje



2

Open sash  
Abra la hoja



3

Close sash. Window opening control device automatically resets.  
Cierre la hoja. La placa de control de apertura de la ventana vuelve a su posición inicial automáticamente.

Verify correct window opening control device operation. Window opening control device should automatically re-engage when operating sash is closed. Clear opening must be less than 4 inches when window opening control device is engaged.

Verifique que la placa de control de apertura de la ventana funcione correctamente. La placa de control de apertura de la ventana debe volver a engancharse automáticamente cuando se cierra la hoja operativa. La apertura libre de obstáculos debe ser inferior a 4 pulgadas cuando la placa de control de apertura de la ventana está enganchada.

- ▶ Window opening control device application is complete.

La aplicación de la placa de control de apertura de la ventana se ha completado.

- ▶ This window opening control device was tested to and complies with the requirements of ASTM F2090, versions 2008, 2010, 2013, and 2017.

Esta placa de control de apertura de ventana fue probada y cumple con los requisitos de ASTM F2090, versiones 2008, 2010, 2013 y 2017.

# Safety Data Sheet

Product Identifier: Andersen™ Sealant for Window and Door Installation

## \*\*\*Section 1 - IDENTIFICATION\*\*\*

### Product Identifier:

Andersen™ Sealant for Window & Door Installation - All colors

### Recommended Use

Adhesives/Sealant

### Restrictions on Use

None known.

### Manufacturer Information

Andersen Corporation  
100 4<sup>th</sup> Avenue North  
Bayport, MN 55003

Phone: (651) 264-5150  
Customer Service: (888) 888-7020  
Emergency # ChemTel 24/7 Domestic (800) 255-3924

## \*\*\*Section 2 - HAZARD(S) IDENTIFICATION\*\*\*

### Classification in accordance with 29 CFR 1910.1200.

Toxic to Reproduction, Category 2

Hazardous to the Aquatic Environment - Acute Hazard, Category 3

Hazardous to the Aquatic Environment - Chronic Hazard, Category 3

### GHS LABEL ELEMENTS

#### Symbol(s)



#### Signal Word

WARNING

#### Hazard Statement(s)

Suspected of damaging fertility or the unborn child.

Harmful to aquatic life with long lasting effects.

#### Precautionary Statement(s)

#### Prevention

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

Wear protective gloves/clothing and eye/face protection. Avoid release to the environment.

#### Response

If exposed or concerned: Get medical advice/attention.

#### Storage

Store locked up.

#### Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

## \*\*\*Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS\*\*\*

CAS	Component	Percent
1317-65-3	Limestone	30-55
471-34-1	Carbonic acid, calcium salt (1:1)	15-25
53306-54-0	1,2-Benzenedicarboxylic acid, bis (2-propylheptyl) ester	5-15

# Safety Data Sheet

Product Identifier: Andersen™ Sealant for Window and Door Installation

1760-24-3	N-[3-(Trimethoxysilyl) propyl]-1, 2-ethanediamine	0.5-2
13463-67-7	Titanium dioxide*(white and black only)	0.1-1
2768-02-7	Organosilane	0.1-1
818-08-6	Dibutyltin oxide	0.1-1
28553-12-0	Diisononyl phthalate	0.1-1
25973-55-1	UV Stabilizers	0.2-0.8
52829-07-9	(Bis (2,2,6,6-tetramethyl-4piperidyl) sebacate	0.2-0.8
1333-86-4	Carbon black*(white and black only)	0.01-0.09
	Misc color pigment blend	2-6

\*(White and black only)

## \*\*\*Section 4 - FIRST-AID MEASURES\*\*\*

### Description of Necessary Measures

#### Inhalation

IF INHALED: If breathing is difficult, remove person to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.

#### Skin Contact

IF ON SKIN: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.

#### Eye Contact

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

#### Ingestion

If a large amount is swallowed, get immediate medical attention.

### Most Important Symptoms/Effects

#### Acute

Skin irritation and eye irritation.

#### Delayed

Reproductive effects.

### Indication of Immediate Medical Attention and Special Treatment Needed, If Needed

Treat symptomatically and supportively.

## \*\*\*Section 5 - FIRE-FIGHTING MEASURES\*\*\*

### Suitable Extinguishing Media

Use carbon dioxide, regular dry chemical, regular foam or water.

### Unsuitable Extinguishing Media

None known.

### Special Hazards Arising from the Chemical

#### Hazardous Combustion Products

**Combustion:** Upon decomposition, this product emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.

### Special Protective Equipment and Precautions for Firefighters

May burn, but does not ignite readily.

### Fire Fighting Measures

Move material from fire area if it can be done without risk. Cool containers with water. Avoid inhalation of vapors or combustion by-products. Use extinguishing agents appropriate for surrounding fire. Dike for later disposal. Stay upwind and keep out of low areas.

# Safety Data Sheet

Product Identifier: Andersen™ Sealant for Window and Door Installation

## Protective Equipment and Precautions for Firefighters

Firefighters should wear full-face, self-contained breathing apparatus and impervious protective clothing. Firefighters should avoid inhaling any combustion products.

### \*\*\*Section 6 - ACCIDENTAL RELEASE MEASURES\*\*\*

## Personal Precautions, Protective Equipment and Emergency Procedures

Wear personal protective clothing and equipment, see Section 8. Keep unnecessary people away, isolate hazard area, and deny entry. Only personnel trained for the hazards of this material should perform clean up and disposal.

## Methods and Materials for Containment and Cleaning Up

Ventilate the area. Stop leak if possible without personal risk. Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Avoid release to the environment.

### \*\*\*Section 7 - HANDLING AND STORAGE\*\*\*

## Precautions for Safe Handling

Do not handle until all safety precautions have been read and understood. Do not breathe vapor or mist. Avoid contact with skin and eyes. Do not eat, drink, or smoke when using this product. Always wear recommended personal protective equipment. Wear personal protective clothing and equipment, see Section 8. Wash thoroughly after handling.

## Conditions for Safe Storage, including any Incompatibilities

Store and handle in accordance with all current regulations and standards. Keep container tightly closed. Keep separated from incompatible substances.

**Incompatibilities:** strong acids, strong oxidizing materials

### \*\*\*Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION\*\*\*

## Component Exposure Limits

### Limestone (1317-65-3)

**OSHA:** 15 mg/m<sup>3</sup> TWA (total dust); 5 mg/m<sup>3</sup> TWA (respirable fraction)  
**NIOSH:** 10 mg/m<sup>3</sup> TWA (total dust); 5 mg/m<sup>3</sup> TWA (respirable dust)  
**Mexico** 10 mg/m<sup>3</sup> TWA LMPE-PPT  
20 mg/m<sup>3</sup> STEL [LMPE-CT]

### Carbonic acid, calcium salt (1:1) (471-34-1)

**NIOSH:** 10 mg/m<sup>3</sup> TWA (total dust); 5 mg/m<sup>3</sup> TWA (respirable dust)

### Titanium dioxide (13463-67-7)

**ACGIH:** 10 mg/m<sup>3</sup> TWA  
**OSHA:** 15 mg/m<sup>3</sup> TWA (total dust)  
**Mexico** 10 mg/m<sup>3</sup> TWA LMPE-PPT (as Ti)  
20 mg/m<sup>3</sup> STEL [LMPE-CT] (as Ti)

### Dibutyl tin (818-08-6)

**ACGIH:** 0.1 mg/m<sup>3</sup> TWA (as Sn); 0.2 mg/m<sup>3</sup> STEL (as Sn)  
**NIOSH:** 0.1 mg/m<sup>3</sup> TWA (except Cyhexatin, as Sn)

### Carbon black (1333-86-4)

**ACGIH:** 3 mg/m<sup>3</sup> TWA (inhalable fraction)  
**OSHA:** 3.5 mg/m<sup>3</sup> TWA  
**NIOSH:** 3.5 mg/m<sup>3</sup> TWA; 0.1 mg/m<sup>3</sup> TWA (Carbon black in presence of Polycyclic aromatic hydrocarbons, as PAH)  
**Mexico** 3.5 mg/m<sup>3</sup> TWA LMPE-PPT  
7 mg/m<sup>3</sup> STEL [LMPE-CT]

## Appropriate Engineering Controls

Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

# Safety Data Sheet

Product Identifier: Andersen™ Sealant for Window and Door Installation

## Individual Protection Measures, such as Personal Protective Equipment

### Eyes/Face Protection

Wear splash resistant safety goggles with a face shield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

### Skin Protection

Wear appropriate chemical resistant clothing.

### Glove Recommendations

Wear appropriate chemical resistant gloves.

### Protective Materials

Nitrile.

### Respiratory Protection

Use an approved respirator if exposure limits are exceeded or if irritation develops or persists.

## \*\*\*Section 9 - PHYSICAL AND CHEMICAL PROPERTIES\*\*\*

<b>Physical State:</b>	Liquid	<b>Appearance:</b>	Paste
<b>Color:</b>	Various	<b>Physical Form:</b>	Paste
<b>Odor:</b>	Mild	<b>Odor Threshold:</b>	Not available
<b>pH:</b>	Not available	<b>Melting Point:</b>	Not available
<b>Boiling Point:</b>	Not available	<b>Decomposition:</b>	Not available
<b>Flash Point:</b>	>200 °F	<b>Evaporation Rate:</b>	Not available
<b>OSHA Flammability Class:</b>	Not available	<b>Vapor Pressure:</b>	Not available
<b>Vapor Density (air = 1):</b>	Not available	<b>Density:</b>	Not available
<b>Specific Gravity (water = 1):</b>	1.3-1.7	<b>Water Solubility:</b>	Slightly soluble
<b>Log KOW:</b>	Not available	<b>Coeff. Water/Oil Dist:</b>	Not available
<b>KOC:</b>	Not available	<b>Auto Ignition:</b>	Not available
<b>Viscosity:</b>	Not available	<b>VOC:</b>	Not available
<b>Volatility:</b>	Not available	<b>Molecular Formula:</b>	Not available

## \*\*\*Section 10 - STABILITY AND REACTIVITY\*\*\*

### Reactivity

No reactivity hazard is expected.

### Chemical Stability

Stable at normal temperatures and pressure.

### Possibility of Hazardous Reactions

Will not polymerize.

### Conditions to Avoid

Avoid heat, flames, sparks and other sources of ignition. Avoid contact with incompatible materials.

### Incompatible Materials

Strong acids, strong oxidizing materials

### Hazardous Decomposition Products

Upon decomposition, this product emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.

### Hazardous Decomposition

**Combustion:** Upon decomposition, this product emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.

# Safety Data Sheet

Product Identifier: Andersen™ Sealant for Window and Door Installation

## \*\*\*Section 11 - TOXICOLOGICAL INFORMATION\*\*\*

### Acute Toxicity

#### Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following selected endpoints are published:

##### **Carbonic acid, calcium salt (1:1) (471-34-1)**

Oral LD50 Rat 6450 mg/kg

##### **Titanium dioxide (13463-67-7)**

Oral LD50 Rat >10000 mg/kg

##### **Dibutyltin oxide (818-08-6)**

Oral LD50 Rat 44.9 mg/kg

##### **(Bis (2,2,6,6-tetramethyl-4piperidyl) sebacate (52829-07-9)**

Inhalation LC50 Rat 500 mg/m<sup>3</sup> 4 h

### Information on Likely Routes of Exposure

#### Inhalation

May be harmful if inhaled.

#### Ingestion

May be harmful if swallowed.

#### Skin Contact

May cause irritation of the skin. May cause redness, itching and burning.

#### Eye Contact

May cause irritation of the eyes. Contact may cause tearing, redness, a stinging or burning feeling, swelling, and blurred vision.

#### Immediate Effects

Skin irritation, eye irritation

#### Delayed Effects

No information is available.

#### Medical Conditions Aggravated by Exposure

Skin disorders, eye disorders

#### Irritation/Corrosivity Data

Causes skin, eye and respiratory irritation.

#### Respiratory Sensitization

No information available for the product.

#### Dermal Sensitization

No information available for the product.

#### Germ Cell Mutagenicity

No information available for the product.

#### Carcinogenicity

Results of a DuPont epidemiology study showed that employees who had been exposed to titanium dioxide pigments were at no greater risk of developing lung cancer than were employees who had not been exposed to titanium dioxide pigments. No pulmonary fibrosis was found in any of the employees and no associations were observed between titanium dioxide pigment exposure and chronic respiratory disease or lung abnormalities. Based on the results of this study, DuPont concluded that titanium dioxide pigment will not cause lung cancer or chronic respiratory disease in humans at concentrations experienced in the workplace.

# Safety Data Sheet

Product Identifier: Andersen™ Sealant for Window and Door Installation

## Component Carcinogenicity

### Titanium dioxide (13463-67-7)

**ACGIH:** A4 - Not Classifiable as a Human Carcinogen

**IARC:** Monograph 93 [2010]; Monograph 47 [1989] (Group 2B (possibly carcinogenic to humans))

**DFG:** Category 3A (could be carcinogenic for man, inhalable fraction with the exception of ultra small particles)

**OSHA:** Present

### Carbon black (1333-86-4)

**ACGIH:** A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

**IARC:** Monograph 93 [2010]; Monograph 65 [1996] (Group 2B (possibly carcinogenic to humans))

**DFG:** Category 3B (could be carcinogenic for man, inhalable fraction)

**OSHA:** Present

## Reproductive Toxicity

May damage fertility or the unborn child

## Specific Target Organ Toxicity - Single Exposure

No target organs identified.

## Specific Target Organ Toxicity - Repeated Exposure

No target organs identified.

## Aspiration Hazard

No information available for the product.

## \*\*\*Section 12 - ECOLOGICAL INFORMATION\*\*\*

### Ecotoxicity

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

### Component Analysis - Aquatic Toxicity

#### Diisononyl phthalate (28553-12-0)

**Fish:** 96 Hr LC50 Brachydanio rerio: >100 mg/L [semi-static]; 96 Hr LC50 Lepomis macrochirus: >0.14 mg/L [flow-through]; 96 Hr LC50 Lepomis macrochirus: >0.17 mg/L [static]; 96 Hr LC50 Pimephales promelas: >0.19 mg/L [flow-through]; 96 Hr LC50 Pimephales promelas: >0.14 mg/L [static]

**Algae:** 72 Hr EC50 Desmodesmus subspicatus: >500 mg/L; 96 Hr EC50 Pseudokirchneriella subcapitata: >1.8 mg/L [static]

**Invertebrate:** 48 Hr EC50 Daphnia magna: >500 mg/L; 48 Hr EC50 Daphnia magna: >0.06 mg/L [Static]

### Persistence and Degradability

No information available for the product.

### Bioaccumulation

No information available for the product.

### Mobility

No information available for the product.

### Biodegradation

No information available for the product.

## \*\*\*Section 13 - DISPOSAL CONSIDERATIONS\*\*\*

### Disposal Methods

Dispose in accordance with all applicable federal, state/regional and local laws and regulations.

### Disposal of Contaminated Packaging

Dispose of properly. Recycle if possible.

### Component Waste Numbers

The U.S. EPA has not published waste numbers for this product's components.

# Safety Data Sheet

**Product Identifier: Andersen™ Sealant for Window and Door Installation**

<b>***Section 14 - TRANSPORT INFORMATION***</b>
---

**US DOT Information**

Not regulated as a hazardous material.

**TDG Information**

Not regulated as dangerous goods.

<b>***Section 15 - REGULATORY INFORMATION***</b>
--

**U.S. Federal Regulations**

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 311/312 (40 CFR 370.21), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), or require an OSHA process safety plan.

**Acute Health: No Chronic Health: Yes Fire: No Pressure: No Reactive: No**

**U.S. State Regulations**

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
Limestone	1317-65-3	No	Yes	Yes	Yes	Yes
Titanium dioxide	13463-67-7	No	Yes	Yes	Yes	Yes
Carbon black	1333-86-4	Yes	Yes	Yes	Yes	Yes

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

**Component Analysis - Inventory**

Component	CAS	US	CA	EU	AU	PH	JP	KR	CN	NZ
Limestone	1317-65-3	Yes	NSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Carbonic acid, calcium salt (1:1)	471-34-1	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
1,2-Benzenedicarboxylic acid, bis(2-propylheptyl)ester	53306-54-0	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
N-[3-(Trimethoxysilyl)propyl]-1,2-ethanediamine	1760-24-3	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Titanium dioxide	13463-67-7	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Organosilane	2768-02-7	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Dibutyltin oxide	818-08-6	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
(Bis(2,2,6,6-tetramethyl-4piperidyl)sebacate	52829-07-9	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
UV Stabilizers	25973-55-1	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Carbon black	1333-86-4	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes

<b>***Section 16 - OTHER INFORMATION***</b>
---

**Summary of Changes**

New SDS: 1.00

# Safety Data Sheet

**Product Identifier: Andersen™ Sealant for Window and Door Installation**

## Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSL - Domestic Substances List; EEC - European Economic Community; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IMDG - International Maritime Dangerous Goods; JP - Japan; Kow - Octanol/water partition coefficient; KR - Korea; LEL - Lower Explosive Limit; LOLI - List Of Lists™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PH - Philippines; RCRA - Resource Conservation and Recovery Act; RID - European Rail Transport; RTECS - Registry of Toxic Effects of Chemical Substances®; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act; TWA - Time Weighted Average; UEL - Upper Explosive Limit; US - United States

## Other Information

The information contained herein is based on data considered accurate which has been obtained from other companies and organizations.

End of Sheet

# Limited Warranty

100 SERIES

**OWNER2OWNER  
LIMITED WARRANTY**

Para ver la versión, en español, de esta Garantía limitada y Proceso de resolución de controversias, visite [andersenwindows.com](http://andersenwindows.com)

## LIMITED WARRANTY AND DISPUTE RESOLUTION PROCESS

**IMPORTANT:** Please carefully read the Dispute Resolution Process that appears in this document after the Limited Warranty. The Dispute Resolution Process includes class action and jury trial waivers that affect your legal rights. To opt out of these waivers, you must visit our website at [www.andersenwindows.com/optout](http://www.andersenwindows.com/optout) and complete the opt-out form within one year from the date of purchase of your Andersen® products from a dealer or retailer. The opt-out only applies to the terms of the Dispute Resolution Process.

## 100 Series Windows & Doors Limited Warranty

### Transferable Limited Warranty on Glass

The glass in Andersen® 100 Series factory glazed window and door units (including dual-pane glass, Low-E glass, SmartSun™ glass, HeatLock® glass, PassiveSun® glass, patterned glass (including obscure, fern, reed and cascade designs), Finelight™ grilles, and tempered versions of these glass options) is warranted to be free from defects in manufacturing, materials and workmanship for twenty (20) years from the date of purchase from the retailer/dealer. It is also warranted not to develop, under normal conditions, any material obstruction of vision resulting from manufacturing defects or as a result of premature failure of the glass or organic seal for twenty (20) years from the date of purchase from the retailer/dealer. Patterned glass (including obscure, fern, reed and cascade designs) is warranted not to develop, under normal conditions, any material change in appearance resulting from manufacturing defects or as a result of premature failure of the glass or organic seal for twenty (20) years from the date of purchase from the retailer/dealer. This limited warranty on glass does not apply to special order glazings, impact-resistant glass or glass that is not factory installed by Andersen.

In the event a glass failure occurs as a result of a defect in manufacturing, materials or workmanship within the limited warranty period, Andersen, at its option, will: (1) provide the appropriate replacement glass product to the Andersen retailer/dealer you specify — labor is not included; or (2) provide a factory-authorized repair to the existing glass at no cost to you; or (3) refund the original purchase price. Such replacement parts or repairs are warranted for the remainder of the original limited warranty period.

### Transferable Limited Warranty on Components Other Than Glass

Non-glass portions of Andersen® 100 Series windows and doors (including non-electric operators, locks, lifts, balance systems, hinges, handles, insect screens, weatherstripping, exterior trim, sash and frame members) are warranted to be free from defects in manufacturing, materials and workmanship for a period of ten (10) years from the date of purchase from the retailer/dealer. This limited warranty does not apply to finishes on bright brass and satin nickel hardware.

In the event a component other than glass fails as a result of a defect in manufacturing, materials or workmanship within the limited warranty period, Andersen, at its option, will: (1) provide replacement parts to the Andersen retailer/dealer you specify — labor is not included; or (2) provide a factory authorized repair to the existing component at no cost to you; or (3) refund the original purchase price. Such replacement parts or repairs are warranted for the remainder of the original limited warranty period.

### Transferable Limited Warranty on Exterior Color Finish

The color finish on the Fibrex® material exterior components (frame, sash, panel, window sills and grilles) on Andersen® 100 Series casement, awning, single-hung, gliding, picture, transom windows, specialty windows and patio doors is warranted not to flake, blister, crack, peel, pit, corrode, or lose adhesion for a period of ten (10) years from the date of purchase from the retailer/dealer.

The color finish on the Fibrex® material exterior components (frame, sash, panel, window sills and grilles) on Andersen 100 Series casement, awning, single-hung, gliding, picture, and transom windows, and patio doors is warranted to be free from manufacturing defects resulting in color fade greater than 5 delta E\* (when measured in accordance with ASTM D2244) for a period of ten (10) years from the date of purchase from the retailer/dealer.

What is not covered by this exterior color finish warranty: weatherstripping, accessories and hardware, including insect screen frames, patio door sills, hinges, handles, trim sets and lock components, exterior trim profiles and exterior aluminum coil stock.

In the event there is a defect covered by this limited warranty for exterior color finish within the limited warranty period, Andersen, at its option, will: 1) refinish the product - labor is included (the finish will be applied with standard commercial refinishing techniques and may not be the same finish as originally applied to the product), 2) repair the product, 3) provide replacement part(s) or product(s) to the Andersen retailer/dealer you specify - labor is not included or 4) refund the original purchase price. Such replacement parts or repairs are warranted for the remainder of the original limited warranty period.

\*Technical measurement of color fade

### No Other Warranties or Representations

**THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ALL WARRANTIES ARE LIMITED TO THE APPLICABLE STATUTE OF LIMITATIONS BUT IN NO CASE WILL EXTEND BEYOND THE LIMITED WARRANTY PERIODS SPECIFIED ABOVE. ANDERSEN EXCLUDES AND WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER ARISING OUT OF CONTRACT, TORT OR OTHERWISE. THE REMEDY OF REPAIR, REPLACEMENT OR REFUND OF THE ACTUAL PURCHASE PRICE OF THE PRODUCT PROVIDED BY THIS LIMITED WARRANTY IS THE EXCLUSIVE REMEDY WITH RESPECT TO ANY AND ALL LOSS OR DAMAGE.**

### Applicable Law

This Limited Warranty is only applicable in the U.S.A. (i.e. the fifty states and the District of Columbia). This Limited Warranty gives you specific legal rights, and you may also have other rights which may vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages or limitation of the duration of an implied warranty, so the above limitations or exclusions may not apply to you. If any specific term of this Limited Warranty is prohibited by any applicable law, it shall be null and void, but the remainder of this Limited Warranty shall remain in full force and effect.

### What is NOT covered by this Limited Warranty

In addition to any other limitations or exclusions in this Limited Warranty, Andersen shall have no obligation for product failure, damage or costs due to or related to the following:

- Product modifications or glass shading devices (e.g., glass tinting, security systems, improper painting or staining, insulated coverings, etc.).
- Units improperly assembled or improperly mulled by others.
- Failure due to the application of non Andersen hardware (e.g., locksets, trim sets, hinges, panic hardware, closers, etc.).
- Failure to properly install Andersen hardware.
- Adjustments or corrections due to improper installation.
- Improper installation or use, including use of a non-commercial door as a main entrance or exit door for a building other than a single-family residential unit or re-installing an Andersen window or door after it has been removed from a building and re-sold and/or re-installed in a different building.
- Exposure to conditions beyond published performance specifications.
- Water infiltration other than as a result of a defect in manufacturing, materials or workmanship.

- Condensation.
- Improper maintenance, such as use of brickwash, razor blades, sealants, sanding or improper washing.
- Chemicals or airborne pollutants, such as salt or acid rain.
- Delivery by others.
- Accidents.
- Acts of God.
- Normal wear and tear.

### Additional items excluded from this Limited Warranty:

- Labor to replace sash or door panels, glass or other components.
- Labor and other costs related to the removal and disposal of defective product.
- Labor and materials to paint or stain any repaired or replaced product, component, trim or other carpentry work that may be required.
- Products not manufactured by Andersen.
- Slight glass curvature, minor scratches or other imperfections in the glass that do not impair structural integrity or significantly obscure normal vision.
- Rattling of grille bars within an air space.
- Insects passing through or around the insect screen.
- Tarnish or corrosion to hardware finishes.
- Special glazings. Contact us concerning the limited warranty on special glazings.
- Bright brass and satin nickel finishes on hardware.
- Service trips to provide instruction on product use.
- Other product series, some products, and accessories have their own limited warranties and are not covered by this limited warranty. Visit [www.andersenwindows.com/warranty](http://www.andersenwindows.com/warranty) for more information.

### How to register your Owner-To-Owner® Limited Warranty

Andersen offers quick, easy warranty registration on our website. Just go to [www.andersenwindows.com/warranty](http://www.andersenwindows.com/warranty) and submit your warranty information online. All warranty information is treated confidentially and will not be sold or traded to any person or organization outside of Andersen and the Andersen Dealer Network.



### Warranty Claim Procedure

To make a claim under this Limited Warranty, contact the Andersen retailer/dealer who sold you your Andersen® product. Or, you may contact us at:

Andersen Windows, Inc./Andersen Service Center  
100 Fourth Avenue North  
Bayport, MN 55003-1096

You may also contact us using the Parts & Service section of our website at [www.andersenwindows.com](http://www.andersenwindows.com) or reach us by phone at 1-888-888-7020.

### You can help us serve you faster by collecting and including the following important information:

- Description of the product such as the exterior color, unit type and size and inside visible glass measurements.
- Product ID label information.
- Glass logo information etched in the inside corner of the glass.
- Description of product concerns.
- Documentation of the purchase date, if available.
- Your name, address (with zip code) where the product is installed and telephone numbers.

### Non-Warranty Repair

You will be responsible for all costs related to any repair that is not covered by this Limited Warranty or which is outside of the limited warranty period. When warranty

coverage is unclear, Andersen may charge an inspection fee for any on-site product inspection. If the inspector determines the Andersen® product has a defect covered by this Limited Warranty, the inspection fee will be waived.

For specific warranty information outside the United States, please contact your local distributor or write to:

Andersen Windows, Inc./International Division  
100 Fourth Avenue North  
Bayport, MN 55003-1096 USA

## DISPUTE RESOLUTION PROCESS

### General

If you are dissatisfied with the remedy provided to you under the Limited Warranty set forth above or have any other claim against Andersen related to your Andersen® products, you and Andersen agree to resolve the claim using the following process ("Dispute Resolution Process"). This Dispute Resolution Process will apply to claims of any nature relating to your Andersen product ("Dispute(s)"). Disputes include, but are not limited to, claims for breach of contract or breach of warranty, claims for violation of state or federal laws or regulations, claims based in tort, negligence or product liability, claims based in fraud or fraud in the inducement, marketing or advertising claims and claims related to the enforceability or effect of any term of the Limited Warranty or the Dispute Resolution Process, including, but not limited to, the waivers of class action and jury trials.

### Notice Required

To assert a Dispute, you must first provide Andersen with written notice. A Notice of Dispute form is available for your use on Andersen's website at [www.andersenwindows.com/noticeofdispute](http://www.andersenwindows.com/noticeofdispute).

### Andersen Response

Andersen will have 60 days from receipt of your Notice of Dispute to respond to you in writing. In that response or at any later time, Andersen may make one or more written offers to you to resolve your Dispute.

### No Class Action or Jury Trials

**YOU AGREE THAT YOU MAY ASSERT DISPUTES AGAINST ANDERSEN ONLY ON AN INDIVIDUAL BASIS AND NOT AS A PLAINTIFF OR CLASS MEMBER IN ANY CLASS OR REPRESENTATIVE ACTION OR PROCEEDING. AS PART OF THIS DISPUTE RESOLUTION PROCESS, YOU AND ANDERSEN ALSO AGREE TO WAIVE ANY RIGHT TO A JURY AND AGREE TO HAVE ALL DISPUTES HEARD AND DECIDED SOLELY BY THE FEDERAL OR STATE COURT JUDGE.**

### Opt-Out Procedure

You may opt out of this Dispute Resolution Process by completing and submitting a written Opt-Out Notice. The Opt-Out Notice is located on Andersen's website at [www.andersenwindows.com/optout](http://www.andersenwindows.com/optout). Whether or not you opt out of the Dispute Resolution Process, all terms of the Limited Warranty set forth above remain in force and effect.

### Applicable Law and Severability

This Dispute Resolution Process, including, but not limited to, issues related to its enforceability and effect, will be governed by the laws of the State of Minnesota without regard to conflict of law principles. If any term of this Dispute Resolution Process is found to be invalid or unenforceable in any particular jurisdiction, that term will not apply to that issue in that jurisdiction. Instead, that term will be severed with the remaining terms continuing in full force and effect.

### Questions

If you have questions about the Dispute Resolution Process or Opt-Out Procedure, contact us at 844-332-7972.

**SECTION 09 29 00**  
**GYPSUM BOARD**

PART 1 GENERAL

1.1 REFERENCES

1.1.1 General Requirements

The publications listed below form a part of this specification to the extent referenced. The publication as referred to within the text by the basic designation only. Use current applicable versions.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.11	Specifications for Interior Installations of Cementitious Backer Units
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ASTM INTERNATIONAL (ASTM)

ASTM C 1002	Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
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ASTM C 1047	Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
-------------	---

ASTM C 1177/ C 1177M	Standard Specification for Glass Mat Gyp Substrate for Use as Sheathing
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ASTM C 1178/C 1178M	Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel
---------------------	---

ASTM C 1396/ C1396M	Standard Specification for Gypsum Board
---------------------	---

ASTM C 475/C 475M	Joint Compound and Joint Tape for Finishing Gypsum Board
-------------------	--

ASTM C 840	Application and Finishing of Gypsum Board.
------------	--

ASTM C 954	Still Drill Screws for the Application of Gypsum Panel Products or Metal Plaster
------------	--

	Bases to Steel Studs from 0.033 in (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
ASTM C 1629/C 1629M	Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels
ASTM D 1037	Evaluating Properties of Wood-Base
ASTM D 1149	Standard Test Method for Rubber Deterioration – Surface Ozone Cracking in Chamber
ASTM D 2394	Simulated Testing of Wood and Wood-Base Finish Flooring
ASTM D 3273	Resistance to Growth of Mold on the Surface of Interior Coating in an Environmental Chamber
ASTM D 412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
ASTM D 5420	Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Strike Impacted by a Falling Weight
ASTM D 624	Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D136	Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
ASTM E 695	Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G 21	Determining Resistance of Synthetic Polymeric Materials to Fungi

GYPSUM ASSOCIATION (GA)

GA 214	Recommended Levels of Gypsum Board Finish
GA 216	Application and Finishing of Gypsum Panel Products
GA 253	Application of Gypsum Sheathing
GA 600	Fire Resistance Design Manual

UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	Fire Resistance Directory
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INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	International Building Code.
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1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Control Joints

SD-03 Product Data

Gypsum Bord

Cementitious backer units

Glass Mat Water-Resistant Gypsum Tile Backing Board

Glass Mat Covered or Reinforced Gypsum Sheathing

Glass Mat Covered or Reinforced Gypsum Sheathing Sealant

Glass Mat Gypsum Roof Board Sheathing

Impact Resistant Gypsum Board

Joint Treatment Materials

Accessories

Adhesives.

SD-07 Certifications

Asbestos Free Materials

SD-08 Manufacturer's Instructions

Material Safety Data sheets

SD-10 Operation and Maintenance Data

Manufacture maintenance instructions

Waste Management.

### 1.3 DELIVERY, STORAGE AND HANDLING

#### 1.3.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

#### 1.3.2 Storage

Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation. Store per manufacturer's recommendations for allowable temperature and humidity range. Gypsum wallboard shall not be stored with materials which have high emissions of volatile organic compounds (VOCs) or other contaminants. Do not store panels near materials that may off gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

#### 1.3.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

## 1.4 ENVIRONMENTAL CONDITIONS

### 1.4.1 Temperature

Maintain a uniform temperature of not less than 50 degrees F in the structure for at least 48 hours prior to, during, and following the application of gypsum board, cementitious backer units, and joint treatment materials, or the bonding of adhesives.

### 1.4.2 Exposure to Weather

Protect gypsum board and cementitious backer unit products from direct exposure to rain, snow, sunlight, and other extreme weather conditions.

### 1.4.3 Temporary Ventilation

Provide temporary ventilation for work of this section.

## 1.5 QUALIFICATIONS

Furnish type of gypsum board work specialized by the installer with a minimum of 5 years of documented successful experience.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, gypsum backing board types, cementitious backing units, and joint treating materials manufactured from asbestos free materials only. Submit Material Safety Data Sheets and manufacturer maintenance instructions for gypsum materials including adhesives.

#### 2.1.1 Gypsum Board

ASTM C 1396/C 1396M. Gypsum board shall contain a minimum of 10 percent post-consumer recycled content, or a minimum of 40 percent post-industrial recycled content. Paper facings shall contain 100 percent post-consumer recycled paper content. Gypsum cores shall contain a minimum of 95 percent post-industrial recycled gypsum content.

##### 2.1.1.1 Regular

Provide Type X instead.

2.1.1.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.2 Gypsum Backing Board

ASTM C 1396/C 1396M, gypsum backing board shall be used as a base in a multilayer system.

2.1.2.1 Regular

Provide Type X instead.

2.1.2.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, square edges.

2.1.3 Regular Water-Resistant Gypsum Backing Board

ASTM C 1396/C 1396M

2.1.3.1 Regular

Provide Type X instead.

2.1.3.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.4 Glass Mat Water-Resistant Gypsum Tile Backing Board

ASTM C 1178/C 1178M

2.1.4.1 Regular

Provide Type X instead.

2.1.4.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, square edges.

2.1.5 Glass Mat Covered or Reinforced Gypsum Sheathing for Wall Construction

Exceeds physical properties of ASTM C 1396/C 1396M and ASTM C 1177/C 1177M.

Provide 5/8 inch, gypsum sheathing. Provide gypsum board of with a noncombustible water resistant core, with glass mat surfaces embedded to the gypsum core or reinforcing embedded throughout the gypsum core. Warrant gypsum sheathing board for at least twelve months against delamination due to direct weather exposure.

2.1.5.1 Glass Mat Covered or Reinforced Gypsum Sheathing Sealant Provide sealant compatible with gypsum sheathing, rubber washers for masonry veneer anchors, and other associated cavity wall components such as anchors and through wall flashing. Provide sealants for gypsum sheathing board edge seams and veneer anchor penetrations recommended by the gypsum sheathing manufacturer and have the following performance requirements:

- a. ASTM D 412: Tensile Strength, 80 psi
- b. ASTM D 412: Ultimate Tensile Strength (maximum elongation), 170 psi
- c. ASTM D 624: Tear Strength, dieB, 27 ppi
- d. ASTM D 1149: Joint Movement Capability after 14 Days cure, plus or minus 50 percent.

2.1.5.2 Glass Mat Gypsum Roof Board Sheathing

ASTM C 1177/C 1177M, 0 Flame Spread and 0 Smoke Developed when tested in accordance with ASTM E84, 500 psi, Class A, non-combustible, minimum 5/8 inch thick, 4 by 8 feet board size.

2.1.6 Impact Resistant Gypsum Board

48 inchwide, 5/8 inch thick, tapered edges. Reinforced gypsum panel with imbedded fiber mesh or lexan backing testing in accordance with the following tests. Hard body impact test must attain a Level 2 performance in accordance with ASTM C1629/C1629M. Provide fasteners that meet manufacturer requirements and specifications stated within this section. Impact resistant gypsum board, when tested in accordance with ASTM E84, have a flame spread rating of 25 or less and a smoke developed rating of 50 or less.

2.1.6.1 Structural Failure Test

ASTM E 695 or ASTM D 2394 for structural failure (drop penetration). ASTM E 695 using a 60 lb sand filled leather bag, resisting no less than 300 ft. lb. cumulative impact energy before failure or ASTM D 2394 using 5.5 inch hemispherical projectile resisting no less than 264 ft. lb. before failure. Provide test specimen stud spacing a minimum 16 inch on center.

2.1.6.2 Indentation Test

ASTM D 5420 or ASTM D 1037 for indentation resistance. ASTM D 5420 using a 32 oz weight with a 5/8 inch hemispherical impacting head dropped once 3 feet creating not more than 0.137 inch indentation or ASTM D 1037 using no less than 470 lb weight applied to the 0.438 inch diameter ball to create not more than a 0.0197 inch indentation depth.

### 2.1.7 Cementitious Backer Units

In accordance with the Tile Council of North America (TCNA) Handbook.

### 2.1.9 Joint Treatment Materials

ASTM C 475/C 475M. Use all purpose joint and texturing compound containing inert fillers and natural binders, including lime compound. Pre-mixed compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds.

#### 2.1.9.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners. 2.1.9.2 Finishing or Topping Compound Specifically formulated and manufactured for use as a finishing compound.

#### 2.1.9.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

#### 2.1.9.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

#### 2.1.9.5 Joint Tape

Use cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer

### 2.1.10 Fasteners

#### 2.1.10.1 Screws

ASTM C 1002, Type "G", Type "S" or Type "W" steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.033 inch thick. ASTM C 954 steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

#### 2.1.10.2 Staples

Not permitted. All fasteners shall be screws.

### 2.1.11 Adhesives

Do not use adhesive containing benzene, carbon tetrachloride, or trichloroethylene.

#### 2.1.11.1 Adhesive for Fastening Gypsum Board to Metal Framing

Not permitted.

#### 2.1.11.2 Adhesive for Laminating

Not permitted

#### 2.1.13 Accessories

ASTM C 1047. Fabricate from corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges shall be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

#### 2.1.14 Bullnose Corner Trim

Where indicated on the drawings, provide 1-1/2 inch radius bullnose trim. Aluminum trim shall be extruded alloy 6063 T5. Paint trim to match wall color.

#### 2.1.15 Water

Provide clean, fresh, and potable water.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

##### 3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Provide and install blocking, headers and supports in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious backer units.

#### 3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with ASTM C 840 or GA 216 and the requirements specified. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length; select panel sizes to minimize waste. Cut out gypsum board to make neat, close, and tight joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Lay out panels to minimize waste; reuse cutoffs whenever feasible. Surfaces of gypsum board and substrate members may not be bonded together with an adhesive. Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. 5/8 inch

gypsum or 5/8 inch ceiling board over framing at 16 inches on center. Provide type of gypsum board for use in each system specified herein as indicated.

### 3.2.1 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C 840, System VIII or GA 216.

### 3.2.2 Arches and Bending Radii

Apply gypsum board in accordance with ASTM C 840, System IX or GA 216.

### 3.2.3 Glass Mat Covered or Fiber Reinforced Gypsum Sheathing

Apply gypsum sheathing in accordance to gypsum association publications GA 253. Follow gypsum sheathing manufacturer's requirements of design details for joints and fasteners and be properly installed to protect the substrate from moisture intrusion. Do not leave exposed surfaces of the gypsum sheathing beyond the manufacturer's recommendation without a weather barrier cladding. Provide air barrier specified in Section 07 27 26 MEMBRANE AIR BARRIER SYSTEM over sheathing surface in shingle fashion with edges and ends lapped a minimum of 2 inches. Property flash the openings. Seal all joints, seams, and penetrations with a compatible moisture cure, medium modulus polymer sealant.

### 3.2.4 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with ASTM C 840, System XIII and GA 216. Control joints shall be located where described in GA 216, paragraphs 4.7.3.1 through 4.7.3.7. Fill control joints between studs in fire-rated construction with firesafing insulation to match the fire-rating of construction.

### 3.2.5 Application of Impact Resistant Gypsum Board

Apply in accordance with applicable system of ASTM C 840 as specified or GA 216. Follow manufacturers written instructions on how to cut, drill and attach board.

## 3.3 APPLICATION OF CEMENTITIOUS BACKER UNITS

### 3.3.1 Application

In wet areas (rooms with tubs or shower enclosures), apply cementitious backer units in accordance with ANSI A108.11. Apply minimum 0.02 inch thick self-curing liquid rubber polymer waterproofing membrane entirely to back face of cementitious backer units, or place a 15 lb asphalt impregnated continuous felt paper membrane behind cementitious backer units, between backer units and studs or base layer of gypsum board, with a minimum 6 inch overlap of sheets laid shingle style.

### 3.3.2 Joint Treatment

ANSI A108.11.

## 3.5 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with ASTM C 840, GA 214 and GA 216. Finish plenum areas above ceilings to Level 1 in accordance with GA 214. Finish water resistant gypsum backing board, ASTM C 1396/C 1396M, to receive ceramic tile to Level 2 in accordance with GA 214. Finish walls and ceilings to match existing adjacent. Tool joints as smoothly as possible to minimize sanding and dust. Do not use fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer. Protect workers, building occupants, and HVAC systems from gypsum dust.

### 3.5.1 Uniform Surface

Provide uniform surface to existing adjacent.

## 3.6 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units. Apply material with exposed surface flush with gypsum board or cementitious backer units.

## 3.7 FIRE-RESISTANT ASSEMBLIES

Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners, wall and ceiling framing in accordance with the specifications contained in UL Fire Resistance for the Design Number(s) indicated, or GA 600 for the File Number(s) indicated. Joints of fire-rated gypsum board enclosures shall be closed and sealed in accordance with UL test requirements or GA requirements. Seal penetrations through rated partitions and ceilings tight in accordance with tested systems.

## 3.8 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

## 3.10 WASTE MANAGEMENT

As specified in Waste Management Plan and as follows. Separate clean waste gypsum products from contaminants. Do not include wood, plastic, metal, asphalt-impregnated gypsum board, or any gypsum board coated with glass fiber, vinyl, decorative paper, or other finish. Place in designated area and protect from moisture and contamination.

**END OF SECTION 09 29 00**

**SECTION 10 14 01**  
**EXTERIOR SIGNAGE**

PART 1 GENERAL

1.1 REFERENCES

1.1.1 General Requirements

The publications listed below form a part of this specification to the extent referenced. The publication as referred to within the text by the basic designation only. Use current applicable versions.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z9.1 Safety Glazing Materials Used in Buildings –  
Safety Performance Specifications and  
Methods of Test.

AMERICAN WELDING SOCIETY (AWS)

AWS C1.1M/C1.1 Recommended Practices for Resistance  
Welding

AWS D1.1/D1.1M Structural Welding Code - Steel

AWS D1.2/D1.2M Structural Welding Code – Aluminum.

ASTM INTERNATIONAL (ASTM)

ASTM A1011/A1011M Standard Specification for Steel, Sheet, and  
Strip, Hot-Rolled, Carbon, Structural, High-  
Strength Low-Alloy and High-Strength Low-  
Alloy with Improved Formability and Ultra-  
High Strength

ASTM A123/A123M Standard Specification for Zinc (Hot-Dip  
Galvanized) Coatings on Iron and Steel  
Products

ASTM A36/A36M Standard Specification for Carbon Structural  
Steel.

ASTM A653/A653M Standard Specification for Steel  
Sheet, Zinc-Coated (Galvanized) or  
Zinc-Iron Alloy-Coated (Galvannealed) by the  
Hot-Dip Process

ASTM A924/A924M	Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B108/B108M	Standard Specification for Aluminum-Alloy Permanent Mold Casting
ASTM B209	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B26/B26M	Standard Specification for Aluminum-Alloy Sand Castings
ASTM B62	Standard Specification for Composition Bronze or Once Metal Castings.
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials.

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS  
(NAAMM)

NAAMM AMP 500	Metal Finishes Manual
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SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS3611	Plastic Sheet, Polycarbonate General Purpose.
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INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	International Building Code.
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## 1.2 GENERAL REQUIREMENTS

All exterior signage shall be provided by a single manufacturer. Exterior signage shall be of the design, detail, sizes, types, and message content shown on the drawings, shall conform to the requirements specified, and shall be provided at the locations indicated. Submit exterior signage schedule in electronic media with spread sheet format. Spread sheet shall include sign location, sign type, and message. Signs shall be complete with lettering, framing as detailed, and related components for a complete installation. Submit one section sample of each.

### 1.2.1 Wind Load Requirements

Exterior signage shall be designed to withstand Yuma, Arizona wind load requirements. Manufacturer to submit design analysis and supporting calculations performed in support of specified signage and in accordance with local jurisdiction guidelines.

## 1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings

SD-03 Product Data

Modular Exterior Signage System  
Installation  
Exterior Signage  
Wind Load Requirements

SD-04 Samples

Exterior Signage

SD-10 Operation and Maintenance Data

Protection and Cleaning

## 1.4 QUALIFICATIONS

Signs, plaques, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

## 1.5 DELIVERY AND STORAGE

Materials shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

## 1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

## PART 2 PRODUCTS

### 2.1 MODULAR EXTERIOR SIGNAGE SYSTEM

Exterior signage shall consist of a system of coordinated directional, identification, and regulatory type signs located where shown, as confirmed to As-Built conditions, and as approved by the government. Dimensions, details, materials, message content, illumination, mountings, and design of signage shall be as shown on the Exterior Wayfinding and Signage drawing sheets. Submit manufacturer's descriptive data and catalog cuts as required.

#### 2.1.1 Free-Standing Base Mount Pylon/Monolith Type Signs

##### 2.1.1.1 Framing

Interior framing shall consist of galvanized steel tube columns welded to companion plates. Perimeter framing shall consist of steel angle framing welded to the post and plate system as designed. Framing members shall be designed to permit access to electrical equipment and panel removal. Mounting shall be provided as shown. Framing members of steel shall be finished with semi-gloss baked enamel or two-component acrylic polyurethane. Openings shall be sealed from moisture and made tamper-proof.

##### 2.1.1.2 Exterior Sheeting Panels

Modular panels shall be provided in sizes shown on drawings. Panels shall be fabricated a minimum of 0.090 inch thick aluminum. Top and end panels shall be removable and shall be secured by 3/16 inch socket head jack nuts. Finish for metal panels shall be two-component acrylic polyurethane.

##### 2.1.1.3 Mounting

Mounting shall be as shown on the Exterior Wayfinding and Signage drawing sheets, and conform to the manufacturing and material references noted within this specification section.

##### 2.1.1.4 Finishes

Base finish shall be two-component acrylic polyurethane. Metal panel system finish shall be two component acrylic polyurethane, as shown.

### 2.1.2 Panel And Post/Panel Type Signs

#### 2.1.2.1 Posts

One-piece aluminum posts shall be provided with minimum 0.125 inch wall thickness. Posts shall be designed to accept panel framing system described. The post shall be designed to permit attachment of panel framing system without exposed fasteners. Caps shall be provided for each post.

#### 2.1.2.2 Panel Framing System

Panel framing consisting of aluminum sections and interlocking track components shall be designed to interlock with posts with concealed fasteners.

#### 2.1.2.3 Panels

Modular message panels shall be provided in sizes shown on drawings. Panels shall be fabricated a minimum of 0.090 inch aluminum. Panels shall be designed to be interchangeable. Panels with metal return sheeting shall have welded corners, ground smooth. Face panels shall be removable to provide access to electrical components.

#### 2.1.2.4 Finishes

Post finish shall be two-component acrylic polyurethane. Metal panel system finish shall be two component acrylic polyurethane, as shown.

#### 2.1.2.5 Mounting

Mounting should be according to manufacture instruction and Code requirements.

## 2.2 GRAPHICS FOR EXTERIOR SIGNAGE SYSTEMS

2.2.1 Graphics Refer to the manufacturing and material references and as per Owners direction.

- a. Aluminum letters shall be provided and fastened to the message panel with concealed fasteners.
- b. Pressure sensitive precision cut vinyl letters with reflecting surface shall be provided.
- c. Message shall be cut out from panel. Acrylic letters shall be projected through the cutout area and chemically welded to 0.125 inch thick acrylic backup sheet.

### 2.2.2 Messages

As approved by the Owner.

## 2.3 DIMENSIONAL BUILDING LETTERS

### 2.3.1 Fabrication

Letters shall be fabricated from 0.090 inch aluminum sheet. Letters shall be cleaned by chemical etching or cleaned ultrasonically in a special degreasing bath. Letters shall be packaged for protection until installation.

### 2.3.2 Mounting

Threaded studs of number and size as recommended by manufacturer, shall be used for concealed anchorage. Letters which project from the building line shall have stud spacer sleeves. Letters, studs, and sleeves shall be of the same material. Templates for mounting shall be supplied.

## 2.4 ALUMINUM ALLOY PRODUCTS

Aluminum alloy products shall conform to ASTM B209 for sheet or plate, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings. Aluminum extrusions shall be provided at least 1/8 inch thick and aluminum plate or sheet at least 16 gauge thick. Welding for aluminum products shall conform to AWS C1.1M/C1.1.

## 2.5 ORGANIC COATING

Surfaces shall be cleaned, primed, and given a two-component acrylic polyurethane finish in accordance with NAAMM AMP 500, AMP 505, with total dry film thickness not less than 1.2 mils.

## 2.6 STEEL PRODUCTS

Structural steel products shall conform to ASTM A36/A36M. Sheet and strip steel products shall conform to ASTM A1011/A1011M. Welding for steel products shall conform to AWS D1.2/D1.2M.

## 2.7 CAST BRONZE

Components shall be fabricated with sharp corners, flat faces, and accurate profiles. Burrs and rough spots shall be removed and polished. Faces shall be finished to a uniform high luster. Cast bronze shall be in accordance with ASTM B62.

## 2.8 VINYL SHEETING FOR GRAPHICS

Vinyl sheeting shall be 5 to 7 year premium type and shall be in accordance with the flammability requirements of ASTM E84 and shall be a minimum 0.003 inch film thickness. Film shall include a precoated pressure sensitive adhesive backing, Class 1, or positionable pressure sensitive adhesive backing, Class 3.

## 2.9 ACRYLIC SHEET

Acrylic sheet shall be in accordance with the flammability requirements of ASTM E84 and shall conform to ANSI Z97.1.

## 2.10 POLYCARBONATE SHEET

Polycarbonate sheet shall conform to SAE AMS3611.

## 2.11 ANCHORS AND FASTENERS

Exposed anchor and fastener materials shall be compatible with metal to which applied and shall match in color and finish and shall be non-rusting, non-corroding, and non-staining. Exposed fasteners shall be tamper-proof.

a. Sign components presented in this document are for design intent purposes only. Shop drawings, which shall be provided by the Sign Contractor, shall be used as the final construction documents and shall include construction, engineering and installation details required for implementing the designs described herein.

b. Details on drawings indicate design approach for sign structures but do not necessarily include fabricating details required for the complete structural integrity of signs. Engineering for structural integrity and a safe permanent installation shall be the sole responsibility of the Sign Contractor.

c. Sign Contractor is responsible for complete structural design of signs and to incorporate reasonable safety factors necessary to protect the Owner and Sign Contractor against public liability.

d. Sign Contractor will have a minimum of 5 years experience with Work comparable to Project requirements.

e. It is desirable that the Sign Contractor for work of this Section have, in-house, the broad knowledge, diverse shop and field experience, flexibility, coordinating ability, skilled craftsmen.

## 2.12 SHOP FABRICATION AND MANUFACTURE

### 2.12.1 Factory Workmanship

Work shall be assembled in the shop, as far as practical, ready for installation at the site. Work that cannot be shop assembled shall be given a trial fit in the shop to ensure proper field assembly. Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Welding to or on structural steel shall be in accordance with AWS D1.1/D1.1M. Welding shall be continuous along the entire area of contact. Exposed welds shall be ground smooth. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practical. Items specified to be galvanized shall be by hot-dip process after fabrication if practical. Galvanization shall be in accordance with ASTM A123/A123M and ASTM A653/A653M, as applicable. Other metallic coatings of steel sheet shall be in accordance with ASTM A924/A924M. Joints exposed to the weather shall be formed to exclude water. Drainage and weep holes shall be included as required to prevent condensation buildup.

#### 2.12.2 Dissimilar Materials

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of asphalt varnish or a coat of zinc-molybdate primer to prevent galvanic or corrosive action.

#### 2.12.3 Shop Painting

Surfaces of miscellaneous metal work, except nonferrous metal, corrosion resisting steel, and zinc-coated work, shall be given one coat of zinc-molybdate primer or an approved rust-resisting treatment and metallic primer in accordance with manufacturer's standard practice. Surfaces of items to be embedded in concrete shall not be painted. Upon completion of work, damaged surfaces shall be recoated.

### 2.13 COLOR, FINISH, AND CONTRAST

For buildings required to be handicapped-accessible, the characters and background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast with their background - either light characters on a dark background or dark characters on a light background.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Manufacturer shall locate sign units and accessories where shown or scheduled, using mounting methods of the type described and in compliance with the manufacturer's instructions. Exact locations for all signs are to be confirmed to As-Built conditions by Manufacturer prior to production. If site conditions are not as anticipated, Manufacturer is to immediately notify. Submit drawings showing elevations of each type of sign; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction.

Signs shall be installed plumb and true at mounting heights indicated, and by method shown on drawing sheets, or as recommended by manufacturer based on site conditions. Signs mounted on other surfaces shall not be installed until finishes on such surfaces have been completed. Submit manufacturer's installation instructions and cleaning instructions.

### 3.1.1 Anchorage

Anchorage and fastener materials shall be in accordance with approved manufacturer's instructions for the indicated substrate. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.

### 3.1.2 Protection and Cleaning

The work shall be protected against damage during construction. Hardware and electrical equipment shall be adjusted for proper operation. Glass, frames, and other sign surfaces shall be cleaned in accordance with manufacturer's instructions. After signs are completed and inspected, Cover all project identification, directional, and other signs which may mislead the public. Covering shall be maintained until instructed to be removed by the Contracting Officer or until the facility is to be opened for business. Submit two copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall include simplified diagrams for the equipment as installed. Signs shall be cleaned, as required, at time of cover removal.

### 3.1.3 Punch List and Backcheck

Contractor will coordinate on-site visits after installation to verify that the correct product was installed and that all items are in the appropriate locations.

**END OF SECTION 10 14 01**

**SECTION 31 00 00**  
**EARTHWORK**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Use current applicable versions.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION  
OFFICIALS (AASHTO)

AASHTO T 180 Standard Method of Test for Moisture-Density relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm 18-in.) Drop

AASHTO T 224 Standard Method of Test for Correction for Coarse Particles in the Soil Compaction Test

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C2 Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes

AWPA P5 Standard for Waterborne Preservatives

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances

ASTM INTERNATIONAL (ASTM)

ASTM A 139 Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)

ASTM A 252 Standard Specification for Welded and Seamless Steel Pipe Piles

ASTM C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

ASTM C 33 Standard Specification for Concrete Aggregates

ASTM D 1140 Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve

ASTM D 1556 Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/cu. ft. (2,700 kN-m/cu.m.))

ASTM D 2216	Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2487	Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2937	Density of Soil in Place by the Drive-Cylinder Method
ASTM D 422	Particle-Size Analysis of Soils
ASTM D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4491	Water Permeability of Geotextiles by Permittivity
ASTM D4533	Trapezoid Tearing Strength of Geotextiles
ASTM D4632	Grab Breaking Load and Elongation of Geotextiles
ASTM D4751	Determining Apparent Opening Size of a Geotextile
ASTM D 6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 530/F-93/004 Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II) (SW-846)

EPA 600/4-79/020 Methods for Chemical Analysis of Water and Wastes

EPA SW-846.3-3 Test Methods for Evaluating Solid Waste:  
Physical/Chemical Methods

## 1.2 DEFINITIONS

### 1.2.1 Satisfactory Materials

1.2.1.1 Earthwork, Roadwork, and Utilities Systems (except beneath buildings) Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, CL, ML, and CL-ML. Satisfactory materials for grading shall be free from roots and other organic matter, trash, debris, frozen material, and stones larger than 3 inches in any dimension.

### 1.2.1.2 Beneath Buildings

a. Natural Insitu Soil: Satisfactory materials for natural insitu soil supporting building foundations and/or slabs shall be limited to materials classified in ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, CL, ML, CL-ML, CH, MH, and shall be free of trash, debris, roots or other organic matter, frozen material, and stones larger than 3 inches in any dimension.

b. Foundation Fill or Backfill: Satisfactory materials for fill or backfill supporting building foundations and/or slabs shall be limited to materials classified in ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, CL, ML, CL-ML, and shall be free of trash, debris, roots or other organic matter, frozen material, and stones larger than 3 inches in any dimension.

c. Fill or Backfill Adjacent to Walls: Satisfactory materials for fill or backfill adjacent to walls shall be limited to cohesionless, free draining materials classified in ASTM D 2487 as GW, GP, GM, SW, SP, SM, and SP-SM, and shall be free of trash, debris, roots or other organic matter, frozen material, and stones larger than 3 inches in any dimension.

### 1.2.2 Unsatisfactory Materials

#### 1.2.2.1 Earthwork, Roadwork, and Utilities Systems (except beneath buildings)

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; demolition debris; and material classified as satisfactory which contains root and other organic matter or frozen material. The Contracting Officer shall be notified of any contaminated materials.

#### 1.2.2.2 Beneath Buildings

a. Natural Insitu Soil: Unsatisfactory materials for fill or backfill supporting building foundations and/or slabs shall be materials classified in ASTM D 2487 as Pt, OH, and OL and any other materials not defined as satisfactory. The Contracting Officer shall be notified of any contaminated materials.

b. Foundation Fill or Backfill: Unsatisfactory materials for fill or backfill supporting building foundations and/or slabs shall be materials classified in ASTM D 2487 as Pt, OH, OL, CH, and MH.

c. Fill or Backfill Adjacent to Walls: Unsatisfactory materials for fill or backfill adjacent to walls shall be materials classified in accordance with ASTM D 2487 as Pt, OH, OL, GC, SC, CL, CH, ML and MH, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW-SM, SC, SW-SC, SP-SC, CL, ML, and CL-ML.

d. Wet or Soft Materials: Materials determined by the Contracting Officer as too wet or too soft to provide a stable subgrade, foundation, or fill will be classified as unsatisfactory regardless of classification. However, if such materials do meet the appropriate ASTM D 2487 classification, the Contractor shall at no additional cost to the Government, recondition the materials.

### 1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, CH, GP-GC, GM-GC, SW-SC, SP-SC, and CL-ML and the unsatisfactory organic materials Pt, OL, and OH. Materials

classified as GM, GP-GM, GW-GM, SW-SM, SP-SM, and SM will be identified as cohesionless only when the fines are nonplastic (plasticity index of zero); otherwise they will be considered cohesive. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

#### 1.2.4 Degree of Compaction

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density. Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the maximum density in accordance with AASHTO T 180 and corrected with AASHTO T 224. To maintain the same percentage of coarse material, use the "remove and replace" procedure as described in AASHTO T 180.

#### 1.2.5 Topsoil

Material suitable for topsoil shall be obtained from required stripping of the project site and/or areas off the installation. Material obtained from off-installation areas suitable for topsoil shall meet the requirements specified for topsoil in Section. Amend topsoil pH range to obtain a pH of 5.5 to 7.

#### 1.2.6 Hard/Unyielding Materials

Unyielding material shall consist of rock and gravelly soils with stones greater than 3 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

#### 1.2.7 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

#### 1.2.8 Unstable Material

Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

#### 1.2.9 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone, or crushed slag composed of hard, tough, and durable particles, and shall contain not more than 10 percent by weight of material passing a No. 200 mesh sieve and no less than 95 percent by weight

passing the 1 inch sieve. The maximum allowable aggregate size shall be 1.6 inches, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

#### 1.2.10 Initial Backfill Material

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 3 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, the initial backfill material shall be free of stones larger than 1 inch in any dimension or as recommended by the pipe manufacturer, whichever is smaller.

#### 1.2.11 Maximum Dry Density

The maximum dry density is expressed as the maximum density obtained when the soil is compacted in accordance with ASTM D 1557, abbreviated as laboratory maximum dry density.

#### 1.2.12 Optimum Moisture Content

The optimum moisture content is the moisture content corresponding to the maximum dry density obtained by the test procedure presented in ASTM D 1557.

### 1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals  
Shoring;

Submit 15 days prior to start work.  
Dewatering Work Plan

#### 1.3.1 General Earthwork and Roadwork

SD-03 Product Data

Utilization of Excavated Materials; G Opening of any Excavation or Borrow Pit

Procedure and location for disposal of unused satisfactory material. Proposed source of borrow material. Advance notice on the opening of excavation or borrow areas

Notification of encountering rock in the project. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

SD-06 Test Reports

Testing  
Borrow Site Testing

Results of testing at the borrow site.

SD-07 Certificates

Testing

Qualifications of the commercial testing laboratory.

#### 1.4 SUBSURFACE DATA

Subsurface soil boring logs, CPT soundings, and soil laboratory test data are shown in the Geotechnical Report. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations. The water level data indicate only the conditions at the particular time or times the information was obtained and may not indicate variations such as those caused by periods of drought or increased rainfall, seasonal fluctuations in rainfall, changes in the surface drainage pattern, or application of irrigation water.

#### 1.5 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

##### 1.5.1 Blasting

Blasting will not be permitted.

#### 1.7 TERMITE PROTECTION

Termite protection is specified under Section 31 31 16 SOIL TREATMENT FOR SUBTERRANEAN TERMITE CONTROL.

The Contractor will be required to protect the structure from subterranean termites.

### PART 2 PRODUCTS

#### 2.1 REQUIREMENTS FOR OFFSITE SOILS

All soils, other than Government furnished borrow, brought in for use as backfill shall be tested for TPH, BTEX and full TCLP including ignitability, corrosivity and reactivity. Backfill shall contain less than 100 parts per million (ppm) of total petroleum hydrocarbons (TPH) and less than 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and shall not fail the TCPL test. TPH concentrations shall be determined by using EPA 600/4-79/020 Method 418.1. BTEX concentrations shall be determined by using EPA 530/F-93/004 Method 5030/8020. TCLP shall be performed in accordance with EPA 530/F-93/004 Method 1311. Provide

Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site. Material shall not be brought on site until tests have been approved by the Contracting Officer.

## 2.2 BURIED WARNING AND IDENTIFICATION TAPE

Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3-inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

### Warning Tape Color Codes

Yellow: Electric

Yellow: Gas, Oil; Dangerous Materials

Orange: Telephone and Other Communications

Blue: Water Systems

Green: Sewer Systems

### 2.2.1 Warning Tape for Metallic Piping

Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

### 2.2.2 Detectable Warning Tape for Non-Metallic Piping

Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

## 2.3 DETECTION WIRE FOR NON-METALLIC PIPING

Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

## 2.4 CAPILLARY WATER BARRIER

Capillary Water Barrier shall consist of clean, crushed, nonporous stone, crushed gravel, or uncrushed gravel conforming to the requirements of ASTM C 33 for coarse aggregate grading size 57, 67, 7, or 78.

## 2.5 PIPE CASING

### 2.5.1 Casing Pipe

ASTM A 139, Grade B, or ASTM A 252, Grade 2, smooth wall pipe. Casing size shall be of the outside diameter and wall thickness as indicated.

Protective coating is not required on casing pipe.

### 2.5.2 Wood Supports

Treated Yellow Pine or Douglas Fir, rough, structural grade. Provide wood with nonleaching water-borne pressure preservative (ACA or CCA) and treatment conforming to AWWA P5 and AWWA C2, respectively. Secure wood supports to carrier pipe with stainless steel or zinc-coated steel bands.

## PART 3 EXECUTION

### 3.1 STRIPPING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to full depth. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations as directed adjacent to project site. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be removed from the site and disposed of by the contractor off government property.

### 3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of off government property by the contractor. Unsatisfactory excavated material shall be disposed of in designated waste or spoil areas. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or

embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or, if no borrow areas are indicated, from other approved areas selected by the Contractor as specified.

### 3.2.1 Ditches, Gutters, and Channel Changes

Excavation of ditches, gutters, and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches and gutters shall not be excavated below grades shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory, thoroughly compacted, material to grades shown. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

### 3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

### 3.2.3 Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Completely drain construction site during periods of construction to keep soil materials sufficiently dry. The Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed.

### 3.2.4 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions forestoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to

maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 2 feet below the working level. The Contractor shall provide drainage and dewatering as required to ensure that all footing excavations are accomplished with the subgrade soils remaining dry and firm until after the footings are placed and backfilled. Operate dewatering system continuously until construction work below existing water levels is complete. Submit performance records weekly. Measure and record performance of dewatering system at same time each day by use of observation wells or piezometers installed in conjunction with the dewatering system. Relieve hydrostatic head in previous zones below subgrade elevation in layered soils to prevent uplift.

### 3.2.5 Trench Excavation Requirements

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical, except that trench construction shall be in accordance with OSHA. Trench walls more than 3 feet deep shall be cut back, excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter and shall not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

#### 3.2.5.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

#### 3.2.5.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

#### 3.2.5.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting

material shall be excavated and replaced by the Contractor without additional cost to the Government.

#### 3.2.5.4 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members and of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

#### 3.2.5.5 Jacking, Boring, and Tunneling

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

#### 3.2.6 Underground Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Perform work adjacent to non-Government utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within 2 feet of known Government-owned utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

#### 3.2.7 Structural Excavation

Excavation shall conform to the dimensions and elevations indicated for each building, structure, and footing except as specified, and shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the building line of each building and structure, excavation for outside grease interceptors and all work incidental thereof. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Ensure that footing subgrades have been inspected and approved by the Contracting Officer prior to concrete placement. Excavate to bottom of footing or drilled pier cap prior to placing footing or drilled pier caps, unless authorized otherwise by the Contracting Officer. Backfill and compact over excavations and changes in grade due to pile driving operations to 95 percent of ASTM D698 maximum density.

Where unstable material is encountered in the bottom of the trench, remove such material to the depth directed and replace it to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the Contractor is responsible for excavating the resulting material and replacing it without additional cost to the Government.

### 3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the borrow areas shown on drawings or from approved private sources, selected by the Contractor. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

### 3.4 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in embankments, fills, and required backfills. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing. Stockpiles of satisfactory shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government.

### 3.5 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before subgrade materials, capillary water barrier, or concrete is to be placed. All surfaces shall be protected from erosion resulting from ponding or flow of water.

### 3.6 GROUND SURFACE PREPARATION

#### 3.6.1 General

Requirements Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material plowed, disked, or otherwise broken up to a depth of 8 inches; pulverized; moistened or aerated as necessary to plus or minus 2.5 percent of optimum moisture; thoroughly mixed; and compacted to at least 92 percent of laboratory maximum density. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment material to assure adequate bond between embankment material and the prepared ground surface.

#### 3.6.1.1 Subgrade Preparation for Pavements

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to plus or minus 2.5 percent of optimum moisture. Minimum subgrade density shall be as specified in paragraph FILLING AND BACKFILLING compact to 95 percent.

#### 3.6.2 Muddy or Frozen Material

Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to plus or minus 2.5 percent of optimum moisture. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades (whether in an excavation or on an embankment) and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. All material that freezes or has been subjected to freeze-thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, weekends, winter shutdowns, or earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material. Alternatively, the material shall be thawed, dried, reworked, and recompact to the specified criteria before additional material is placed. The Contracting Officer will determine when placement of fill shall cease due to cold weather. The Contracting Officer may elect to use average daily air temperatures, and/or physical observation of the soils for his determination. Fill material shall not contain frozen clumps of soil, snow, or ice. Minimum subgrade density shall be as specified in paragraph TESTING.

### 3.7 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of in designated waste disposal or spoil areas. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material storage or designated waste areas as directed. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

### 3.8 MOISTURE CONTENT

Satisfactory materials in each layer of fill shall contain the amount of moisture within the limits specified below. Materials that are not within the specified limits after compaction shall be reworked regardless of density. The moisture content after compaction shall be as uniform as practicable throughout any one layer and shall be within the limits of 2.5 percentage points above optimum moisture content and 2.5 percentage points below optimum moisture content. Materials which are too wet shall be disked, harrowed, plowed, bladed, or otherwise manipulated to reduce the moisture content to within the specified limits. Materials which are too dry shall be broken up, sprinkled, and thoroughly mixed to bring the moisture content uniformly up to within specified limits of moisture content specified above, the Contractor shall either adjust the moisture content to bring it within the specified limits or remove it from the fill.

### 3.9 GENERAL EARTHWORK

#### 3.9.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 92 percent laboratory maximum density. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

#### 3.9.2 Subgrade Preparation

##### 3.9.2.1 Proof Rolling

Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. After stripping, proof roll the existing subgrade of the paved areas and building pads with six passes of a dump truck loaded with 4 cubic yards of soil. Operate the truck in a systematic manner to ensure the number of passes over all areas, and at speeds between 2 1/2 to 3 1/2 mph. Notify the Contracting Officer a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Contracting Officer. Rutting or pumping of material shall be undercut as directed by the Contracting Officer and replaced with fill and backfill material.

#### 3.9.2.2 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Materials shall be moistened or aerated as necessary to plus or minus 2.5 percent of optimum moisture. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 6 inches below finished grade for the subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. When the subgrade is in cut, the top 8 inches of subgrade shall be scarified, windrowed, moistened or aerated as necessary to plus or minus 2.5 percent of optimum moisture, thoroughly blended, reshaped, and compacted. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade and cross section.

#### 3.9.2.3 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Compact each layer of the embankment to at least 95 percent of laboratory maximum density.

#### 3.9.2.4 Subgrade for Pavements

Subgrade for pavements shall be compacted to at least 98 percent laboratory maximum density for the depth below the subgrade of 12 inches in fill or backfill and 8 inches in undisturbed native soil or cut.

The moisture content shall be maintained within the limits of 2 percent below optimum to 1 percent above optimum during compaction of raw subgrade.

### 3.11 BACKFILLING AND COMPACTION FOR UTILITIES SYSTEMS

Backfill material shall consist of satisfactory material, select granular material, or initial backfill material as required. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density, unless otherwise specified.

### 3.11.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The trench shall be backfilled to two feet above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test. The trench shall not be backfilled until all specified tests are performed.

#### 3.11.1.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

#### 3.11.1.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

#### 3.11.1.3 Initial Backfill

Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

#### 3.11.1.4 Final Backfill

- a. Roadways Water flooding or jetting methods of compaction will not be permitted.
- b. Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of one foot loose thickness, and compacted to 95 percent maximum density. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

### 3.11.2 Backfill for Appurtances

After the manhole, catch basin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 7 days, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress.

### 3.11.3 Special Requirements

Special requirements for both excavation and backfill relating to the specific utilities are as follows.

#### 3.11.3.1 Water Lines

Trenches shall be of a depth to provide a minimum cover of 30 inches in unpaved areas and 36 inches in paved areas from the existing ground top of the pipe.

#### 3.11.3.2 Electrical Distribution System

Direct burial cable and conduit or duct line shall have a minimum cover of 24 inches from the finished grade, unless otherwise indicated.

#### 3.11.4 Buried Tape and Detection Wire

##### 3.11.4.1 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 18 inches below finished grade unless otherwise shown. Provide buried utility lines with utility identification tape. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

##### 3.11.4.2 Buried Detection Wire

Bury detection wire directly above non-metallic piping at a distance not to exceed 12 inches above the top of pipe. The wire shall extend continuously and unbroken, from manhole to manhole. The ends of the wire shall terminate inside the manholes at each end of the pipe, with a minimum of 3 feet of wire, coiled, remaining accessible in each manhole. The wire shall remain insulated over its entire length. The wire shall enter manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, the wire shall terminate in the valve pit at the pump station end of the pipe. For water mains, the wire shall be pulled in the valve box after each valve and extend entire length of pipe.

### 3.13 FINISHING

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the drawings. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades specified in paragraphs related to SUBGRADE PREPARATION. Finish gutters and ditches in a manner that will result in effective drainage. Finish the surface of areas to receive aggregate surface course or seeding from settlement or washing to a smoothness suitable for the application of materials. Repair graded or backfilled areas prior to acceptance of the work, and re-established grades to the

required elevations and slopes.

### 3.13.1 Subgrade and Embankments

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do not disturb the finished subgrade by traffic or other operation. Protect and maintain the finished subgrade in a satisfactory condition until subbase, base, or pavement is placed. Do not permit the storage or stockpiling of materials on the finished subgrade. Do not lay subbase, base course, or pavement until the subgrade has been checked and approved, and in no case place subbase, base, surfacing, or pavement on a muddy, spongy, or frozen subgrade.

### 3.13.2 Capillary Water Barrier

Place a 4 inch minimum capillary water barrier under basement concrete floor and area-way slabs as noted directly on the subgrade and compact with a minimum of two passes of a hand-operated plate-type vibratory compactor.

### 3.13.3 Grading Around Structures

Construct areas within 5 feet outside of each building and structure line true-to-grade, shape to drain, and maintain free of trash and debris until final inspection has been completed and the work has been accepted.

## 3.14 TESTING

Perform testing by a Corps validated commercial testing laboratory or the Contractor's validated testing facility. If the Contractor elects to establish testing facilities, do not permit work requiring testing until the Contractor's facilities have been inspected, Corps validated and approved by the Contracting Officer. Determine field in-place density in accordance with ASTM D1556. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, remove the material, replace and recompact to meet specification requirements. Perform tests on recompacted areas to determine conformance with specification requirements. Appoint a registered professional civil engineer to certify inspections and test results. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

### 3.14.1 Fill and Backfill Material Gradation

One test per 10,000 cubic yards stockpiled or in-place source material. Determine gradation of fill and backfill material in accordance with ASTM D422.

### 3.14.2 In-Place Densities

- a. One test per 2,000 square feet, or fraction thereof, of each lift of fill or backfill areas, regardless as to method of compaction.
- b. Testing shall be performed in accordance with ASTM D1556. 3.15.3 Check Tests on In-Place Densities

If ASTM D6938 is used, check in-place densities by ASTM D1556 as follows:

- a. One check test per lift for each 50,000 square feet, or fraction thereof, of each lift of fill or backfill compacted by other than hand-operated machines.
- b. One check test per lift for each 2,000 square feet, of fill or backfill areas compacted by hand-operated machines.
- c. One check test per lift for pavement subgrade or aggregate base courses for each 27,000 square feet, or fraction thereof, of embankment or backfill.

#### 3.14.4 Moisture Contents

In the stockpile, excavation, or borrow areas, perform a minimum of two tests per day per type of material or source of material being placed during stable weather conditions. During unstable weather, perform tests as dictated by local conditions and approved by the Contracting Officer.

#### 3.14.5 Optimum Moisture and Laboratory Maximum Density

Perform tests for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per soil type of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

#### 3.15.6 Tolerance Tests for Subgrades

Perform continuous checks on the degree of finish specified in paragraphs related to SUBGRADE PREPARATION during construction of the subgrades.

#### 3.14.7 Displacement of Sewers

After other required tests have been performed and the trench backfill compacted to the finished grade surface, inspect the pipe to determine whether significant displacement has occurred. Conduct this inspection in the presence of the Contracting Officer. Inspect pipe sizes larger than 36 inches, while inspecting smaller diameter pipe by shining a light or laser between manholes or manhole locations, or by the use of television cameras passed through the pipe. If, in the judgment of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, replace or repair the defects as directed at no additional cost to the Government.

### 3.16 DISPOSITION OF SURPLUS MATERIAL

Provide surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber as wasted in Government disposal area removed from Government property as directed by the Contracting Officer.

**END OF SECTION 31 00 00**

**SECTION 31 11 00  
CLEARING AND GRUBBING**

**PART 1 GENERAL**

**1.1 SUBMITTALS**

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Nonsaleable Materials

Written permission to dispose of such products on private property shall be filed with the Contracting Officer.

**1.2 DELIVERY, STORAGE, AND HANDLING**

Deliver materials to store at the site, and handle in a manner which will maintain the materials in their original manufactured or fabricated condition until ready for use.

**PART 2 PRODUCTS**

**2.1 TREE WOUND PAINT**

Submit samples in cans with manufacturer's label of bituminous based paint of standard manufacture specially formulated for tree wounds.

**2.2 HERBICIDE**

Comply with Federal Insecticide, Fungicide, and Rodenticide Act (Title 7 U.S.C. Section 136) for requirements on Contractor's licensing, certification and record keeping. Contact the command Pest Control Coordinator prior to starting work. Submit samples in cans with manufacturer's label.

**PART 3 EXECUTION**

**3.1 PROTECTION**

**3.1.1 Roads and Walks**

Keep roads and walks free of dirt and debris at all times.

**3.1.2 Trees, Shrubs, and Existing Facilities**

Vegetation to be left standing shall be preserved and protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as approved by the Contracting Officer.

### 3.1.3 Utility Lines

Protect existing utility lines that are indicated to remain from damage. Notify the Contracting Officer immediately of damage to or an encounter with an unknown existing utility line. The Contractor is responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, notify the Contracting Officer in ample time to minimize interruption of the service.

## 3.2 CLEARING

Clearing shall consist of the satisfactory disposal of vegetation designated for removal, including brush, and rubbish occurring within the areas to be cleared. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work. Vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except vegetation indicated or directed to be left standing.

## 3.3 GRUBBING

Grubbing shall consist of the removal and disposal of roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Material to be grubbed, not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

## 3.4 DISPOSAL OF MATERIALS

### 3.4.1 Nonsaleable Materials

Roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, shall be disposed of outside the limits of Government-controlled land at the Contractor's responsibility, except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

**END OF SECTION 31 11 00**

**SECTION 31 23 00  
EXCAVATION AND FILL**

PART 1 GENERAL

1.1 DELIVERY, STORAGE AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

1.2 QUALITY ASSURANCE

1.2.1 Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Excavation made with power-driven equipment is not permitted within **two feet** of known utilities or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Authority Having Jurisdiction. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

PART 2 PRODUCTS

PART 3 EXECUTION

**END OF SECTION 31 23 00**

**SECTION 31 31 00**  
**SOIL TREATMENT FOR SUBTERRANEAN TERMITE CONTROL**

PART 1 GENERAL

1.1 REFERENCES

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

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)  
7 USC Section 136 Federal Insecticide, Fungicide, and Rodenticide Act

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Termiticide Application Plan

Termiticide application plan with proposed sequence of treatment work with dates and times. Include the termiticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area/volume treated, amount applied; and the name and state license number of the state certified applicator.

Termiticides Manufacturer's label and Material Safety Data Sheet (MSDS) for termiticides proposed for use.

Foundation Exterior

Written verification that other site work will not disturb the treatment.

Utilities and Vents

Written verification that utilities and vents have been located. Crawl and Plenum Air Spaces

Written verification that crawl spaces and plenum air spaces have been located.

Verification of Measurement

Written verification that the volume of termiticide used meets the application rate.

Application Equipment

A listing of equipment to be used.

Warranty

Copy of Contractor's warranty.

SD-04 Samples

Termiticides

Samples of the pesticides used in this work. The Contracting Officer may draw, at any time and without prior notice, from stocks at the job site; should analysis, indicate such samples to contain less than the amount of active ingredient specified on the label, work performed with such products shall be repeated, with pesticides conforming to this specification, at no additional cost to the Owner.

#### SD-06 Test Reports

Equipment Calibration and Tank Measurement Certification of calibration tests conducted on the equipment used in the termiticide application.

Soil Moisture

Soil moisture test result.

Quality Assurance

Pest Management Report and copies of daily records signed by an officer of the Contractor.

#### SD-07 Certificates

Qualifications

Qualifications and state license number of the termiticide applicator.

### 1.3 QUALITY ASSURANCE

Comply with requirements on Contractor's licensing, certification, and record keeping. Maintain daily records using Pest Management Maintenance. Record and submit copies of records when requested by the Contracting Officer. Identify target pest, type of operation, brand name and manufacturer of pesticide, formulation, concentration or rate of application used.

#### 1.3.1 Qualifications

For the application of pesticides, use the services of a subcontractor whose principal business is pest control. The subcontractor shall be licensed and certified in the state where the work is to be performed. Termiticide applicators shall also be certified in the U.S. Environmental Protection Agency (EPA) pesticide applicator category which includes structural pest control.

#### 1.3.2 Safety Requirements

Formulate, treat, and dispose of termiticides and their containers in accordance with label directions. Draw water for formulating only from sites designated by the Contracting Officer, and fit the filling hose with a backflow preventer meeting local plumbing codes or standards. The filling operation shall be under the direct and continuous observation of a contractor's representative to prevent overflow. Secure pesticides and related materials under lock and key

when unattended. Ensure that proper protective clothing and equipment are worn and used during all phases of termiticide application. Dispose of used pesticide containers off Government property.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

##### 1.4.1 Delivery

Deliver termiticide material to the site in the original unopened containers bearing legible labels indicating the EPA registration number and manufacturer's registered uses. All other materials, to be used on site for the purpose of termite control, shall be delivered in new or otherwise good condition as supplied by the manufacturer or formulator.

##### 1.4.2 Inspection

Inspect termiticides upon arrival at the job site for conformity to type and quality in accordance with paragraph TERMITICIDES. Each label shall bear evidence of registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended or under appropriate regulations of the host county. Other materials shall be inspected for conformance with specified requirements. Remove unacceptable materials from the job site.

##### 1.4.3 Storage

Store materials in designated areas and in accordance with manufacturer's labels. Termiticides and related materials shall be kept under lock and key when unattended.

##### 1.4.4 Handling

Observe manufacturer's warnings and precautions. Termiticides shall be handled in accordance with manufacturer's labels, preventing contamination by dirt, water, and organic material. Protect from sunlight as recommended by the manufacturer.

#### 1.5 SITE CONDITIONS

The following conditions will determine the time of application.

##### 1.5.1 Soil Moisture

Soils to be treated shall be tested immediately before application. Test soil moisture content to a minimum depth of 3 inches. The soil moisture shall be as recommended by the termiticide manufacturer. The termiticide will not be applied when soil moisture exceeds manufacturer's recommendations because termiticides do not adhere to the soil particles in saturated soils.

### 1.5.2 Runoff and Wind Drift

Do not apply termiticide during or immediately following heavy rains. Applications shall not be performed when conditions may cause runoff or create an environmental hazard. Applications shall not be performed when average wind speed exceeds 10 miles per hour. The termiticide shall not be allowed to enter water systems, aquifers, or endanger humans or animals.

#### 1.5.2.1 Vapor Barriers and Waterproof Membranes

Termiticide shall be applied prior to placement of a vapor barrier or waterproof membrane.

#### 1.5.2.2 Utilities and Vents

Prior to application, HVAC ducts and vents located in treatment area shall be turned off and blocked to protect people and animals from termiticide.

### 1.5.3 Placement of Concrete

Place concrete covering treated soils as soon as the termiticide has reached maximum penetration into the soil. Time for maximum penetration shall be as recommended by the manufacturer.

## 1.6 WARRANTY

The Contractor shall provide a 5-year written warranty against infestations or reinfestations by subterranean termites of the buildings or building additions constructed under this contract. Warranty shall include annual inspections of the buildings or building additions. If live subterranean termite infestation or subterranean termite damage is discovered during the warranty period, and the soil and building conditions have not been altered in the interim, the Contractor shall:

- a. Retreat the soil and perform other treatment as may be necessary for elimination of subterranean termite infestation;
- b. Repair damage caused by termite infestation; and
- c. Reinspect the building approximately 180 days after the retreatment.

## PART 2 PRODUCTS

### 2.1 TERMITICIDES

Provide termiticides currently registered by the EPA or approved for such use by the appropriate agency of the host county. Select non-repellant termiticide for maximum effectiveness and duration after application. The selected termiticide shall be suitable for the soil and climatic conditions at the project site.

## PART 3 EXECUTION

### 3.1 VERIFICATION OF MEASUREMENT

Once termiticide application has been completed, measure tank contents to determine the remaining volume. The total volume measurement of used contents for the application shall equal the established application rate for the project site conditions. Provide written verification of the measurements.

### 3.2 TECHNICAL REPRESENTATIVE

The certified installation pest management coordinator shall be the technical representative, shall be present at all meetings concerning treatment measures for subterranean termites, and may be present during treatment application. The command Pest Control Coordinator shall be contacted prior to starting work.

### 3.3 SITE PREPARATION

Site preparation shall be in accordance with Section 31 00 00 EARTHWORK, and Seeding and Sodding per installation requirements. Work related to final grades, landscape plantings, foundations, or any other alterations to finished construction which might alter the condition of treated soils, shall be coordinated with this specification.

#### 3.3.1 Ground Preparation

Food sources shall be eliminated by removing debris from clearing and grubbing and post construction wood scraps such as ground stakes, form boards, and scrap lumber from the site, before termiticide application begins.

#### 3.3.2 Verification

Before work starts, verify that final grades are as indicated and smooth grading has been completed in accordance with Section 31 00 00 EARTHWORK. Soil particles shall be finely graded with particles no larger than 1 inch and compacted to eliminate soil movement to the greatest degree.

#### 3.3.3 Foundation Exterior

Provide written verification that final grading and landscape planting

operations will not disturb treatment of the soil on the exterior sides of foundation walls, grade beams, and similar structures.

#### 3.3.4 Utilities and Vents

Provide written verification that the location and identity of HVAC ducts and vents, water and sewer lines, and plumbing have been accomplished prior to the termiticide application.

#### 3.3.5 Crawl and Plenum Air Spaces

Provide written verification that the location and identity of crawl and plenum air spaces have been accomplished prior to the termiticide application.

#### 3.3.6 Application Plan

Submit a Termiticide Application Plan for approval before starting the specified treatment.

### 3.4 TERMITICIDE TREATMENT

#### 3.4.1 Equipment Calibration and Tank Measurement

Immediately prior to commencement of termiticide application, calibration tests shall be conducted on the application equipment to be used and the application tank shall be measured to determine the volume and contents. These tests shall confirm that the application equipment is operating within the manufacturer's specifications and will meet the specified requirements. Provide written certification of the equipment calibration test results within 1 week of testing.

#### 3.4.2 Mixing and Application

Formulating, mixing, and application shall be performed in the presence of a technical representative. A closed system is recommended as it prevents the termiticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying termiticides shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

#### 3.4.3 Treatment Method

For areas to be treated, establish complete and unbroken vertical and/or horizontal soil poison barriers between the soil and all portions of the intended structure which may allow termite access to wood and wood related products. Application shall not be made to areas which serve as crawl spaces or for use as a plenum air space.

##### 3.4.3.1 Surface Application

Use surface application for establishing horizontal barriers. Surface applicants shall be applied as a coarse spray and provide uniform distribution over the soil surface. Termiticide shall penetrate a minimum of 1 inch into the soil, or as recommended by the manufacturer.

#### 3.4.3.2 Rodding and Trenching

Use rodding and trenching for establishing vertical soil barriers. Trenching shall be to the depth of the foundation footing. Width of trench shall be as recommended by the manufacturer, or as indicated. Rodding or other approved method may be implemented for saturating the base of the trench with termiticide. Immediately after termiticide has reached maximum penetration as recommended by the manufacturer, backfilling of the trench shall commence. Backfilling shall be in 6 inch rises or layers. Each rise shall be treated with termiticide.

#### 3.4.4 Sampling

Samples may draw from stocks at the job site, at any time and without prior notice, take samples of the termiticides used to determine if the amount of active ingredient specified on the label is being applied.

### 3.5 CLEAN UP, DISPOSAL, AND PROTECTION

Once application has been completed, proceed with clean up and protection of the site without delay.

#### 3.5.1 Clean Up

The site shall be cleaned of all material associated with the treatment measures, according to label instructions, and as indicated. Excess and waste material shall be removed and disposed off site.

#### 3.5.2 Disposal of Termiticide

Dispose of residual termiticides and containers off property, and in accordance with manufacture's label instructions and EPA criteria.

#### 3.5.3 Protection of Treated Area

Immediately after the application, the area shall be protected from other use by erecting barricades and providing signage as required or directed. Signage shall be in accordance with Section 10 14 01 EXTERIOR SIGNAGE. Signage shall be placed inside the entrances to crawl spaces and shall identify the space as treated with termiticide and not safe for children and animals.

### 3.6 CONDITIONS FOR SATISFACTORY TREATMENT

#### 3.6.1 Equipment Calibrations and Measurements

Where results from the equipment calibration and tank measurements tests are unsatisfactory, re-treatment will be required.

#### 3.6.2 Testing

Should an analysis, performed by a third party, indicate that the samples of the applied termiticide contain less than the amount of active ingredient specified on the label, and/or if soils are treated to a depth less than specified or approved, re-treatment will be required.

#### 3.6.3 Disturbance of Treated Soils

Soil and fill material disturbed after treatment shall be re-treated before placement of slabs or other covering structures.

#### 3.6.4 Termites Found Within the Warranty Period

If live subterranean termite infestation or termite damage is discovered during the warranty period, re-treat the site.

### 3.7 RE-TREATMENT

Where re-treatment is required, comply with the requirements specified in paragraph WARRANTY.

**END OF SECTION 31 31 00**

**SECTION 32 11 16**  
**BASED COURSE FOR RIGID PAVING**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publication as referred to within the text by the basic designation only. Use current applicable versions.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION  
OFFICIALS (AASHTO)

AASHTO T 180                      Standard Method of Test for Moisture-Density Relations of Soils  
Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

AASHTO T 224                      Standard Method of Test for Correction for Coarse Particles in the  
Soil Compaction Test

ASTM INTERNATIONAL (ASTM)

ASTM C117                      Standard Test Method for Materials Finer than 75-um (No. 200)  
Sieve in Mineral Aggregates by Washing

ASTM C131                      Standard Test Method for Resistance to Degradation of Small-Size  
Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C136                      Standard Test Method for Sieve Analysis of Fine and Coarse  
Aggregates

ASTM C29/C29M                      Standard Test Method for Bulk Density ("Unit Weight") and Voids  
in Aggregate

ASTM D1556                      Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D1557                      Standard Test Methods for Laboratory Compaction Characteristics  
of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2700 kN-m/m<sup>3</sup>)

ASTM D2167                      Density and Unit Weight of Soil in Place by the Rubber Balloon  
Method

ASTM D2487                      Soils for Engineering Purposes (Unified Soil Classification  
System)

ASTM D422	Particle-Size Analysis of Soils
ASTM D4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D75/D75M	Standard Practice for Sampling Aggregates
ASTM E11	Wire Cloth and Sieves for Testing Purposes

## 1.2 DEFINITION

Degree of compaction required is expressed as a percentage of the maximum laboratory dry density obtained by the test procedure presented in ASTM D1557 abbreviated as a percent of laboratory maximum dry density. One exception is as follows: Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the  $\frac{3}{4}$  inch sieve, the degree of compaction for material having more than 30 percent by weight of their particles retained on the  $\frac{3}{4}$  inch sieve will be expressed as a percentage of the laboratory maximum dry density in accordance with AASHTO T 180 Method D and corrected with AASHTO T 224.

## 1.3 SYSTEM DESCRIPTION

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. Submit a list of proposed equipment, including descriptive data. Provide equipment which is adequate and has the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

## 1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment  
Waybills and Delivery Tickets

SD-06 Test Reports

Sampling and Testing  
Field Density Tests

## 1.5 QUALITY ASSURANCE

Sampling and testing are the responsibility of the Contractor, to be performed by an approved testing laboratory. Perform tests at the specified frequency. No work requiring testing will be permitted until the testing laboratory has been inspected and approved. Test the materials to establish compliance with the specified requirements.

### 1.5.1 Sampling

Take samples for laboratory testing in conformance with ASTM D75/D75M.  
When deemed necessary, the sampling will be observed by the Contracting Officer.

### 1.5.2 Tests

#### 1.5.2.1 Sieve Analysis

Make sieve analysis in conformance with ASTM C117 and ASTM C136. Complete particle-size analysis of the soils in conformance with ASTM D422. Sieves shall conform to ASTM E11.

#### 1.5.2.2 Liquid Limit and Plasticity Index

Determine liquid limit and plasticity index in accordance with ASTM D4318.

#### 1.5.2.3 Moisture-Density Determinations

Determine the laboratory maximum dry density and optimum moisture in accordance with ASTM D1557 or AASHTO T 180, Method D and corrected with AASHTO T 224 as indicated on the drawings.

#### 1.5.2.4 Field Density Tests

Measure field density in accordance with ASTM D1556, ASTM D2167, or ASTM D6938. For the method presented in ASTM D1556, use the base plate, as shown in the drawing. For the method presented in ASTM D6938, check and adjust the calibration curves, if necessary, using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with ASTM D6938 result in a wet unit weight of soil and ASTM D6938 will be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D6938. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration, in ASTM D6938, on each different type of material to be tested at the beginning of a job and at intervals as directed.

a. Submit certified copies of test results for approval not less than 30 days before material is required for the work.

b. Submit calibration curves and related test results prior to using the device or equipment being calibrated.

c. Submit copies of field test results within 24 hours after the tests are performed.

#### 1.5.2.5 Wear Test

Perform wear tests in conformance with ASTM C131.

#### 1.5.2.6 Weight of Slag

Determine weight per cubic foot of slag in accordance with ASTM C29/C29M.

### 1.5.3 Testing Frequency

#### 1.5.3.1 Initial Tests

Perform one of each of the following tests on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements prior to installation.

- a. Sieve Analysis including 0.02 mm size material
- b. Liquid limit and plasticity index
- c. Moisture-density relationship
- d. Wear
- e. Weight per cubic foot of Slag

#### 1.5.3.2 In-Place Tests

Perform one of each of the following tests on samples taken from the placed and compacted or rigid pavement base course. Samples shall be taken and tested at the rates indicated.

- a. Perform density tests on every lift of material placed and at a frequency of one set of tests for every 500 square yards, or portion thereof, of completed area.
- b. Perform sieve analysis including 0.02 mm size material on every lift of material placed and at a frequency of one sieve analysis for every 1000 square yards, or portion thereof, of material placed.
- c. Perform liquid limit and plasticity index tests at the same frequency as the sieve analysis.

d. Measure the thickness of each course at intervals providing at least one measurement for each 500 square yards or part thereof. The thickness measurement shall be made by test holes, at least 3 inches in diameter through the course.

#### 1.5.4 Approval of Material

Select the source of materials 30 days prior to the time the material will be required in the work. Tentative approval will be based on initial test results. Final approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted course.

#### 1.6 ENVIRONMENTAL REQUIREMENTS

Perform construction when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, protect all completed areas by approved methods against detrimental effects of freezing. Correct completed areas damaged by freezing, rainfall, or other weather conditions to meet specified requirements.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

##### 2.1.1 Rigid Pavement Base Course

Provide aggregates consisting of crushed stone or slag, gravel, shell, sand, or other sound, durable, approved materials processed and blended or naturally combined. Provide aggregates which are durable and sound, free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. Material retained on the No. 4 sieve shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested as specified in ASTM C131. At least 50 percent by weight retained on each sieve shall have one freshly fractured face with the area at least equal to 75 percent of the smallest midsectional area of the piece. Aggregate shall be reasonably uniform in density and quality. Slag shall be an air-cooled, blast-furnace product having a dry weight of not less than 65 pcf. Aggregates shall have a maximum size of 2 inches and shall be within the limits specified as follows:

Maximum Allowable Percentage by Weight  
Passing Square-Mesh Sieve

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Sieve Designation	Rigid Pavement Base Course
No. 10	85
No. 200	8

The portion of any blended component and of the completed course passing the No. 40 sieve shall be either nonplastic or shall have a liquid limit not greater than 25 and a plasticity index not greater than 5. The Contractor is responsible for any additional stability required to provide a working platform for construction equipment. If the Contractor can demonstrate with a test section that a material has adequate stability to support construction equipment, the fractured face requirement can be deleted, subject to the approval of the Contracting Officer.

### PART 3 EXECUTION

#### 3.1 OPERATION OF AGGREGATE SOURCES

Clearing, stripping and excavating are the responsibility of the Contractor. Operate the aggregate sources to produce the quantity and quality of materials meeting the specified requirements in the specified time limit. Aggregate sources on private lands shall be conditioned in agreement with local laws and authorities.

#### 3.2 STOCKPILING MATERIAL

Prior to stockpiling of material, clear and level storage sites. Stockpile all materials, including approved material available from excavation and grading, in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

#### 3.3 PREPARATION OF UNDERLYING MATERIAL

Prior to constructing the rigid pavement base course, clean the underlying course or subgrade of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. Correct ruts, or soft yielding spots, in the underlying courses, subgrade areas having inadequate compaction, and deviations of the surface from the specified requirements, by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements.

For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, the surface shall be stabilized prior to placement of the overlying course. Accomplish stabilization by mixing the overlying course material into the underlying course, and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements for the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the overlying course is placed.

### 3.4 GRADE CONTROL

The finished and completed course shall conform to the lines, grades, and cross sections shown. The lines, grades, and cross sections shown shall be maintained by means of line and grade stakes placed by the Contractor at the work site.

### 3.5 MIXING AND PLACING MATERIALS

Mix and place the materials to obtain uniformity of the material at the water content specified. Make such adjustments in mixing or placing procedures or in equipment as may be directed to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to insure a satisfactory subbase course.

### 3.6 LAYER THICKNESS

The compacted thickness of the completed course shall be as indicated. When a compacted layer of 6 inches is specified, the material may be placed in a single layer; when a compacted thickness of more than 6 inches is required, no layer shall be thicker than 6 inches nor be thinner than 3 inches when compacted.

### 3.7 COMPACTION

Compact each layer of the material, as specified, with approved compaction equipment. Maintain water content during the compaction procedure to within plus or minus 2 percent of optimum water content, as determined from laboratory tests, as specified in paragraph SAMPLING AND TESTING. In all places not accessible to the rollers, compact the mixture with hand-operated power tampers. Compaction of the rigid base course shall continue until each layer is compacted through the full depth to at least 98 percent of laboratory maximum density. Make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory subbase course. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

### 3.8 PROOF ROLLING

Areas designated on the drawings to be proof rolled shall receive an application with a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds and inflated to a minimum of 125 psi. A coverage is defined as the application of one tire print over the designated area. In the areas designated, apply proof rolling to the top layer of the subbase course. Maintain water content of the top layer of the subbase course such that the water content is within plus or minus 2 percent of optimum water content, as determined from laboratory tests, as specified in paragraph SAMPLING AND TESTING. Any material in the subbase courses or underlying materials indicated to be unsatisfactory by the proof rolling shall be removed, dried, and recompact, or removed and replaced with satisfactory materials.

### 3.9 SMOOTHNESS TEST

The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 12 foot straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

### 3.10 THICKNESS CONTROL

The completed thickness of the course(s) shall be in accordance with the thickness and grade indicated on the drawings. The completed course shall not be more than 1/2 inch deficient in thickness nor more than 1/2 inch above or below the established grade. Where any of these tolerances are exceeded, correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness is 1/2 inch or more thicker than shown, the course will be considered as conforming with the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch of the thickness shown.

### 3.11 MAINTENANCE

Maintain the completed course in a satisfactory condition until accepted.

**END OF SECTION 32 11 16**

**SECTION 32 17 13  
PARKING BUMPERS**

**PART 1 GENERAL**

**1.1 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publication as referred to within the text by the basic designation only. Use current applicable versions.

**AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)**

- |           |   |
|-----------|---|
| ACI 318   | Building Code Requirements for Structural Concrete and Commentary |
| ACI SP-66 | ACI Detailing Manual  |

**AMERICAN WELDING SOCIETY (AWS)**

- |                |   |
|----------------|---|
| AWS D1.4/D1.4M | Structural Welding Code - Reinforcing Steel |
|----------------|---|

**ICC INTERNATIONAL CODE COUNCIL**

- |     |                              |
|-----|------------------------------|
| IBC | International Building Code. |
|-----|------------------------------|

**STATE OF ARIZONA, DEPARTMENT OF TRANSPORTATION**

**1.2 SUBMITTALS**

**1.2.1 General:**

Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 – Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

**1.2.2. Shop Drawings:** Submit Shop Drawings of bumpers, including plan layout and installation details, for approval.

**1.2.3 Product Data:**

Submit manufacturers' product data of precast bumpers and epoxy adhesive for approval.

### 1.3 QUALITY ASSURANCE

Precast parking bumpers shall be manufactured for the intended purpose by a company or firm specializing in the manufacture of precast concrete parking appurtenances.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Parking Bumpers:

Provide precast concrete parking bumpers of half octagonal configuration and dimensions indicated. Unless indicated otherwise, provide bumpers of 72-inch length.

Bumpers shall be manufactured of Class 4000 reinforced concrete to withstand constant use and rough service. Each bumper shall be reinforced with two No. 4 deformed steel reinforcing bars, minimum.

Each bumper to be installed on at-grade asphalt pavement shall be manufactured with minimum two holes to accommodate the installation rebar. Holes shall be positioned 6 inches in from each end.

Bumpers to be installed on concrete slabs of parking structures, shall be manufactured without holes.

#### 2.1.2 Adhesive:

Adhesive for anchoring bumpers or wheel stops to pavement shall be an epoxy adhesive manufactured for the purpose.

#### 2.1.3 Steel Bars for Installation:

Epoxy-coated rebar, No. 5 size, conforming with applicable requirements.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

3.1.1 Precast concrete bumpers shall be anchored and secured in position on at-grade asphalt pavements, as indicated in the drawings

3.1.2 Precast concrete bumpers shall be secured in position on at-grade concrete pavements, as indicated in drawings

**END OF SECTION 32 17 13**

**SECTION 32 17 24  
PAVEMENT MARKINGS**

**PART 1 GENERAL**

**1.1 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publication as referred to within the text by the basic designation only. Use current applicable versions.

**ASTM INTERNATIONAL (ASTM)**

ASTM D 792            Density and Specific Gravity (Relative Density) of Plastics by  
Displacement

ASTM E 28            Softening Point of Resins Derived from Naval Stores by Ring and Ball  
Apparatus

**U.S. GREEN BUILDING COUNCIL (USGBC)**

LEED                 Leadership in Energy and Environmental Design(tm) Green Building  
Rating System

**APPLICABLE LOCAL AND STATE JURISDICTIONS**

**1.2 SUBMITTALS**

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment

Composition Requirements

Manufacturer's current printed product description and Material Safety Data Sheets (MSDS) for each type paint/color proposed for use.

Qualifications

Documentation on personnel qualifications, as specified.

### SD-06 Test Reports Sampling and Testing

Certified copies of the test reports, prior to the use of the materials at the jobsite. Testing shall be performed in an approved independent laboratory.

### SD-07 Certificates

#### Volatile Organic Compound (VOC)

Certificate stating that the proposed pavement marking paint meets the VOC regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located.

### 1.3 DELIVERY AND STORAGE

All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

### 1.4 EQUIPMENT

All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Equipment operating on roads and runways shall display low speed traffic markings and traffic warning lights.

#### 1.4.1 Paint Application Equipment

1.4.1.1 Self-Propelled or Mobile-Drawn Pneumatic Spraying Machines The equipment to apply paint to pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. The shall have a speed during application not less than 5 mph, and shall be capable of applying the stripe widths indicated, at the paint coverage rate specified in paragraph APPLICATION, and of even uniform thickness with clear-cut edges. Equipment used for marking streets and highways shall be capable of placing the prescribed number of lines at a single pass as solid lines, intermittent lines or a combination of solid and intermittent lines using a maximum of two different colors of paint as specified. The paint applicator shall have paint reservoirs or tanks of sufficient capacity and suitable gauges to apply paint in accordance with requirements specified. Tanks shall be equipped with suitable air-driven mechanical agitators. The spray mechanism shall be equipped with quick-action valves conveniently located, and shall include necessary pressure regulators and gauges in full view and reach of the operator. Paint strainers shall be installed in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Pneumatic spray guns shall be provided for hand application of paint in areas where the mobile paint applicator cannot be used.

#### 1.4.1.2 Hand-Operated, Push-Type Machines

All machines, tools, and equipment used in performance of the work shall be approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces will be acceptable for marking small streets and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

#### 1.4.2 Thermoplastic Application Equipment

##### 1.4.2.1 Thermoplastic Material

Thermoplastic material shall be applied to the primed pavement surface by spray techniques or by the extrusion method, wherein one side of the shaping die is the pavement and the other three sides are contained by, or are part of, suitable equipment for heating and controlling the flow of material. By either method, the markings shall be applied with equipment that is capable of providing continuous uniformity in the dimensions of the stripe.

##### 1.4.2.2 Application Equipment

a. Application equipment shall provide continuous mixing and agitation of the material. Conveying parts of the equipment between the main material reservoir and the extrusion shoe or spray gun shall prevent accumulation and clogging. All parts of the equipment which come into contact with the material shall be easily accessible and exposable for cleaning and maintenance. All mixing and conveying parts up to and including the extrusion shoes and spray guns shall maintain the material at the required temperature with heat-transfer oil or electrical-element-controlled heat.

b. The application equipment shall be constructed to ensure continuous uniformity in the dimensions of the stripe. The applicator shall provide a means for cleanly cutting off stripe ends squarely and shall provide a method of applying "skiplines". The equipment shall be capable of applying varying widths of traffic markings.

c. The applicator shall be equipped with a drop-on type bead dispenser capable of uniformly dispensing reflective glass spheres at controlled rates of flow. The bead dispenser shall be automatically operated and shall begin flow prior to the flow of composition to assure that the strip is fully reflectorized.

##### 1.4.2.3 Mobile and Maneuverable

Application equipment shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. The equipment used for the placement of thermoplastic pavement markings shall be of two general types: mobile applicator and portable

applicator.

a. Mobile Application Equipment: The mobile applicator shall be defined as a truck-mounted, self-contained pavement marking machine that is capable of hot applying thermoplastic by either the extrusion or spray method. The unit shall be equipped to apply the thermoplastic marking material at temperatures exceeding 375 degrees F, at widths varying from 3 to 12 inches and in thicknesses varying from 0.020 to 0.190 inch and shall have an automatic drop-on bead system. The mobile unit shall be capable of operating continuously and of installing a minimum of 20,000 lineal feet of longitudinal markings in an 8-hour day.

1. The mobile unit shall be equipped with a melting kettle which holds a minimum of 6000 pounds of molten thermoplastic material. The kettle shall be capable of heating the thermoplastic composition to temperatures of 375 to 425 degrees F. A thermostatically controlled heat transfer liquid shall be used. Heating of the composition by direct flame will not be allowed. Oil and material temperature gauges shall be visible at both ends of the kettle. The mobile unit shall be equipped with a spray gun system. The spray system shall consist of a minimum of four spray guns, located two on each side of the truck, and shall be capable of marking simultaneous edge line and centerline stripes. The spray system shall be surrounded (jacketed) with heating oil to maintain the molten thermoplastic at a temperature of 375 to 425 degrees F; and shall be capable of spraying a stripe of 3 to 12 inches in width, and in thicknesses varying from 0.055 inch to 0.095 inch, and of generally uniform cross section.

2. The mobile unit shall be equipped with an electronic programmable line pattern control system. The control system shall be capable applying skip or solid lines in any sequence, through any and all of the extrusion shoes, or the spray guns, and in programmable cycle lengths. In addition, the mobile unit shall be equipped with an automatic counting mechanism capable of recording the number of lineal feet of thermoplastic markings applied to the pavement surface with an accuracy of 0.5 percent.

b. Portable Application Equipment: The portable applicator shall be defined as hand-operated equipment, specifically designed for placing special markings such as crosswalks, stop bars, legends, arrows, and short lengths of lane, edge and centerlines. The portable applicator shall be capable of applying thermoplastic pavement markings by the extrusion method. The portable applicator shall be loaded with hot thermoplastic composition from the melting kettles on the mobile applicator. The portable applicator shall be equipped with all the necessary components, including a materials storage reservoir, bead dispenser, extrusion shoe, and heating accessories, so as to be capable of holding the molten thermoplastic at a temperature of 375 to 425 degrees F, of extruding a line of 3 to 12 inches in width, and in thicknesses of not less than 0.125 inch nor more than 0.190 inch and of generally uniform cross section.

### 1.4.3 Surface Preparation Equipment

#### 1.4.3.1 Waterblast Equipment

The water pressure shall be specified at 2600 psi at 140 degrees F in order to adequately clean the surfaces to be marked.

#### 1.4.4 Marking Removal Equipment

##### 1.4.4.1 Chemical Equipment

Chemical equipment shall be capable of application and removal of chemicals from the pavement surface, and shall leave only non-toxic biodegradable residue.

#### 1.4.5 Traffic Controls

Suitable warning signs shall be placed near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines or freshly placed raised markers to control traffic and prevent damage to painted surfaces or displacement of raised pavement markers. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

### 1.5 MAINTENANCE OF TRAFFIC

#### 1.5.1 Roads, Streets, and Parking Areas

When traffic must be rerouted or controlled to accomplish the work, the necessary warning signs, flagpersons, and related equipment for the safe passage of vehicles shall be provided.

### 1.6 WEATHER LIMITATIONS FOR REMOVAL

Pavement surface shall be free of snow, ice, or slush. Surface temperature shall be at least 40 degrees F and rising at the beginning of operations, except those involving shot or sand blasting. Operation shall cease during thunderstorms. Operation shall cease during rainfall, except for waterblasting and removal of previously applied chemicals. Waterblasting shall cease where surface water accumulation alters the effectiveness of material removal.

### 1.7 QUALIFICATIONS

The Contractor shall submit documentation certifying that pertinent personnel are qualified for equipment operation and handling of chemicals.

## PART 2 PRODUCTS

### 2.1 PAINT

The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Paints for airfields, roads, parking areas, and streets shall conform to FS TT-P-1952, color as indicated. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

### 2.2 THERMOPLASTIC COMPOUNDS

The thermoplastic reflectorized pavement marking compound shall be extruded or sprayed in a molten state onto a primed pavement surface. Following a surface application of glass beads and upon cooling to normal pavement temperatures, the marking shall be an adherent reflectorized strip of the specified thickness and width that is capable of resisting deformation by traffic.

#### 2.2.1 Composition Requirements

The binder component shall be formulated as a hydrocarbon resin. The pigment, beads and filler shall be uniformly dispersed in the binder resin. The thermoplastic composition shall be free from all skins, dirt, and foreign objects and shall comply with the following requirements:

Component	Percent by Weight	
	White	Yellow
Binder	17 min.	17 min.
Titanium dioxide	10 min.	-
Glass beads,	20 min.	20 min.
Calcium carbonate & inert fillers	49 max.	*
Yellow pigments	-	*

\*Amount and type of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, providing the other composition requirements of this specification are met.

## 2.2.2 Physical Properties

### 2.2.2.1 Color

The color shall be as indicated on the plans.

### 2.2.2.2 Drying Time

When installed at 70 degrees F and in thicknesses between 1/8 and 3/16 inch, after curing 15 minutes.

### 2.2.2.3 Softening Point

The composition shall have a softening point of not less than 194 degrees F when tested in accordance with ASTM E 28.

### 2.2.2.4 Specific Gravity

The specific gravity of the composition shall be between 1.9 and 2.2 as determined in accordance with ASTM D 792.

## 2.2.3 Asphalt Concrete Primer

The primer for asphalt concrete pavements shall be a thermosetting adhesive with a solids content of pigment reinforced synthetic rubber and synthetic plastic resin dissolved and/or dispersed in a volatile organic compound (VOC). Solids content shall not be less than 10 percent by weight at 70 degrees F and 60 percent relative humidity. A wet film thickness of 0.005 inch plus or minus 0.001 inch, shall dry to a tack-free condition in less than 5 minutes.

## 2.2.4 Portland Cement Concrete Primer

The primer for Portland cement concrete pavements shall be an epoxy resin primer. The primer shall be of the type recommended by the manufacturer of the thermoplastic composition. Epoxy primers recommended by the manufacturer shall be approved by the Contracting Officer prior to use. Requests for approval shall be accompanied with technical data, instructions for use, and a 1 quart sample of the primer material.

## 2.3 SAMPLING AND TESTING

Materials proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at source of supply, sufficiently in advance of needs to allow 60 days for testing. Upon notification by the Contractor that the material is at the site or source of supply, a sample

shall be taken by random selection from sealed containers by the Contractor in the presence of a representative of the Contracting Officer. Samples shall be clearly identified by designated name, specification number, batch number, manufacturer's formulation number, project contract number, intended use, and quantity involved. Testing shall be performed in an approved independent laboratory. If materials are approved based on reports furnished by the Contractor, samples will be retained by the Government for possible future testing should the material appear defective during or after application.

## PART 3

### EXECUTION 3.1 SURFACE PREPARATION

Surfaces to be marked shall be thoroughly cleaned before application of the pavement marking material. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, or approved chemicals. Areas of pavement affected with oil or grease shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking. Surfaces shall be recleaned, when work has been stopped due to rain.

#### 3.1.1 Cleaning Concrete Curing Compounds

On new Portland cement concrete pavements, cleaning operations shall not begin until a minimum of 30 days after the placement of concrete. All new concrete pavements shall be cleaned by water blasting. When water blasting is performed, thermoplastic and preformed markings shall be applied no sooner than 24 hours after the blasting has been completed.

The extent of the blasting work shall be to clean and prepare the concrete surface as follows:

- a. There is no visible evidence of curing compound on the peaks of the textured concrete surface.
- b. There are no heavy puddled deposits of curing compound in the valleys of the textured concrete surface.
- c. All remaining curing compound is intact; all loose and flaking material is removed.
- d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.

e. The surface to be marked is dry.

### 3.2 APPLICATION

All pavement markings and patterns shall be placed as shown on the plans.

#### 3.2.1 Paint

Paint shall be applied to clean, dry surfaces, and only when air and pavement temperatures are above 40 degrees F and less than 95 degrees F.

Paint temperature shall be maintained within these same limits. New asphalt pavement surfaces and new Portland concrete cement shall be allowed to cure for a period of not less than 30 days before applications of paint. Paint shall be applied pneumatically with approved equipment at rate of coverage specified . The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

##### 3.2.1.1 Rate of Application

Nonreflective Markings: Paint shall be applied evenly to the pavement surface to be coated at a rate of 105 plus or minus 5 square feet/gallon. Reflective Markings: Paint shall be applied the same as for nonreflective markings. Apply glass beads at the rate of 6 pounds/ gallon while paint is still wet.

##### 3.2.1.2 Drying

The maximum drying time requirements of the paint specifications will be strictly enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a delay in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

#### 3.2.2 Thermoplastic Compounds

Thermoplastic pavement markings shall be placed upon dry pavement; surface dry only will not be considered an acceptable condition. At the time of installation, the pavement surface temperature shall be a minimum of 40 degrees F and rising. Thermoplastics, as placed, shall be free from dirt or tint.

##### 3.2.2.1 Longitudinal Markings

All centerline or other longitudinal type markings shall be applied with a mobile applicator. All special markings, crosswalks, stop bars, legends, arrows, and similar patterns shall be placed with a portable applicator, using the extrusion method.

#### 3.2.2.2 Primer

After surface preparation has been completed the asphalt and/or concrete pavement surface shall be primed. The primer shall be applied with spray equipment. Primer materials shall be allowed to "set-up" prior to applying the thermoplastic composition. The asphalt concrete primer shall be allowed to dry to a tack-free condition, usually occurring in less than 10 minutes. The Portland cement concrete primer shall be allowed to dry in accordance with the thermoplastic manufacturer's recommendations. To shorten the curing time of the epoxy resins an infrared heating device may be used on the concrete primer.

a. Asphalt Concrete Primer: Primer shall be applied to all asphalt concrete pavements at a wet film thickness of 0.005 inch, plus or minus 0.001 inch (265-400 square feet/gallon).

b. Portland Cement Concrete Primer: Primer shall be applied to all concrete pavements at a wet film thickness of between 0.04 to 0.05 inch (320-400 square feet/gallon).

#### 3.2.2.3 Markings

After the primer has "set-up", the thermoplastic shall be applied at temperatures no lower than 375 degrees F nor higher than 425 degrees F at the point of deposition. Immediately after installation of the marking, drop-on glass spheres shall be mechanically applied so that the spheres are held by and imbedded in the surface of the molten material.

a. Extruded Markings: All extruded thermoplastic markings shall be applied at the specified width and at a thickness of not less than 0.125 inch nor more than 0.190 inch.

b. Sprayed Markings: All sprayed thermoplastic markings shall be applied at the specified width and the thicknesses designated in the contract plans. If the plans do not specify a thickness, centerline markings shall be applied at a wet thickness of 0.090 inch, plus or minus 0.005 inch, and edge line markings at a wet thickness of 0.060 inch plus or minus 0.005 inch.

### 3.3 MARKING REMOVAL

#### 3.3.1 Cleanup and Waste Disposal

The worksite shall be kept clean of debris and waste from the removal operations. Cleanup shall immediately follow removal operations in areas subject to air traffic. Debris

**END OF SECTION 32 17 24**

**SECTION 32 17 26**  
**TACTILE WARNING TRUNCATED DOMES DETECTABLE WARNINGS**

**PART 1 GENERAL**

**1.1 Section Includes**

Detectable Warnings/ Truncated Domes Tactile Surfaces

**1.2 RELATED REQUIREMENTS**

03 30 00 Cast-in-Place Concrete.

07 92 00 Joint Sealants

32 17 24 Pavement Markings

32 17 26 Tactile Warning surfaces

**1.3 SUBMITTALS**

Qualification Data: Installer to provide documentation of approval and training by manufacturer.

Product Data: Provide product criteria, characteristics, and current accredited testing data.

Manufacturer's Installation Instructions: Indicate any special preparation of substrate, installation and attachment methods, and all conditions requiring special attention.

Warranty: Submit warranties upon completion of work and ensure all forms have been completed in Owner's name within 30 days of scope completion.

Maintenance Data: For users operation and maintenance of system including:

Methods for maintaining system's materials and finishes.

Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

**1.4 QUALITY ASSURANCE**

Installer Qualifications: Authorized and trained by manufacturer.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. Store in temperature ranges of 25 - 90 degrees F.

## **1.6 WARRANTY**

Installation Warranty: Contractor shall correct defective work within a 2 year period after Date of Substantial Completion.

Manufacturer Warranty: Provide 5 year warranty for tactile warning surfacing for failing to maintain more than 95% of their surface adhesion, or nonskid characteristics.

## **PART 2 - PRODUCTS**

### **2.1 DESCRIPTION**

Tactile warning surfacing (TWSI) and nonskid coatings for pedestrian traffic.

### **2.2 PERFORMANCE AND DESIGN CRITERIA**

ATBCB PROWAG - Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way; 2011.

36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

49 CFR 27, 37, and 38 - Standards for Accessible Transportation Facilities, Final Rule; Department of Transportation; current edition.

ADAAG requirements (Title 49, Part 37.9 Standards for Accessible Transportation Facilities, Appendix A, Section 4.29.2 – Detectable warnings on walking surfaces)

### **LOCAL AND STATE APPLICABLE AGENCIES**

### **2.3 DETECTABLE WARNING**

Truncated Domes:

Basis of Design Product: Detectable Warning (Truncated Dome) ADA Systems. Comparable and substituted products will be judged based on the following performance criteria, features, warranty, and qualifications.

Performance Criteria:

Substrate Requirements:

Portland Cement:

Strength: 3,000 PSI minimum.

Finish: Medium broom finish or coarser profile.

Cure: 20 day minimum.

Asphalt:

Compaction: 95% minimum.

Finish: Rolled, compacted, smooth.

Cure: 20 day minimum.

Skid Resistance: 0.80 minimum in accordance with ASTM F1679.

UV Resistance: 99% minimum Fade Resistance and Color Retention in accordance with ASTM G155.

Chemical Resistance: Tested for 7 days.

Road Salts: no effect.

Anti-freeze: no effect.

Diesel fuel: no effect.

Gasoline: no effect.

Transmission fluid: no effect.

Motor oil: no effect.

VOC: 25 g/l maximum. Tested in accordance with ASTM D2205.

Water Absorption: Maximum 0.5%. Tested in accordance with ASTM D570.

Smoke Development: Pass. Tested in accordance with EN ISO 9239-1.

Flame Spread: Less than 150 mm. Tested in accordance with EN ISO 11925-2.

Shore Hardness: Shore Durometer, A-1, 80 minimum after 24 hours. Tested in accordance with ASTM D2240.

Tracking: None. Tested for 32 minutes maximum in accordance with ASTM D711.

Viscosity: 6000-12000 cps ASTM D2196 - Brookfield #7 spindle @20 rpm, 77 deg F

Color: White, Red, Blue, Black, Yellow, Gray, Green and derivative colors

Seamless installation. Adhesive, sealants or mechanical fasteners not required.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

Verify surface is free of surface applied sealers, coloring agents, or other materials detrimental to surface bond.

Verify existing conditions meet manufacturer's requirements before starting work.

Verify surface temperature is between 35 degrees F and 88 degrees F.

### **3.2 PREPARATION**

Prepare surfaces to receive work in accordance with manufacturer's instructions.

Grind or abrade to remove surface applied sealers, coloring agents, oils, bond breakers, or any surface applied or infused materials that will cause rejection of adhesion and provide required surface profile.

Broom or air sweep clean surfaces free of debris, vegetation and material impacting adhesion.

Provide completely dry surface, with moisture content not exceeding 6%.

### **3.3 INSTALLATION**

General: Install all materials in accordance with manufacturer's instructions based on conditions present.

Truncated Domes:

Mask work area.

Reducer:

Mix and catalyze Reducer component in accordance with installation instructions.

Install Reducer component. Cross roll at 90 degrees to ensure appropriate coverage and penetration. Wait minimum 30 minutes for Reducer component to cure.

Base/Nonskid:

Mix and catalyze base component in approved color(s) in accordance with installation instructions.

Fill all surface deformities with manufacture's recommended materials.

Install Base component and cross roll at 90 degrees up to 3 times to ensure adequate coverage and penetration.

Remove masking immediately upon completion.

Wait minimum 30 minutes for base component to cure.

Domes:

Layout dome forms in accordance with contract documents and dimensional allowances.

Mix and catalyze base component in approved color(s) in accordance with installation instructions.

Pour catalyzed base component onto mats in coverage rates indicated by manufacturer.

Apply material as per manufacturers recommended procedures to ensure adequate coverage and penetration of all apertures.

Remove excess material

Remove forms immediately in accordance with manufacturer's instructions.

Wait minimum 30 minutes for final component to cure.

When material is tack free, surface is ready for pedestrian traffic.

### **3.4 CLEANING**

Clean as needed with very light pressure wash without the use of soaps, abrasives or rotary tip.

### **3.5 PROTECTION**

Protect installed work areas required by the manufacturer until work is complete to maintain product performance, design criteria and warranty.

**END OF SECTION 32 17 2**