**TECHNICAL SPECIFICATIONS**

SANTA FE COUNTY
JACONA COLLECTION CENTER

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SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Project consists of a fire station with sleeping and living quarters, an apparatus barn and associated support spaces.

1. Project Location: Jacona, New Mexico
2. Owner: Santa Fe County

B. Architect Identification: The Contract Documents, dated 8/1/15), were prepared for Project by Riskin Associates Architecture, Inc., 227 E. Palace Avenue, Suite C, Santa Fe, New Mexico, 87501.

C. Project Coordinator: Joseph Martinez has been appointed by Owner to serve as Project Coordinator.

D. The Work consists of a waste collection center with a 6,713 square foot main building for waste/recycling, a 1000 square foot covered re-use area, a 3,326 square foot pad for greenwaste and an 800 square foot pad for scrap metal/tires. Also included is a road to serve the facility and associated parking/driveways. Utilities include new electrical service, telephone, a well and well-housing and two cisterns.

1. The Work includes concrete block and concrete foundations, bent frame structures, steel construction, metal roofing, steel windows and doors and interior finishes consisting of drywall, paint, acoustical and drywall ceilings and ceramic wall tile. Equipment and specialties include casework, plumbing fixtures/accessories as well as a trench drains, oil separator/sediment trap and vehicle bay doors. Sitework includes parking, concrete sidewalks and landscaping/irrigation.

2. All required permits (including those required by CID and Santa Fe County and EID septic) are the responsibility of the Contractor. The Contractor shall coordinate and arrange for permits, pick up permits AND pay for all permits required. The Contractor is responsible for the entire cost of permits and fees. An access permit has already been obtained for roadway improvements. See the NMDOT Highway 502 Access Permit Specifications available on the County's website. All other required permits related to Highway 502 shall be obtained by the Contractor. The Contractor shall submit the ED permit, well permit and septic permit to Santa Fe County Land Use (José Larrañaga) prior to beginning any work.

3. The Contractor is responsible for bringing in temporary utilities (including all associated costs) as needed, including but not limited to water and electricity.

4. Cut and fill are approximately balanced; any excess earth/soil/fill shall be retained on-site (location as directed by Owner) for the Owner's use.

1.3 CONTRACT

A. Project will be constructed under a general construction contract.

1.4 USE OF PREMISES

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

1.5 PRODUCTS ORDERED IN ADVANCE

A. General: Owner has negotiated Purchase Orders with suppliers of material and equipment to be incorporated into the Work. Owner has assigned these Purchase Orders to Contractor. Costs for receiving, handling, storage if required, and installation of material and equipment are included in the Contract Sum.

1. Contractor's responsibilities are the same as if Contractor had negotiated Purchase Orders, including responsibility to renegotiate purchase and to execute final Purchase-Order agreements.
2. The Schedule of Products Ordered in Advance is included at the end of this Section.

1.6 SEPARATE CONTRACTS

A. The Contractor shall coordinate with OAS (Office of Archaeological Services) to avoid any disturbance to the two archaeological sites identified in the Archaeological Survey. The Contractor shall fence off those areas as directed by OAS and shall take all precautions as outlined in the Survey.

1.7 UTILITIES

There are no utilities currently on-site. A well is part of the Contract Documents. Until the well has been constructed, the Contractor will be responsible for providing water as needed for construction. The Contractor is responsible for bringing in temporary utilities (including all associated costs) as needed, including but not limited to water and electricity.

The primary electrical service to the transformer, the transformer and the primary conductors is by the Utility (Jemez Mountain). The contractor will provide the pad, bollards, secondary conduit and secondary conductors. The Contractor shall assist the Owner with submitting a Request for New Service to the Electrical Utility (Jemez Mountain) and shall coordinate with the Utility as needed to obtain service. The Contractor shall provide all documents to the Utility as needed.

1.8 SITE ACCESS

For site access during construction, the Contractor shall coordinate with NMDOT regarding the use of the Jacona Land Grant access road driveway. The Contractor will be allowed to use the dirt road connecting the facility with the Land Grant access road for construction access provided the road is returned to a finished, graded state at the end of the project.

1.9 SOILS CONDITIONS AND GEOTECHNICAL (SOILS) REPORT

There are no It is the responsibility of the Contractor to comply with the soils report; imported soil may be required. Means and methods are also the Contractor’s responsibility. Any excess cut volume will be used

adjacent to the site on the old trash site as cover; the Contractor shall coordinate with the Owner regarding location.

The soils report defines the criteria for engineered fill and supercedes the specifications; it is the responsibility of the Contractor to source that fill. The Contractor is also responsible for means and methods.

It is the responsibility of the Contractor to comply with the soils report and to determine the final cut and fill amounts. The cut and fill listed on the grading plan is based only on the bottom of slab; it is a guide and estimate only.

1.10 TESTING AND INSPECTIONS

A. Testing responsibility shall be as follows:

| Type | Scheduling/Coordination | Financial Responsibility |
|---|---|---|
| Earthwork/Backfill | Contractor | Contractor |
| Site Concrete/Asphalt | Contractor | Contractor |
| Building Concrete | Contractor | Contractor |
| Structural Steel/Framing/Assembly | Contractor | Owner hires Special Inspector |
| Field Corrections related to Special Inspections | Contractor | Contractor |
| All Other Testing | Contractor | Contractor |

1.11 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

# SECTION 01210 - ALLOWANCES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.

1. Certain materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.

C. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Division 1 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

D. Allowances do not include General Contractor overhead and profit.

### 1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

### 1.4 SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Show all receipts and backup information to substantiate costs for these allowances. Any amounts over the allowance shall be approved by the Owner in writing prior to any costs incurred; if the costs are approved they shall be a change order. Any amounts remaining unspent from the allowance shall be returned to the owner in the form of a change order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Include $2200 (not including New Mexico Gross Receipts Tax) for Catwalk (see 11/A7.0).

END OF SECTION 01210

# SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

### 1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Supplemental Instructions."

### 1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within 7 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.

1. Include a statement outlining 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 the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01250

# SECTION 01290 - PAYMENT PROCEDURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:
   1. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

### 1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

### 1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

      a. Application for Payment forms with Continuation Sheets.
      b. Submittals Schedule.

   2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

   1. Identification: Include the following Project identification on the Schedule of Values:

      a. Project name and location.
      b. Name of Architect.
      c. Contractor's name and address.
      d. Date of submittal.

   2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.
b. Description of the Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value.

1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.

6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

## 1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Submittals Schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.
12. Certificates of insurance and insurance policies.
13. Performance and payment bonds.
14. Data needed to acquire Owner's insurance.
15. Initial settlement survey and damage report if required.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01290

# SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Coordination Drawings.
4. Administrative and supervisory personnel.
5. Project meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

### 1.3 COORDINATION

A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.

2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

## 1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Indicate relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Refer to Division 15 Section "Basic Mechanical Materials and Methods" and Division 16 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for mechanical and electrical installations.

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

## 1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

## 1.6 PROJECT MEETINGS

A. General: Architect will conduct weekly progress meetings and conferences at Project site.

B. Preconstruction Conference: Attend a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Architect will conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Critical work sequencing.
c. Designation of responsible personnel.
d. Procedures for processing field decisions and Change Orders.
e. Procedures for processing Applications for Payment.
f. Submittal procedures.
g. Use of the premises.
h. Responsibility for temporary facilities and controls.
i. Office, work, and storage areas.
j. Equipment deliveries and priorities.
k. First aid.
l. Security.
m. Progress cleaning.
n. Working hours.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates at least 7 days in advance.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   a. Related Change Orders.
   b. Purchases.
   c. Deliveries.
   d. Submittals.
   e. Review of mockups.
   f. Possible conflicts.
   g. Compatibility problems.
   h. Time schedules.
   i. Weather limitations.
   j. Manufacturer's written recommendations.
   k. Warranty requirements.
   l. Compatibility of materials.
   m. Acceptability of substrates.
   n. Temporary facilities and controls.
   o. Space and access limitations.
   p. Regulations of authorities having jurisdiction.
   q. Testing and inspecting requirements.
   r. Required performance results.
   s. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements.
4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Attend progress meetings at minimum weekly intervals. Coordinate dates of payment requests with meetings.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.
14) Documentation of information for payment requests.

c. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

# SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Special reports.

B. Related Sections include the following:
1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
3. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

### 1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

## 1.4 SUBMITTALS

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

B. Contractor's Construction Schedule: Submit two printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period. Submit initial progress schedules and schedul of values in duplicate within 7 days after execution of Owner-Contractor Agreement. After review by Architect, revise and resubmit as required. Submit revised schedules with first Application for Payment and each subsequent Application for Payment, reflecting changes since previous submittal.

C. Daily Construction Reports: Submit one copy at monthly intervals.

D. Material Location Reports: Submit one copy at monthly intervals.

E. Field Condition and Special Reports: Submit one copy at time of discovery of differing conditions.

## 1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

# PART 2 - PRODUCTS

## 2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with Schedule of Values, and Construction Schedule.
2. Initial Submittal: Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Comply with the following:

1. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
2. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's [and Construction Manager's] administrative procedures necessary for certification of Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

F. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

G. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
1. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
2. Use "one workday" as the unit of time.

H. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Purchase of materials.
c. Delivery.
d. Fabrication.
e. Installation.

2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
3. Format: Horizontal bar chart with separate bar for each major trade or operation, identifying first work day of each week.
4. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. Show projected percentage of completion ofor each item of Work as of time of each Application for Progress Payment.

5. Show submittal dates required for Shop Drawing, Product Data and Samples, and product deliverty dates, including those furnished by Owner.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors, separate contractors at Project site.
2. Approximate count of personnel at Project site.
3. High and low temperatures and general weather conditions.
4. Accidents.
5. Stoppages, delays, shortages, and losses.
6. Meter readings and similar recordings.
7. Emergency procedures.
8. Orders and requests of authorities having jurisdiction.
9. Construction Change Directives received.
10. Services connected and disconnected.
11. Equipment or system tests and startups.
12. Partial Completions and occupancies.

B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.Post copies in Project meeting rooms and temporary field offices.

END OF SECTION 01320

# SECTION 01330 - SUBMITTAL PROCEDURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for submitting Applications for Payment.
2. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
4. Division 1 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals.
5. Division 1 Section "Closeout Procedures" for submitting warranties and operation and maintenance manuals.
6. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
7. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

### 1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

### 1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Allow 15 days for processing each resubmittal.
4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

E. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 4 by 5 inches (100 by 125 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Unique identifier, including revision number.
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.

F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy for the Architect’s records, one copy for the Consultant’s records and one copy for the Owner’s records in addition to the other copies required by Contractor, Subcontractors and Suppliers.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.
   a. Number of Copies: Copy for Architect, copy for Consultant, copy for Owner. Any additional copies will be returned by the Architect for the Contractor's use.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

   1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:

      a. Manufacturer's written recommendations.
      b. Manufacturer's product specifications.
      c. Manufacturer's installation instructions.
      d. Standard color charts.
      e. Manufacturer's catalog cuts.
      f. Wiring diagrams showing factory-installed wiring.
      g. Printed performance curves.
      h. Operational range diagrams.
      i. Mill reports.
      j. Standard product operating and maintenance manuals.
      k. Compliance with recognized trade association standards.
      l. Compliance with recognized testing agency standards.
      m. Application of testing agency labels and seals.
      n. Notation of coordination requirements.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

   1. Preparation: Include the following information, as applicable:

      a. Dimensions.
      b. Identification of products.
      c. Fabrication and installation drawings.
      d. Roughing-in and setting diagrams.
      e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
      f. Shopwork manufacturing instructions.
      g. Templates and patterns.
      h. Schedules.
      i. Design calculations.
      j. Compliance with specified standards.
      k. Notation of coordination requirements.
      l. Notation of dimensions established by field measurement.

   2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
   3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 42 inches (750 by 1050 mm).
   4. Number of Copies: Submit at least one correctable, translucent, reproducible print of each submittal. Architect will return the reproducible print.

D. Samples: Prepare physical units of materials or products, including the following:

1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
4. Preparation: Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:

    a. Generic description of Sample.
    b. Product name or name of manufacturer.
    c. Sample source.

5. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.

    a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
    b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

6. Number of Samples for Initial Selection: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
7. Number of Samples for Verification: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

    a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

    b. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

E. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form: Name, address, and telephone number of entity performing subcontract or supplying products.

## 2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Requirements."

B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

J. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.

K. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

L. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

M. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

N. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures."

P. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

Q. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

R. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

S. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

T. Material Safety Data Sheets: Submit information directly to Owner. If submitted to Architect, Architect will not review this information but will return it with no action taken.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows: Approved, Approved as Noted, Revise and Resubmit, Not Approved, No Action Required, Other.

C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

END OF SECTION 01330

# SECTION 01400 - QUALITY REQUIREMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-control services required by Architect, Owner or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:
1. Division 1 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
2. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
3. Divisions 2 through 16 Sections for specific test and inspection requirements.

### 1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include Date of issue, Name, address, and telephone number of testing agency, Dates and locations of samples and tests or inspections, Names of individuals making tests and inspections, Description of the Work and test and inspection method, Complete test or inspection data, Test and inspection results and an interpretation of test results, Ambient conditions at time of sample taking and testing and inspecting, Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements, Name and signature of laboratory inspector, Recommendations on retesting and reinspecting

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

G. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.

1. Contractor responsibilities include the following:

a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

## 1.6 QUALITY CONTROL

A. Owner Responsibilities: The owner will contract and pay for Special Inspections only.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction. All testing (including but not limited to geotechnical, concrete interior and concrete exterior) except Special Inspections are the Contractor's responsibility.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
2. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
3. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
4. Submit copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.

1. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.

3. Testing agency will retest and reinspect corrected work.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment, including service connections. Report results in writing.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work.
2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400

SECTION 01420 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

J. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

K. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 CONSTRUCTION DOCUMENTS INTENT

A. The intent of the Construction Documents is to include all items necessary for the proper execution and completion of the Work. The Construction Documents are complementary and what is required by any one, shall be as binding as if required by all. In the event of a conflict between the contract documents the more stringent shall govern in the sole judgement of the Architect.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.

E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web-site addresses are subject to change.

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| ADAAG | Americans with Disabilities Act (ADA)<br>Accessibility Guidelines for Buildings and Facilities<br>Available from Access Board<br>www.access-board.gov | <br><br>(800) 872-2253<br>(202) 272-5434 |
| CFR | Code of Federal Regulations<br>Available from Government Printing Office<br>www.access.gpo.gov/nara/cfr | <br>(888) 293-6498<br>(202) 512-1530 |
| CRD | Handbook for Concrete and Cement<br>Available from Army Corps of Engineers<br>Waterways Experiment Station<br>www.wes.army.mil | <br><br>(601) 634-2355 |
| DOD | Department of Defense Specifications and Standards<br>Available from Defense Automated Printing Service<br>www.astimage.daps.dla.mil/online | <br>(215) 697-6257 |
| FED-STD | Federal Standard<br>(See FS) | |
| FS | Federal Specification | |

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| | Available from Defense Automated Printing Service<br>www.astimage.daps.dla.mil/online | (215) 697-6257 |
| | Available from General Services Administration<br>www.fss.gsa.gov/pub/fed-specs.cfm | (202) 619-8925 |
| | Available from National Institute of Building Sciences<br>www.nibs.org | (202) 289-7800 |
| FTMS | Federal Test Method Standard<br>(See FS) | |
| MILSPEC | Military Specification and Standards<br>Available from Defense Automated Printing Service<br>www.astimage.daps.dla.mil/online | (215) 697-6257 |
| UFAS | Uniform Federal Accessibility Standards<br>Available from Access Board<br>www.access-board.gov | (800) 872-2253<br>(202) 272-5434 |

1.5 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list or indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S." Names, telephone numbers, and Web-site addresses are subject to change.

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|---|---|---|
| AA | Aluminum Association, Inc. (The)<br>www.aluminum.org | (202) 862-5100 |
| AAADM | American Association of Automatic Door Manufacturers<br>www.aaadm.com | (216) 241-7333 |
| AABC | Associated Air Balance Council<br>www.aabchq.com | (202) 737-0202 |
| AAMA | American Architectural Manufacturers Association<br>www.aamanet.org | (847) 303-5664 |
| AAN | American Association of Nurserymen<br>(See ANLA) | |
| AASHTO | American Association of State Highway and Transportation Officials<br>www.aashto.org | (202) 624-5800 |
| AATCC | American Association of Textile Chemists and Colorists (The)<br>www.aatcc.org | (919) 549-8141 |
| ABMA | American Bearing Manufacturers Association<br>www.abma-dc.org | (202) 367-1155 |
| ACI | American Concrete Institute/ACI International<br>www.aci-int.org | (248) 848-3700 |
| ACPA | American Concrete Pipe Association | (972) 506-7216 |

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| | www.concrete-pipe.org | |
| AEIC | Association of Edison Illuminating Companies, Inc. (The)<br>www.aeic.org | (205) 257-2530 |
| AFPA | American Forest & Paper Association<br>(See AF&PA) | |
| AF&PA | American Forest & Paper Association<br>www.afandpa.org | (800) 878-8878<br>(202) 463-2700 |
| AGA | American Gas Association<br>www.aga.org | (202) 824-7000 |
| AGC | Associated General Contractors of America (The)<br>www.agc.org | (703) 548-3118 |
| AHA | American Hardboard Association<br>www.hardboard.org | (847) 934-8800 |
| AHAM | Association of Home Appliance Manufacturers<br>www.aham.org | (202) 872-5955 |
| AI | Asphalt Institute<br>www.asphaltinstitute.org | (859) 288-4960 |
| AIA | American Institute of Architects (The)<br>www.aia.org | (800) 242-3837<br>(202) 626-7300 |
| AISC | American Institute of Steel Construction<br>www.aisc.org | (800) 644-2400<br>(312) 670-2400 |
| AISI | American Iron and Steel Institute<br>www.steel.org | (202) 452-7100 |
| AITC | American Institute of Timber Construction<br>www.aitc-glulam.org | (303) 792-9559 |
| ALCA | Associated Landscape Contractors of America<br>www.alca.org | (800) 395-2522<br>(703) 736-9666 |
| ALSC | American Lumber Standard Committee | (301) 972-1700 |
| AMCA | Air Movement and Control Association International, Inc.<br>www.amca.org | (847) 394-0150 |
| ANLA | American Nursery & Landscape Association<br>(Formerly: AAN - American Association of Nurserymen)<br>www.anla.org | (202) 789-2900 |
| ANSI | American National Standards Institute<br>www.ansi.org | (202) 293-8020 |
| AOSA | Association of Official Seed Analysts<br>www.aosaseed.com | (505) 522-1437 |
| APA | APA - The Engineered Wood Association<br>www.apawood.org | (253) 565-6600 |

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| APA | Architectural Precast Association<br>www.archprecast.org | (941) 454-6989 |
| API | American Petroleum Institute<br>www.api.org | (202) 682-8000 |
| ARI | Air-Conditioning & Refrigeration Institute<br>www.ari.org | (703) 524-8800 |
| ASCA | Architectural Spray Coaters Association<br>www.ascassoc.com | (609) 848-6120 |
| ASCE | American Society of Civil Engineers<br>www.asce.org | (800) 548-2723<br>(703) 295-6300 |
| ASHRAE | American Society of Heating, Refrigerating and Air-Conditioning Engineers<br>www.ashrae.org | (800) 527-4723<br>(404) 636-8400 |
| ASME | ASME International<br>(The American Society of Mechanical Engineers International)<br>www.asme.org | (800) 843-2763<br>(212) 591-7722 |
| ASSE | American Society of Sanitary Engineering<br>www.asse-plumbing.org | (440) 835-3040 |
| ASTM | ASTM International<br>(American Society for Testing and Materials International)<br>www.astm.org | (610) 832-9585 |
| AWCI | AWCI International<br>(Association of the Wall and Ceiling Industries International)<br>www.awci.org | (703) 534-8300 |
| AWCMA | American Window Covering Manufacturers Association<br>(See WCMA) | |
| AWI | Architectural Woodwork Institute<br>www.awinet.org | (800) 449-8811<br>(703) 733-0600 |
| AWPA | American Wood-Preservers' Association<br>www.awpa.com | (817) 326-6300 |
| AWS | American Welding Society<br>www.aws.org | (800) 443-9353<br>(305) 443-9353 |
| AWWA | American Water Works Association<br>www.awwa.org | (800) 926-7337<br>(303) 794-7711 |
| BHMA | Builders Hardware Manufacturers Association<br>www.buildershardware.com | (212) 297-2122 |
| BIA | Brick Industry Association (The)<br>www.bia.org | (703) 620-0010 |
| BIFMA | BIFMA International<br>(Business and Institutional Furniture Manufacturer's | (616) 285-3963 |

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| | Association International)<br>www.bifma.com | |
| CCC | Carpet Cushion Council<br>www.carpetcushion.org | (203) 637-1312 |
| CCFSS | Center for Cold-Formed Steel Structures<br>www.umr.edu/~ccfss | (573) 341-4471 |
| CDA | Copper Development Association Inc.<br>www.copper.org | (800) 232-3282<br>(212) 251-7200 |
| CEA | Canadian Electricity Association<br>www.canelect.ca | (613) 230-9263 |
| CFFA | Chemical Fabrics & Film Association, Inc.<br>www.chemicalfabricsandfilm.com | (216) 241-7333 |
| CGA | Compressed Gas Association<br>www.cganet.com | (703) 788-2700 |
| CGSB | Canadian General Standards Board<br>www.pwgsc.gc.ca/cgsb | (819) 956-0425 |
| CIMA | Cellulose Insulation Manufacturers Association<br>www.cellulose.org | (888) 881-2462<br>(937) 222-2462 |
| CISCA | Ceilings & Interior Systems Construction Association<br>www.cisca.org | (630) 584-1919 |
| CISPI | Cast Iron Soil Pipe Institute<br>www.cispi.org | (423) 892-0137 |
| CLFMI | Chain Link Fence Manufacturers Institute<br>www.chainlinkinfo.org | (301) 596-2583 |
| CPPA | Corrugated Polyethylene Pipe Association<br>www.cppa-info.org | (800) 510-2772<br>(202) 462-9607 |
| CRI | Carpet & Rug Institute (The)<br>www.carpet-rug.com | (800) 882-8846<br>(706) 278-3176 |
| CRSI | Concrete Reinforcing Steel Institute<br>www.crsi.org | (847) 517-1200 |
| CSA | CSA International<br>(Formerly: IAS - International Approval Services)<br>www.csa-international.org | (800) 463-6727<br>(416) 747-4000 |
| CSI | Construction Specifications Institute (The)<br>www.csinet.org | (800) 689-2900<br>(703) 684-0300 |
| CSSB | Cedar Shake & Shingle Bureau<br>www.cedarbureau.org | (604) 820-7700 |
| CTI | Cooling Technology Institute<br>(Formerly: Cooling Tower Institute)<br>www.cti.org | (281) 583-4087 |

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| DHI | Door and Hardware Institute<br>www.dhi.org | (703) 222-2010 |
| EIA | Electronic Industries Alliance<br>www.eia.org | (703) 907-7500 |
| EIMA | EIFS Industry Members Association<br>www.eifsfacts.com | (800) 294-3462<br>(770) 968-7945 |
| EJMA | Expansion Joint Manufacturers Association, Inc.<br>www.ejma.org | (914) 332-0040 |
| FCI | Fluid Controls Institute<br>www.fluidcontrolsinstitute.org | (216) 241-7333 |
| FGMA | Flat Glass Marketing Association<br>(See GANA) | |
| FM | Factory Mutual System<br>(See FMG) | |
| FMG | FM Global<br>(Formerly: FM - Factory Mutual System)<br>www.fmglobal.com | (401) 275-3000 |
| FSC | Forest Stewardship Council<br>www.fscoax.org | 52 951 5146905 |
| GA | Gypsum Association<br>www.gypsum.org | (202) 289-5440 |
| GANA | Glass Association of North America<br>(Formerly: FGMA - Flat Glass Marketing Association)<br>www.glasswebsite.com/gana | (785) 271-0208 |
| GRI | Geosynthetic Research Institute<br>www.drexel.edu/gri | (215) 895-2343 |
| GTA | Glass Tempering Division of Glass Association of North America<br>(See GANA) | |
| HI | Hydraulic Institute<br>www.pumps.org | (888) 786-7744<br>(973) 267-9700 |
| HI | Hydronics Institute<br>www.gamanet.org | (908) 464-8200 |
| HMMA | Hollow Metal Manufacturers Association<br>(See NAAMM) | |
| HPVA | Hardwood Plywood & Veneer Association<br>www.hpva.org | (703) 435-2900 |
| HPW | H. P. White Laboratory, Inc.<br>www.hpwhite.com | (410) 838-6550 |

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| IAS | International Approval Services<br>(See CSA) | |
| ICEA | Insulated Cable Engineers Association, Inc.<br>www.icea.net | (770) 830-0369 |
| ICRI | International Concrete Repair Institute, Inc.<br>www.icri.org | (847) 827-0830 |
| IEC | International Electrotechnical Commission<br>www.iec.ch | 41 22 919 02 11 |
| IEEE | Institute of Electrical and Electronics Engineers, Inc. (The)<br>www.ieee.org | (212) 419-7900 |
| IESNA | Illuminating Engineering Society of North America<br>www.iesna.org | (212) 248-5000 |
| IGCC | Insulating Glass Certification Council<br>www.igcc.org | (315) 646-2234 |
| IGMA | Insulating Glass Manufacturers Alliance (The)<br>www.igmaonline.org | (613) 233-1510 |
| ILI | Indiana Limestone Institute of America, Inc.<br>www.iliai.com | (812) 275-4426 |
| ISSFA | International Solid Surface Fabricators Association | (702) 567-8150 |
| I3A | International Imaging Industry Association<br>(Formerly: PIMA - Photographic & Imaging Manufacturers Association)<br>www.pima.net | (914) 698-7603 |
| ITS | Intertek Testing Services<br>www.itsglobal.com | (800) 345-3851<br>(607) 753-6711 |
| IWS | Insect Screening Weavers Association<br>(Now defunct) | |
| KCMA | Kitchen Cabinet Manufacturers Association<br>www.kcma.org | (703) 264-1690 |
| LMA | Laminating Materials Association<br>(Formerly: ALA - American Laminators Association)<br>www.lma.org | (201) 664-2700 |
| LPI | Lightning Protection Institute<br>www.lightning.org | (800) 488-6864<br>(847) 577-7200 |
| LSGA | Laminated Safety Glass Association<br>(See GANA) | |
| MBMA | Metal Building Manufacturers Association<br>www.mbma.com | (216) 241-7333 |
| MFMA | Maple Flooring Manufacturers Association<br>www.maplefloor.org | (847) 480-9138 |

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| MFMA | Metal Framing Manufacturers Association<br>www.metalframingmfg.org | (312) 644-6610 |
| MHIA | Material Handling Industry of America<br>www.mhia.org | (800) 345-1815<br>(704) 676-1190 |
| MIA | Marble Institute of America<br>www.marble-institute.com | (614) 228-6194 |
| ML/SFA | Metal Lath/Steel Framing Association<br>(See SSMA) | |
| MPI | Master Painters Institute<br>www.paintinfo.com | (888) 674-8937 |
| MSS | Manufacturers Standardization Society of The Valve and Fittings Industry Inc.<br>www.mss-hq.com | (703) 281-6613 |
| NAAMM | National Association of Architectural Metal Manufacturers<br>www.naamm.org | (312) 332-0405 |
| NAAMM | North American Association of Mirror Manufacturers<br>(See GANA) | |
| NACE | NACE International<br>(National Association of Corrosion Engineers International)<br>www.nace.org | (281) 228-6200 |
| NAIMA | North American Insulation Manufacturers Association (The)<br>www.naima.org | (703) 684-0084 |
| NAMI | National Accreditation and Management Institute, Inc. | (304) 258-5100 |
| NBGQA | National Building Granite Quarries Association, Inc.<br>www.nbgqa.com | (800) 557-2848 |
| NCMA | National Concrete Masonry Association<br>www.ncma.org | (703) 713-1900 |
| NCPI | National Clay Pipe Institute<br>www.ncpi.org | (414) 248-9094 |
| NCTA | National Cable & Telecommunications Association<br>www.ncta.com | (202) 775-3550 |
| NEBB | National Environmental Balancing Bureau<br>www.nebb.org | (301) 977-3698 |
| NECA | National Electrical Contractors Association<br>www.necanet.org | (301) 657-3110 |
| NeLMA | Northeastern Lumber Manufacturers' Association<br>www.nelma.org | (207) 829-6901 |
| NEMA | National Electrical Manufacturers Association | (703) 841-3200 |

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| | www.nema.org | |
| NETA | InterNational Electrical Testing Association<br>www.netaworld.org | (303) 697-8441 |
| NFPA | National Fire Protection Association<br>www.nfpa.org | (800) 344-3555<br>(617) 770-3000 |
| NFRC | National Fenestration Rating Council<br>www.nfrc.org | (301) 589-6372 |
| NGA | National Glass Association<br>www.glass.org | (703) 442-4890 |
| NHLA | National Hardwood Lumber Association<br>www.natlhardwood.org | (800) 933-0318<br>(901) 377-1818 |
| NLGA | National Lumber Grades Authority<br>www.nlga.org | (604) 524-2393 |
| NOFMA | National Oak Flooring Manufacturers Association<br>www.nofma.org | (901) 526-5016 |
| NRCA | National Roofing Contractors Association<br>www.nrca.net | (800) 323-9545<br>(847) 299-9070 |
| NRMCA | National Ready Mixed Concrete Association<br>www.nrmca.org | (888) 846-7622<br>(301) 587-1400 |
| NSA | National Stone Association<br>(See NSSGA) | |
| NSF | NSF International<br>(National Sanitation Foundation International)<br>www.nsf.org | (800) 673-6275<br>(734) 769-8010 |
| NSSGA | National Stone, Sand & Gravel Association<br>(Formerly: NSA - National Stone Association)<br>www.nssga.org | (800) 342-1415<br>(703) 525-8788 |
| NTMA | National Terrazzo and Mosaic Association, Inc.<br>www.ntma.com | (800) 323-9736<br>(703) 779-1022 |
| NWWDA | National Wood Window and Door Association<br>(See WDMA) | |
| PCI | Precast/Prestressed Concrete Institute<br>www.pci.org | (312) 786-0300 |
| PDCA | Painting and Decorating Contractors of America<br>www.pdca.com | (800) 332-7322<br>(703) 359-0826 |
| PDI | Plumbing & Drainage Institute<br>www.pdionline.org | (800) 589-8956<br>(508) 230-3516 |
| PGI | PVC Geomembrane Institute<br>//pgi-tp.ce.uiuc.edu | (217) 333-3929 |

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| RCSC | Research Council on Structural Connections<br>www.boltcouncil.org | (800) 644-2400<br>(312) 670-2400 |
| RFCI | Resilient Floor Covering Institute<br>www.rfci.com | Contact by mail only |
| RIS | Redwood Inspection Service<br>www.calredwood.org | (888) 225-7339<br>(415) 382-0662 |
| SAE | SAE International<br>www.sae.org | (724) 776-4841 |
| SDI | Steel Deck Institute<br>www.sdi.org | (847) 462-1930 |
| SDI | Steel Door Institute<br>www.steeldoor.org | (440) 899-0010 |
| SEFA | Scientific Equipment and Furniture Association<br>www.sefalabfurn.com | (516) 294-5424 |
| SGCC | Safety Glazing Certification Council<br>www.sgcc.org | (315) 646-2234 |
| SIGMA | Sealed Insulating Glass Manufacturers Association<br>(See IGMA) | |
| SJI | Steel Joist Institute<br>www.steeljoist.org | (843) 626-1995 |
| SMA | Screen Manufacturers Association<br>www.screenmfgassociation.org | (561) 533-0991 |
| SMACNA | Sheet Metal and Air Conditioning Contractors'<br>National Association<br>www.smacna.org | (703) 803-2980 |
| SPFA | Spray Polyurethane Foam Alliance<br>(Formerly: SPI/SPFD - The Society of the<br>Plastics Industry, Inc.; Spray Polyurethane Foam Division)<br>www.sprayfoam.org | (800) 523-6154 |
| SPIB | Southern Pine Inspection Bureau (The)<br>www.spib.org | (850) 434-2611 |
| SPI/SPFD | Society of the Plastics Industry (The)<br>Spray Polyurethane Foam Division<br>(See SPFA) | |
| SPRI | SPRI<br>(Single Ply Roofing Institute)<br>www.spri.org | (781) 444-0242 |
| SSINA | Specialty Steel Industry of North America<br>www.ssina.com | (800) 982-0355<br>(202) 342-8630 |
| SSMA | Steel Stud Manufacturers Association<br>(Formerly: ML/SFA - Metal Lath/Steel Framing Association) | (312) 456-5590 |

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| | www.ssma.com | |
| SSPC | SSPC: The Society for Protective Coatings<br>www.sspc.org | (877) 281-7772<br>(412) 281-2331 |
| STI | Steel Tank Institute<br>www.steeltank.com | (847) 438-8265 |
| SWI | Steel Window Institute<br>www.steelwindows.com | (216) 241-7333 |
| SWRI | Sealant, Waterproofing, and Restoration Institute<br>www.swrionline.org | (816) 472-7974 |
| TCA | Tile Council of America, Inc.<br>www.tileusa.com | (864) 646-8453 |
| TIA/EIA | Telecommunications Industry Association/Electronic Industries Alliance<br>www.tiaonline.org | (703) 907-7700 |
| TPI | Truss Plate Institute | (608) 833-5900 |
| TPI | Turfgrass Producers International<br>www.turfgrasssod.org | (800) 405-8873<br>(847) 705-9898 |
| UL | Underwriters Laboratories Inc.<br>www.ul.com | (800) 704-4050<br>(847) 272-8800 |
| UNI | Uni-Bell PVC Pipe Association<br>www.uni-bell.org | (972) 243-3902 |
| USITT | United States Institute for Theatre Technology, Inc.<br>www.culturenet.ca/usitt | (800) 938-7488<br>(315) 463-6463 |
| WASTEC | Waste Equipment Technology Association<br>www.wastec.org | (800) 424-2869<br>(202) 244-4700 |
| WCLIB | West Coast Lumber Inspection Bureau<br>www.wclib.org | (800) 283-1486<br>(503) 639-0651 |
| WCMA | Window Covering Manufacturers Association<br>(See WCSC) | |
| WCSC | Window Covering Safety Council<br>(Formerly: WCMA - Window Covering Manufacturers Association)<br>www.windowcoverings.org | (800) 506-4636<br>(212) 661-4261 |
| WDMA | Window & Door Manufacturers Association<br>(Formerly: NWWDA - National Wood Window and Door Association)<br>www.wdma.com | (800) 223-2301<br>(847) 299-5200 |
| WIC | Woodwork Institute of California<br>www.wicnet.org | (916) 372-9943 |
| WMMPA | Wood Moulding & Millwork Producers Association | (800) 550-7889 |

| | | |
|---|---|---|
| | www.wmmpa.com | (530) 661-9591 |
| WWPA | Western Wood Products Association<br>www.wwpa.org | (503) 224-3930 |

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change.

| | | |
|---|---|---|
| BOCA | BOCA International, Inc.<br>www.bocai.org | (708) 799-2300 |
| CABO | Council of American Building Officials<br>(See ICC) | |
| IAPMO | International Association of Plumbing and Mechanical Officials (The)<br>www.iapmo.org | (909) 595-8449 |
| ICBO | International Conference of Building Officials<br>www.icbo.org | (800) 284-4406<br>(562) 699-0541 |
| ICC | International Code Council, Inc.<br>(Formerly: CABO - Council of American Building Officials)<br>www.intlcode.org | (703) 931-4533 |
| SBCCI | Southern Building Code Congress International, Inc.<br>www.sbcci.org | (205) 591-1853 |

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change.

| | | |
|---|---|---|
| CE | Army Corps of Engineers<br>www.usace.army.mil | |
| CPSC | Consumer Product Safety Commission<br>www.cpsc.gov | (800) 638-2772<br>(301) 504-0990 |
| DOC | Department of Commerce<br>www.doc.gov | (202) 482-2000 |
| EPA | Environmental Protection Agency<br>www.epa.gov | (202) 260-2090 |
| FAA | Federal Aviation Administration<br>www.faa.gov | (202) 366-4000 |
| FDA | Food and Drug Administration<br>www.fda.gov | (888) 463-6332 |
| GSA | General Services Administration<br>www.gsa.gov | (202) 708-5082 |
| HUD | Department of Housing and Urban Development<br>www.hud.gov | (202) 708-1112 |

| | | |
|---|---|---|
| LBL | Lawrence Berkeley Laboratory<br>(See LBNL) | |
| LBNL | Lawrence Berkeley National Laboratory<br>www.lbl.gov | (510) 486-5605 |
| NCHRP | National Cooperative Highway Research Program<br>(See TRB) | |
| NIST | National Institute of Standards and Technology<br>www.nist.gov | (301) 975-6478 |
| OSHA | Occupational Safety & Health Administration<br>www.osha.gov | (800) 321-6742<br>(202) 693-1999 |
| PBS | Public Building Service<br>(See GSA) | |
| RUS | Rural Utilities Service<br>(See USDA) | (202) 720-9540 |
| TRB | Transportation Research Board<br>www.nas.edu/trb | (202) 334-2934 |
| USDA | Department of Agriculture<br>www.usda.gov | (202) 720-2791 |
| USPS | Postal Service<br>www.usps.com | (202) 268-2000 |

D. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change.

| | | |
|---|---|---|
| CAPUC | (See CPUC) | |
| CBHF | State of California, Department of Consumer Affairs<br>Bureau of Home Furnishings and Thermal Insulation<br>www.dca.ca.gov/bhfti | (800) 952-5210<br>(916) 574-2041 |
| CPUC | California Public Utilities Commission<br>www.cpuc.ca.gov | (415) 703-2782 |
| TFS | Texas Forest Service<br>Forest Products Laboratory<br>//txforestservice.tamu.edu | (936) 639-8180 |

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01420

# SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:

1. Sewers and drainage.
2. Water service and distribution.
3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
4. Heating and cooling facilities.
5. Ventilation.
6. Electric power service.
7. Lighting.
8. Telephone service.

C. Support facilities include, but are not limited to, the following:

1. Temporary roads and paving.
2. Dewatering facilities and drains.
3. Project identification and temporary signs.
4. Waste disposal facilities.
5. Field offices.
6. Storage and fabrication sheds.
7. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:

1. Environmental protection.
2. Stormwater control.
3. Pest control.
4. Site enclosure fence.
5. Security enclosure and lockup.
6. Temporary enclosures.
7. Fire protection.

E. Related Sections include the following:
1. Division 2 Section "Hot-Mix Asphalt" for construction and maintenance of asphalt paving for temporary roads and paved areas.
2. Division 2 Section "Cement Concrete Pavement" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.
3. Divisions 2 through 16 for temporary heat, ventilation, and humidity requirements for specific products.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to the Owner, Architect, Testing Agencies and Authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage, by all parties engaged in construction.

C. Water Service: Pay water service use charges, whether metered or otherwise, for water used by all entities engaged in construction activities at Project site.

D. Electric Power Service: Pay electric power service use charges, whether metered or otherwise, for electricity used by all entities engaged in construction activities at Project site.

1.5 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.

1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.
2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

B. Pavement: Comply with Division 2 pavement Sections.

C. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.76-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts.

D. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."

E. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

F. Water: Potable.

2.2 EQUIPMENT

A. General: Provide equipment suitable for use intended.
1. Field Offices: Prefabricated or Mobile units or Job-built construction with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.

B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

C. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

D. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, and paper cups.

E. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

F. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

G. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

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

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.

B. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.

1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Connect temporary sewers to municipal system as directed by sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.

D. Sanitary Facilities: Provide approved chemical toilets throughout period of construction except as noted herein. Keep toilets properly serviced to prevent undue stench and to assure cleanliness. Provide wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
2. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.

    a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
3. Drinking-Water Facilities: Provide bottled-water, drinking-water units. Use of common drinking cups, dipper, canteens or dipping of water from containers is prohibited.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low

temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.

1. Maintain a minimum temperature of 50 deg F (10 deg C) in permanently enclosed portions of building for normal construction activities, and 65 deg F (18.3 deg C) for finishing activities and areas where finished Work has been installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.
1. Install power distribution wiring overhead and rise vertically where least exposed to damage.

H. Electric Distribution: Provide temporary electric power of adequate capacity to light work sufficeintly to assure safety of works and good workmanship and to operate power equipment.

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Provide one 100-W incandescent lamp per 500 sq. ft. (45 sq. m), uniformly distributed, for general lighting, or equivalent illumination.
3. Provide one 100-W incandescent lamp every 50 feet (15 m) in traffic areas.
4. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.

J. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.
   a. Provide a dedicated telephone line for each facsimile machine and computer with modem in each field office.
2. Provide a portable cellular telephone for superintendent's use in making and receiving telephone calls when away from field office.

## 3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide a reasonably level, graded, well-drained subgrade of satisfactory soil material, compacted to not less than 95 percent of maximum dry density in the top 6 inches (150 mm).
2. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.

D. Dewatering Facilities and Drains: Comply with requirements in applicable Division 2 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
3. Remove snow and ice as required to minimize accumulations.

E. Project Identification and Temporary Signs:
1. Provide Project identification as indicated at the end of this section, one-sided only, facing one direction
2. One additional sign may be displayed.
3. Erect signs on site at location established by Architect.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.

G. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.

H. Common-Use Field Office: Provide an insulated, weathertight, air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 10 persons at Project site. Keep office clean and orderly.
   a. Provide a room of not less than 240 sq. ft. (22.5 sq. m) for Project meetings. Furnish room with conference table, 8 folding chairs, and 4-foot- (1.2-m-) square tack board.

2. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
3. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer. Paint interior walls with two coats of interior latex-flat wall paint.
4. Provide an electric heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F (20 deg C). Provide an air-conditioning unit capable of maintaining an indoor temperature of 72 deg F (23 deg C).
5. Provide fluorescent light fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot (4-m) intervals, 1 per wall in each room.

I. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.

## 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Landscape Protection – Protect existing landscap in construction area by providing barriers around trees and shrubs designated by Architect.

C. Stormwater Control: Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

D. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

E. Site Enclosure Fence: Before construction operations begin, install chain-link enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.

1. Set fence posts in compacted mixture of gravel and earth.
2. Provide gates in sizes and at locations to accommodate delivery vehicles and construction operations.
3. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Barricade all open trench work left unsupervised. Provide fence around active construction site to prevent injury to workmen, public and school children. Location and size of fence shall be approved by Owner. Public access shall be provided to the school at all times.

G. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Vertical Openings: Close openings of 25 sq. ft. (2.3 sq. m) or less with plywood or similar materials.
3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. (9.2 sq. m) in area, use fire-retardant-treated material for framing and main sheathing.

I. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.

    a. Field Offices: Class A stored-pressure water-type extinguishers.
    b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
    c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Supervise welding operations, combustion-type temporary heating units, similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
8. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

## 3.5 OPERATION, TERMINATION, AND REMOVAL

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

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, similar facilities on a 24-hour basis to achieve indicated results and to avoid possibility of damage.
2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3.6 EXISTING UTILITIES

A. There are currently no utilities on-site. The contractor is responsible for any temporary utilities required for the construction operation.

B. The contractor shall sequence work such that the utilities are available for his operation or bring in temporary utilities.

C. The contractor shall be responsible for coordination will all utility companies and responsible for obtaining and paying for any and all required permits.

END OF SECTION 01500

# SECTION 01600 - PRODUCT REQUIREMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:
   1. Division 1 Section "Alternates" for products selected under an alternate.
   2. Division 1 Section "References" for applicable industry standards for products specified.
   3. Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.
   4. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

### 1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise.
   3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
   1. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
   5. Store products to allow for inspection and measurement of quantity or counting of units.
   6. Store materials in a manner that will not endanger Project structure.
   7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   9. Protect stored products from damage.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
   1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements.
2. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Submit a request for substitution for any manufacturer not specifically named.
3. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer.
4. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Product[s]" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
5. Products Specified by Naming only one product: No options or substitutions allowed.

6. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.

7. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
   a. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 LIMITATIONS ON SUBSTITUTIONS

A. During the bidding period, within time constraints detailed in Instructions to Bidders.

B. Substitutions will be considered after bids are received only when a product becomes unavailable due to no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

D. Any substitution request constitutes a representation that the Contractor has investigated proposed product and determined that it meets or exceeds in all respects, specified product. That the Contractor will provide the same warranty as specified product. That the Contractor will coordinate istallation and make other changes which

may be required for Work to be complete in all respects. That the Contractor waives any claims for additional costs arising from the substitution.

E. If substitutions proposed by Contractor create the need for additional design work, Contractor shall reimburse Owner for these services and any other expenses involved therein.

2.3 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01600

# SECTION 01700 - EXECUTION REQUIREMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

B. Related Sections include the following:

1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 1 Section "Submittal Procedures" for submitting surveys.
3. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

### 1.3 SUBMITTALS

A. Certified Surveys: Submit two copies signed by land surveyor or professional engineer.

### 1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.
b. List of detrimental conditions, including substrates.
c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

## 3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

## 3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

## 3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8 feet (2.4 m) in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.

G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

## 3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

## 3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

## 3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01700

# SECTION 01770 - CLOSEOUT PROCEDURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Operation and maintenance manuals.
4. Warranties.
5. Instruction of Owner's personnel.
6. Final cleaning.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 1 Section "Construction Progress Documentation" for submitting Final Completion construction photographs and negatives.
3. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
4. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
5. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
6. Division 1 Section "Demonstration and Training" for requirements for instruction of Owner's personnel.
7. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

### 1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

## 1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

## 1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first.

1.6 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
3. Mark important additional information that was either shown schematically or omitted from original Drawings.
4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Note related Change Orders, Record Drawings and product data where applicable.

D. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:

a. Emergency instructions and procedures.
b. System, subsystem, and equipment descriptions, including operating standards.
c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.

d. Description of controls and sequence of operations.
e. Piping diagrams.

2. Maintenance Data:

a. Manufacturer's information, including list of spare parts.
b. Name, address, and telephone number of Installer or supplier.
c. Maintenance procedures.
d. Maintenance and service schedules for preventive and routine maintenance.
e. Maintenance record forms.
f. Sources of spare parts and maintenance materials.
g. Copies of maintenance service agreements.
h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

## 1.8 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

## 3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.
2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with Owner with at least seven days' advance notice.
4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.
2. Review of documentation.
3. Operations.
4. Adjustments.
5. Troubleshooting.
6. Maintenance.
7. Repair.

## 3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.

l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01770

# SECTION 01781 - PROJECT RECORD DOCUMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include the following:
1. Division 1 Section "Closeout Procedures" for general closeout procedures.
2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 2 through 16 Sections for specific requirements for Project Record Documents of products in those Sections.

### 1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up Record Prints.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as Record Product Data.

## PART 2 - PRODUCTS

### 2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

## 2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of the manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 01781

# SECTION 01782 - OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, and finishes and systems and equipment.

B. Related Sections include the following:
1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 2 through 16 Sections for specific operation and maintenance manual requirements for products in those Sections.

### 1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

### 1.4 SUBMITTALS

A. Final Submittal: Submit 1 copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

### 1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with the same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (115-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (115-by-280-mm), 20-lb/sq. ft. (75-g/sq. m) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.

2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in the manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.

2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

## PART 3 - EXECUTION

### 3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

G. Comply with Division 1 Section "Closeout Procedures" for the schedule for submitting operation and maintenance documentation.

END OF SECTION 01782

# SECTION 01820 - DEMONSTRATION AND TRAINING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

B. Related Sections include the following:
1. Division 1 Section "Project Management and Coordination" for requirements for preinstruction conferences.

### 1.3 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

### 1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

## PART 2 - PRODUCTS

### 2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Motorized doors, including overhead coiling doors, overhead coiling grilles and automatic entrance doors.
2. Equipment, including projection screens, food-service equipment.
3. Fire-protection systems, including fire alarm, fire pumps and fire-extinguishing systems.

4. Intrusion detection systems.
5. Heat generation, including boilers and water distribution piping.
6. Refrigeration systems, including chillers, condensers pumps and distribution piping.
7. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
8. HVAC instrumentation and controls.
9. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies and motor controls.
10. Lighting equipment and controls.
11. Communication systems, including intercommunication, clocks, voice and data and televisions.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project Record Documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.

l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

### 3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

END OF SECTION 01820

# SECTION 02110

# CLEARING

## PART 1 GENERAL

### 1.1 Work Included

A. The work covered by this section consists of furnishing all plant, labor and equipment in performing all stripping and clearing operations in accordance with the Project Manual and Drawings. Clearing shall consist of removing natural and artificial objectionable material from the construction areas and proper disposal.

### 1.2 Related Work

A. Section 02200 - Earthwork

B. Section 02220 - Excavation, Trenching, Fill and Backfill

C. General foundation notes on Drawings. In case of conflict or omission, the general foundation notes shall govern.

### 1.3 Traffic Handling

A. General: All construction signage and barricading shall comply with the New Mexico Manual & Specifications for a Uniform System of Traffic Control Devices for Streets & Highways, latest edition and applicable regulations adopted by the local Traffic Engineer.

B. Barricading Within Public Right-of-Way: The Contractor shall submit a construction signing and barricading plan to the appropriate government authority having jurisdiction prior to barricading or closing a public right-of-way.

C. Barricading Private Streets or Parking Lots: The Contractor shall submit a construction signage and barricading plan to the Architect prior to barricading or closing a private street, parking lot and/or areas of the project site.

### 1.4 Subsurface Soil Data

A. Subsurface soil investigations have been made, and the results are available for examination by the Contractor. This is not a warranty of conditions, the Contractor is expected to examine the site and determine for himself the character of materials that may be encountered.

## PART 2 PRODUCTS - No products required for clearing.

## PART 3 EXECUTION

### 3.1 Coordination

A. Strip and stockpile suitable topsoil that may be reused.

### 3.2 Clearing and Grubbing

A. General: Clear and grub all areas shown on the contract drawings to be excavated or on which fill is to be constructed.

B. Clearing: Clearing shall consist of removal and disposal of trees and other vegetation as well as down timber, snags, brush, existing foundations, slabs, and rubbish within the areas to be cleared. Individual trees, groups of trees and other vegetation not required to be removed shall be protected and left standing.

C. Grubbing: Stumps, matted roots, and roots larger than 2 inch in diameter shall be removed from within 8 inches of the surface of areas on which fills are to be constructed except in paved areas. Materials as described above within 18 inches of finished subgrade of paved areas in either cut or fill sections shall be removed. Areas disturbed by grubbing shall be filled as specified in Section 02200 - Earthwork.

D. Grass & Topsoil: Grass, grass roots, and incidental topsoil shall not be left beneath a fill area, nor shall this material be used as fill material. Grass, grass roots, and topsoil may be stockpiled and later used in the top 6 inches of fills outside roadways, parking areas and building pads.

### 3.3 Salvageable Items

A. Carefully remove items indicated to be salvaged and store as indicated on the Drawings or directed by Owner.

### 3.4 Preservation Of Property

A. Provide temporary fences, barricades, coverings, or other protection to preserve existing items (landscaping, site features, utility items, building equipment, furniture, interior finishes, etc.) indicated to remain and to prevent injury or damage to persons or property. Apply protection to adjacent properties as required.

B. Restore damaged work to condition existing prior to start of work, unless otherwise directed.

## 3.5 Existing Utilities

A. The Contractor shall verify the location of any utility lines, pipelines, or underground utility lines in or near the area of the work in advance of and during clearing work. The Contractor is fully responsible for any and all damage caused by failure to locate, identify and preserve any and all existing utilities, pipelines and underground utility lines. Repair damaged utilities to the satisfaction of the utility Owner at no expense to the Owner.

B. Should uncharted or incorrectly charted piping or other utilities be encountered during clearing, contact the Architect immediately for directions as to procedures.

C. Cooperate with the Owner and public or private utility companies in keeping service and facilities in operation.

## 3.6 Waste

A. Dispose of all waste off Owner's property.

B. Burning of waste will not be permitted.

## 3.7 Air Pollution

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt air pollution. Comply with governing regulations pertaining to environmental protection.

**END OF SECTION**

# SECTION 02300

# EARTHWORK

## PART 1 GENERAL

### 1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 Summary

A. This Section includes the following:

1. Preparing subgrades for walks, pavements, lawns, and plantings.
2. Subbase course for concrete walks and pavements.
3. Base course for asphalt paving.
4. Subsurface drainage backfill for walls and trenches.
5. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

### 1.3 Definitions

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

J. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

## 1.4 Submittals

A. Product Data: For the following:

1. Each type of plastic warning tape.
2. Drainage fabric.
3. Separation fabric.

B. Samples: For the following:

1. 30-lb (14-kg) samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources.
2. 12-by-12-inch (300-by-300-mm) sample of drainage fabric.
3. 12-by-12-inch (300-by-300-mm) sample of separation fabric.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill..

2. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.

## 1.5 Quality Assurance

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials testing, as documented according to ASTM D 3740 and ASTM E 548.

B. Preexcavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

## 1.6 Project Conditions

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.
3. Contact New Mexico One Call 1-800-321-2537 a minimum of 48 hours prior to construction.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

# PART 2 PRODUCTS

## 2.1 Soil Materials

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (38-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch (38-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

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

## 2.2 Accessories

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

B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

C. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 110 lbf (490 N); ASTM D 4632.
2. Tear Strength: 40 lbf (178 N); ASTM D 4533.
3. Puncture Resistance: 50 lbf (222 N); ASTM D 4833.
4. Water Flow Rate: 150 gpm per sq. ft. (100 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 50 (0.3 mm); ASTM D 4751.

D. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.

## PART 3 EXECUTION

### 3.1 Preparation

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

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

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

## 3.2 Dewatering

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

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

## 3.3 Excavation, General

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Classified Excavation: Excavation to subgrade elevations classified as earth.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

a) Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock excavation includes removal and disposal of rock.

a) Do not excavate rock until it has been classified and cross-sectioned by Engineer.

## 3.4 Excavation For Walks And Pavements

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

## 3.5 Excavation For Utility Trenches

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

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

1. Clearance: 12 inches (300 mm) on each side of pipe or conduit.
2. Clearance: As indicated.

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

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

## 3.6 Approval Of Subgrade

A. Notify Engineer when excavations have reached required subgrade.

B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer.

## 3.7 Unauthorized Excavation

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

1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

## 3.8 Storage Of Soil Materials

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

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

## 3.9 Backfill

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for record documents.
3. Inspecting and testing underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.

## 3.10 Utility Trench Backfill

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.

C. Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase.

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

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

E. Coordinate backfilling with utilities testing.

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

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

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

## 3.11 Fill

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

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

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.

## 3.12 Moisture Control

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

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

## 3.13 Compaction Of Backfills And Fills

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

B. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 92 percent.

3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 85 percent.

## 3.14 Grading

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

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

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

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

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

## 3.15 Subsurface Drainage

A. Drainage Piping: Drainage pipe is specified in Division 2 Section "Foundation Drainage Systems."

B. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch (150-mm) course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches (300 mm) of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each course of filter material to 95 percent of maximum dry unit weight according to ASTM D 698.

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

1. Compact each course of filter material to 95 percent of maximum dry density according to ASTM D 698.
2. Place and compact impervious fill material over drainage backfill to final subgrade.

## 3.16 Subbase and Base Courses

A. Install separation fabric on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

B. If required on the plans, under pavements and walks, place subbase course on separation fabric according to fabric manufacturer's written instructions and as follows:

C. Under pavements and walks, place subbase course on prepared subgrade and as follows:

1. Place base course material over subbase.
2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
3. Shape subbase and base to required crown elevations and cross-slope grades.
4. When thickness of compacted subbase or base course is 6 inches (150 mm) or less, place materials in a single layer.
5. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

D. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

## 3.17 Drainage Course

A. Under slabs-on-grade, install drainage fabric on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends. Place drainage course on drainage fabric and as follows:

B. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:

1. Compact drainage course to required cross sections and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
2. When compacted thickness of drainage course is 6 inches (150 mm) or less, place materials in a single layer.
3. When compacted thickness of drainage course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

## 3.18 Field Quality Control

A. Testing Agency: Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 500 sq. ft. or less of paved area but in no case fewer than three tests.
2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

## 3.19 Protection

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

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

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

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

## 3.20 Disposal Of Surplus And Waste Materials

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

B. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Engineer.

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

**END OF SECTION**

# SECTION 02315

# EXCAVATION AND FILL

## PART 1 GENERAL

### 1.01 Work Included

A. All labor, materials, tools, equipment, transportation, and temporary construction of any nature necessary for a complete, operational installation of all work shown on the Plans and/or specified hereinafter.

### 1.02 Related Work

A. Consult all other Specification Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete, operational installation.

### 1.03 System Description

A. Definitions:

1. A trench is defined as an excavation in which the depth is greater than the width of the bottom of the excavation.
2. Excavations for appurtenant structures, such as but not limited to manholes, transition structures, junction structures, vaults, valve boxes, catch basins, thrust blocks, and boring pits shall be deemed to be in the category of trench excavation.

B. Unless otherwise indicated on the Plans, all excavation for pipelines shall be open cut.

### 1.04 References

A. New Mexico Department of Transportation (NMDOT)

1. Standard Specifications.
2. Standard Test Methods: No. 202.

B. OSHA Construction Safety Orders.

## PART 2 PRODUCTS

### 2.01 Select Backfill Material

A. Select backfill material shall be sand, free from clay or organic matter Select backfill material shall have a size and gradation falling within the following limits when determined by NMDOT Class _____.

| Sieve Size | Percentage Passing Sieve By Weight |
|---|---|
| No. 4 | 100 |
| No. 200 | 5 max. |

### 2.02 Pipe Detection Wire

A. Tracer wire shall be #8 AWG insulated copper wire solid or stranded.

## PART 3 EXECUTION

### 3.01 Preparation

A. General:

1. Prior to trenching, the Contractor shall excavate at locations specifically indicated on the plans, if any, where new lines cross other utilities of uncertain depth and determine the elevation of the utility in question to ensure that the new line will clear the potential obstruction.
2. The Contractor shall contact **NM One Call (1-800-321-2537**) for assistance in locating existing utilities. All grading, utility, and/or excavation contractors are required to request their own utility locates and verify field conditions prior to construction.
3. If after excavation, a crossing utility does present an obstruction, then the line and grade of the new line will be adjusted as directed by the Owner to clear the utility.

## 3.02 Trench Excavation

A. General:

1. Excavation shall include removal of all water and materials that interfere with construction. The Contractor shall remove any water which may be encountered in the trench by pumping or other methods during the pipe laying, bedding and backfill operations. Material shall be sufficiently dry to permit approved jointing.
2. Excavation shall include the construction and maintenance of bridges required for vehicular and pedestrian traffic, support for adjoining structures, and where necessary, the rearrangement and repair of adjoining utilities.
3. It shall be the Contractor's responsibility to direct vehicular and pedestrian traffic through or around his work area at all times.
4. The Contractor shall relocate, reconstruct, replace or repair, at his own expense, all improvements which are in the line of construction or which may be damaged, removed, disrupted or otherwise disturbed by the Contractor. Except as specified in other Sections or shown on the Plans, this provision applies to all surface improvements of whatever nature such as walls, fences, above-grade utilities, landscaping, paving, structures, or other physical features whether shown on the Plans or not and to all subsurface improvements such as utilities which are indicated on the Plans or marked in the field. The Contractor shall connect such utilities to existing systems and leave all in a workable and operating condition. The cost of this work shall be considered as included in other items of work and no additional compensation will be allowed therefor.

B. Existing Paving and Concrete:

1. Existing pavement over trench shall be sawcut, removed, and hauled away from the job. Existing pavement shall be neatly sawcut along the limits of excavations. If a longitudinal pavement joint or edge of pavement is located within three (3) feet of the limit of excavation, all intervening pavement shall be removed and replaced after completion of backfilling.
2. Existing concrete over the trench shall be sawcut to a full depth in straight lines either parallel to the curb or at right angles to the alignment of the sidewalk. No section to be replaced shall be smaller than thirty (30) inches in either length, or width. If the sawcut would fall within thirty (30) inches of a construction joint, expansion joint, or edge, or within twelve (12) inches of a score mark, the concrete shall be removed to the joint, edge, or mark.

3. Boards or other suitable material shall be placed under equipment outrigging to prevent damage to paved surfaces.

C. Trench Width:

1. The maximum allowable trench widths at the top of the pipe shall be as follows:

| Pipe Type | Trench Width (Max.) |
|---|---|
| Asbestos Cement | Outside diameter of |
| Copper | barrel plus 18 inches |
| Fiberglass | |
| Galvanized Iron | |
| Plastic | |
| Vitrified Clay | |
| Cast-Iron | Outside diameter of |
| Concrete Cylinder | barrel plus 24 inches |
| Corrugated Metal | |
| Ductile-Iron | |
| Reinforced Concrete | |
| Welded Steel | |

a) The maximum trench width shall be inclusive of all shoring.
b) If the maximum trench width is exceeded, the Owner may direct the Contractor to encase or cradle the pipe in concrete at no additional charge to the project.

2. For pipes three (3) inches in diameter and larger, the free working space on each side of the pipe barrel shall not be less than six (6) inches.

D. Open Trench:

1. Contractor shall keep open excavations to a minimum. The maximum amount of open excavations shall be limited to the excavations reasonably required by the Contractor to perform the work in an orderly and planned manner. Contractor is required to barricade and cover all open excavations outside of normal working hours. Owner shall have the right to limit the amount of open trench.
2. Provisions for trench crossings and free access shall be made at all street crossings, driveways, water gate valves, and fire hydrants. Water valves and access to manholes shall remain uncovered and visible at all times.

E. Excavation bracing:

1. The excavation shall be supported and excavation operations conducted in accordance with the OSHA. The contractor shall have a "competent person" on the jobsite in accordance with OSHA regulations.
2. The contractor shall, at his own expense, furnish, put in place and maintain such sheeting and bracing as may be required to support the sides of all excavations (whether above or below the pipe grade), and to prevent any movement which could in any way diminish the required trench section or otherwise injure or delay the work. The sheeting and bracing shall be withdrawn in a manner such as to prevent any earth movement that might overload the pipe.

F. Excavated Material:

1. All excavated material not required for backfill shall be immediately removed and properly disposed of off-site by the Contractor, unless otherwise directed by the Owner.
2. Material excavated in streets and roadways shall be laid alongside the trench no closer than two feet (2') from the trench edge and kept trimmed to minimize inconvenience to public traffic.
3. Provisions shall be made whereby all storm and waste water can flow uninterrupted in gutters or drainage channels.
4. Excavated material shall not be stored on landscaping.

## 3.03 Pipe Bedding

A. Bedding Excavation: The trench shall be excavated below the grade of the pipe bottom to the following minimum depths:

| Pipe Type | Depth |
|---|---|
| Copper | 3" |
| Galvanized Iron | 3" |
| Plastic 2" and smaller | 3" |
| Asbestos-Cement | 6" |
| Cast-Iron | 6" |
| Ductile-Iron | 6" |
| Plastic | 6" |
| Reinforced Concrete | 3" |
| Vitrified Clay | 6" |
| Concrete Cylinder | 4" |
| Welded Steel | 4" |
| Corrugated Metal | 3" |
| Reinforced Concrete | 3" |

B. Stabilization of Trench Bottom: When the trench bottom is unstable due to wet or spongy foundation, trench bottom shall be stabilized with gravel or crushed rock. The Owner will determine the suitability of the trench bottom and the amount of gravel or crushed rock needed to stabilize a soft foundation. Soft material shall be removed and replaced with gravel or crushed rock when ordered by the Owner.

C. Placement of Bedding Material: The trench bottom shall be cleaned to remove all loose native material prior to placing select backfill material. Sufficient select backfill material as specified in Paragraph 2.01.A (above) shall be placed in trench and tamped to bring trench bottom up to grade of the bottom of pipe. The relative compaction of compacted material shall be not less than ninety percent (90%). It is the intention of these requirements to provide uniform bearing under the full length of pipe to a minimum width of sixty percent (60%) of the external diameter.

## 3.04 Trench Backfill

A. Initial Backfill:

1. Prior to trench backfill, the condition of the trench and laying of pipe must be inspected and approved by the Owner.
2. Select backfill material as specified in Paragraph 2.01.A (above) shall be used for initial backfill. After the pipe has been properly laid and inspected, select backfill material shall be placed on both sides of the pipe and compacted to final depth as follows:

| Pipe Type | Depth |
|---|---|
| Plastic: 2-1/2 inch & smaller | 6" above top of pipe |
| Asbestos-Clement | 12" above top of pipe |
| Cast-Iron | 12" above top of pipe |
| Concrete Cylinder | 12" above top of pipe |
| Ductile-Iron | 12" above top of pipe |
| Plastic: 3" and larger | 12" above top of pipe |
| Vitrified Clay | 12" above top of pipe |
| Welded Steel | 12" above top of pipe |
| Copper | 6" above top of pipe |
| Fiberglass | 6" above top of pipe |
| Galvanized Iron | 6" above top of pipe |
| Corrugated Metal | 1/2 outside diameter |
| Reinforced Concrete of pipe | (pipe spring line) |

3. Compaction: Initial backfill compaction shall be by mechanical means except as noted in Paragraph 3.04.D (below). The initial backfill material shall be hand tamped in layers not exceeding four inches (4") in uncompacted depth and shall be brought up

uniformly on both sides of the pipe to avoid bending or distortional stress. After hand tamping, the relative compaction of the initial backfill material shall be not less than ninety percent (90%).

B. Pipe Detection Wire: In trenches containing pressurized pipes, including ductile iron pipe, tracer wire shall be placed directly above the pipe and shall be looped into all valve boxes and connected to existing exposed tracer wires, and other appurtenances as appropriate.

C. Subsequent Backfill:

1. Above the level of initial backfill, the trench shall be backfilled with native material from trench excavation or with imported select backfill material (Contractor's option). Subsequent backfill shall be free of vegetable matter, stones or lumps exceeding three inches (3") in greatest dimension, and other unsatisfactory material. The Owner shall approve the backfill material prior to placement.
2. Except as noted in Paragraph 3.04D (below), subsequent backfill compaction shall be by mechanical means with backfill material placed in layers not exceeding eight inches in loose depth unless otherwise permitted by Owner. Each layer shall be thoroughly compacted before succeeding layers are placed. Compacting equipment and methods shall be acceptable to Owner. Compacting equipment designed for trench compaction such as hoe-mounted sheepsfoot rollers and vibrating plates, remote controlled rollers, hand-held or guided vibrating plates are acceptable. Tampers, stompers, drop-hammers and similar equipment which produce intermittent blows to the soil and pipe are not acceptable.
3. Subsequent backfill shall be compacted to a relative compaction of not less than ninety (90) percent except the relative compaction shall not be less than ninety-five percent (95%) within 2.5 feet of finished permanent surface grade of areas to be paved or otherwise improved or 1.5 feet below the finished subgrade, whichever is greater.

D. Jetting:

1. Trench backfill compaction by jetting and/or flooding will be allowed for select backfill material (sand) only. Jetting of native material will not be allowed unless approved in writing by the Owner.
2. When jetting select material as subsequent backfill, the maximum loose depth of each lift shall be increased from eight inches to twenty-four inches (8"-24") .

3. When jetting and/or flooding, the Contractor shall prevent floating of the pipe. The Contractor shall be wholly responsible for damage resulting from jetting operations.
4. After consolidation by jetting, the relative compaction of the backfill material shall meet or exceed the above compaction requirements.

## 3.05 Compaction Testing

A. Compaction testing by Owner is for the information of the Owner. Contractor may utilize soils compaction information produced for the Owner, however, Contractor is responsible for making his own determination of the compaction necessary to meet the minimum requirements of these specifications and to prevent trench settlement. Any trench settlement shall be deemed as evidence of inadequate compaction. Trench settlement, including repair of any surface improvements shall be repaired in accordance with Article 13 of the General Conditions.

## 3.06 Trench Surfacing

A. General: In unimproved areas, the trench surface shall be restored to its original condition. No mounds of earth shall be left along the trench.

B. Temporary Surfacing:

1. Temporary surfacing shall be a minimum of one (1) inch of cutback asphalt on six inches (6") of Class 2 Aggregate Base ~~for~~ and shall be placed at all trench locations subject to vehicular or pedestrian traffic.
2. Temporary surfacing shall be laid within one (1) day after backfilling (except where the Contractor elects to place permanent surfacing within this time period).
3. Temporary surfacing shall be maintained to prevent the occurrence of mudholes and prevent the surface from settling below one (1) inch or rising more than one (1) inch from the existing pavement grade.

C. Permanent Surfacing: Refer to Section 02585 Restoration of Surfaces.

**END OF SECTION**

# SECTION 02511

# HOT-MIX ASPHALT PAVING

## PART 1 GENERAL

### 1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 Summary

A. This Section includes the following:

1. Hot-mix asphalt paving.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt overlays.
4. Pavement-marking paint.
5. Wheel stops.

### 1.3 System Description

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

1. Standard Specification: As indicated.
2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

### 1.4 Submittals

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

B. Job-Mix Designs: Certification of the mix design prepared within the year prior to construction, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

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

D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.

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

## 1.5 Quality Assurance

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

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

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

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

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings" Review methods and procedures related to asphalt paving including, but not limited to, the following:

1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
2. Review condition of substrate and preparatory work performed by other trades.
3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
4. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel, and equipment required to execute the Work without delays.

5. Review inspection and testing requirements, governing regulations, and proposed installation procedures.
6. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

## 1.6 Delivery, Storage, And Handling

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

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

## 1.7 Project Conditions

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

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

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

# PART 2 PRODUCTS

## 2.1 Aggregates

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

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

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

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

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

## 2.2 Asphalt Materials

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

B. Undersealing Asphalt: ASTM D 3141, pumping consistency.

C. Prime Coat: Asphalt emulsion prime conforming to state DOT requirements.

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

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

F. Water: Potable.

## 2.3 Auxiliary Materials

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

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

C. Paving Geotextile: Nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.

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

1. Color: As indicated.

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

1. Dowels: Galvanized steel, diameter 3/4 inch (19 mm), minimum length 10 inches (254 mm)
2. Epoxy glue for bonding precast to dowels.

## 2.4 Mixes

A. Hot-Mix Asphalt: Provide a dense, hot-laid, hot-mix asphalt plant mix previously approved by the New Mexico Department of Transportation, Cities of Santa Fe or Albuquerque, Counties of Santa Fe or Bernalillo, and designed according to procedures adopted by the agency whose mix design is used.

1. Provide a mix with a history of satisfactory performance in geographical area where Project is located.

# PART 3 EXECUTION

## 3.1 Examination

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

## 3.2 Cold Milling

A. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and, as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.

1. Repair or replace curbs, manholes, and other construction damaged during cold milling.

## 3.3 Patching And Repairs

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.

1. Tack coat faces of excavation and allow to cure before paving.
2. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.

C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch (6 mm). Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

E. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.10 to 0.15 gal./sq. yd. (0.4 to 0.7 L/sq. m) of surface.

1. Allow tack coat to cure undisturbed before paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

## 3.4 Surface Preparation

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

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

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

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

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

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

## 3.5 Hot-Mix Asphalt Placing

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

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Spread mix at minimum temperature of 250 deg F (121 deg C).
3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

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

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

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

## 3.6 Joints

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

1. Clean contact surfaces and apply tack coat.
2. Offset longitudinal joints in successive courses a minimum of 6 inches (150 mm).
3. Offset transverse joints in successive courses a minimum of 24 inches (600 mm).
4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

## 3.7 Compaction

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

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

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

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

1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

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

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

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

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

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

## 3.8 Installation Tolerances

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

1. Base Course: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

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

1. Base Course: 1/4 inch (6 mm).
2. Surface Course: 1/8 inch (3 mm).
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

## 3.9 Pavement Marking

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

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

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

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

## 3.10 Wheel Stops

A. Securely attach wheel stops into pavement with not less than 2 galvanized steel dowels embedded in precast concrete at one-third points. Firmly bond each dowel to wheel stop and to pavement.

Extend upper portion of dowel 5 inches (125 mm) into wheel stop and lower portion a minimum of 5 inches (125 mm) into pavement.

**END OF SECTION**

# SECTION 02650

# UTILITIES

## PART 1 - GENERAL

### 1.0 Scope of Work

A. Potable Water, Fire Protection, Sanitary Sewer, and Natural Gas Lines and Systems outside the building to a point within 5' of building.

### 1.1 Work Included

A. The work covered by this section consists of furnishing all plant, labor, equipment, appurtenances and material in performing all operations, trenching, placing, backfilling, and testing of utilities complete drawings. Work includes the necessary clearing and grubbing, pavement cutting, pavement restoration, grading, and cleanup.

### 1.2 Related Work

A. Quality Control

B. Earthwork

C. Asphaltic Concrete Paving

D. Plumbing

### 1.3 Subsurface Soil Data

A. Subsurface soil investigations have been made and the results are available for examination by the contractor. The contractor is expected to examine the site and determine for himself the character of materials to be encountered.

B. No additional allowance will be made for rock removal, site clearing and grading, filling, compaction, disposal, or removal of any unclassified materials.

### 1.4 References

A. I.A.P.M.O.: International Association of Plumbing and Mechanical Officials

B. U.P.C.: Uniform Plumbing Code, 1991 Edition

C. U.S.C.: Foundation for Cross Connection and Hydraulic Research

D. A.W.W.A.: American Waterworks Association

## 1.1 Submittals

A. Submit copies of materials certificates and tests in accordance with type of tests and frequencies as outlined within the project manual.

## 1.2 Testing and Inspection

A. Earthwork Testing and Inspection: The contractor shall provide all testing, retesting and inspection services. The testing laboratory shall provide on-site observation by experienced personnel during earth backfill work. The contractor shall notify the testing laboratory at least two working days in advance of any fields operations of backfilling, or of any resumption of operations after stoppages. The testing laboratory, which will perform testing and inspection service, is subject to prior approval by the architect. Submit tests in accordance with Section 02150, Excavation, Trenching, Fill and Backfill and Section 02200, Earthwork.

B. Utilities Testing and Inspection: Inspection shall be performed by the proper utility company and/or his elected delegates, city, testing laboratories, or Contractor. The contractor shall notify the proper utility company and/or testing laboratories and/or city prior to any construction shall pay for all fees associated with such testing and inspection.

C. Lines and Grades: A Registered Professional Land Surveyor or registered Civil Engineer shall establish all lines and grades. Lines and grades shall conform to the elevations indicated on the Contract Drawings with minor adjustments. Correct irregularities at no cost to the owner.

## 1.3 Traffic Handling

A. General: All construction signing and barricading shall comply with the New Mexico Manual & Specifications for Uniform System of Traffic Control Devices for Streets & Highways, latest edition and application regulations adopted by the local Traffic Engineer.

B. Barricading Private Streets of Parking Lots: The contractor shall submit a construction signing and barricading plan to the Architect prior to barricading or closing a private street of parking lot.

## 1.8 Codes

A. Utility systems shall conform to the applicable requirements of all applicable State and/or City codes and ordinances and to the rules and regulations of the utility company supplying service.

## 1.9 Lead Ban

A. All piping, solder, and flux used in the installation of piping systems delivering water for human consumption shall be lead free. The term lead free is defined as pipe which does not contain more than 8.0% lead, and solder and flux which does not contain more than 0.2% lead. Soldered joints below grade shall be made using Sil-Fos or Phos-Copper.

## 1.10 Special Warning

A. The forms of chlorine that may be used in the disinfection operations are liquid chlorine, sodium hypochlorites solution, and calcium hypochlorite granules or tablets. Liquid chlorine and calcium hypochlorites (HTH) are corrosive and are strong oxidizers. They will burn or explode if they come in contact with organic compounds, such as antifreeze or gasoline. Refer to the appropriate material safety data sheets for further information.

# PART 2 PRODUCTS

## 2.1 Water Systems

A. Potable Water Service Lines

Water service lines two (2) inches in diameter or less, shall be Engle Method Cross Linked Polyethylene (PEX) pipe. All PEX fittings shall be brass insertion fittings and approved for use by the pipe manufacturer. WIRSBO AQUAPEX pipe or approved equal.

B. Water Service Line Tie-In Materials

1. Curb Valve: Bronze body with conductive compression connections (both ends) for CTS O.D. polyethylene or copper tubing, MFR: Mueller, No. H-15209 or equivalent.
2. Union: Bronze, conductive compression connections (both ends) for CTS O.D. polyethylene or copper tubing, MFR: Mueller, No. H-15403 or equivalent.
3. Service Clamp: Bronze, double strap clamp with I.P. thread and O-Ring seal cemented in place, MFR: Mueller, H-16000 series.
4. Corporation Stop: Bronze body, I.P. thread inlet by conductive compression connection for CTS O.D. polyethylene or copper tubing outlet, MFR: Mueller, No. H-15028 or equivalent.
5. Valve Box: Cast iron 5-1/4” shaft screw type, 3-piece with drop lid marked “water”, MFR: Tyler, Series 6860 or equivalent.

C. Waterlines: Polyvinyl chloride (PVC) water pipe shall conform to ASTM D-2241; produced from PVC compounds meeting the requirements of ASTM D-1784. Classification 12454-B, PVC 1120 compounds as approved by the National Science Foundation; and be integral bell conforming to ASTM D-262 and D-3139 with elastomeric gaskets that conform to ASTM F-477 and be chemically bonded to piping. Selection of 160 psi pressure rated SDR 26 piping or 200 psi pressure rated SDR 21 piping will be based on operating system requirements. No water mains in this project. If needed, use SDR 21.

D. Fire Hydrant: fire hydrants and their extensions shall conform to American Water Works Association Standard C-502 and C-550, and shall be of the Mueller AWWA Improved Traffic Mode, Catalog No. A425, "Kennedy" K81A or equal Hydrants are acceptable. Fire hydrants shall have one, 5-1/4" diameter valve opening; 6" mechanical joint end inlets or Lok-Tyton end inlets as required; two, 2-1/2" hose nozzle connections; and one, 4-1/2" pumper nozzle with National Standard Fire Hose coupling crew threads and nozzle caps with attached chains. Fire hydrants for use with PVC pipe shall be push-on type or mechanical joint with appropriate transition gaskets for PVC pipe.

All fire hydrants shall be factory painted from the top to a point one foot below the ground level flange. The bonnet shall be painted with a reflectorized paint. Hydrants shall be yellow in color, as per NFC.

In addition, fire hydrants shall have the following design features:

1. Sealed oil reservoir with "O" rings and automatic lubrication to all work parts.
2. Breakable safety flange with break-a-way steel stem coupling pinned to the stem.
3. Neoprene main valve closing with the pressure seal with AWWA bronze seat ring and bronze brushed double drain openings.

E. Water Tie-In Materials

1. Tapping Sleeve: Cast iron, mechanical joint, 200 PSI working pressure, Class 125 outlet flange (ANSI B16.1), furnished with the required gaskets. MFR: Mueller, No. H-615 or equivalent.
2. Great Valve: Resilient seat, conform to AWWA C509, 200 PSI working pressure, non-rising stem type, epoxy coated (AWWA C550) inside and outside or epoxy coated inside with bitumastic coating outside, full diameter waterway to permit use as a tapping valve, and ends to suit piping system. MFR: Mueller, A-2074 series of waterous 500 series (UL-listed and/or FM-approved) or equivalent.
3. Valve Box: Cast iron, 5-1/4" shaft screw type, 3-piece with drop lid marked "water.

4. Meter Boxes: Meter boxes shall be 18" diameter, non-metallic and shall be extended a minimum of 1" below the service line.

The meter box lid shall be a cast iron, double lid cover with 11-1/2" lid opening, plastic or aluminum inner lid, and locking outer lid with pentagon head worm type lock. The meter box shall be equal to Ford No. W32.

## 2.2 Sanitary Sewer Systems

A. Polyvinyl Chloride (PVC) Sewer Pipe: Minimum sewer main pipe size shall be 6" nominal diameter, and minimum sewer service pipe size shall be 4" nominal diameter. All PVC sewer pipe shall be made of materials conforming to the requirements of ASTM designation D 1784, Type I, Grade I for Rigid Polyvinyl Chloride compounds. The resistance to acids and other reagents shall be established in accordance with ASTM Method D-543. The PVC sewer pipe shall be SDR 35, Type PSM with elastomeric gasket joints and shall meet the requirements of ASTM D 3034. The pipe shall have an integral bell with a solid cross section rubber ring, which has been factory assembled and securely locked in place to prevent displacement. Standard lengths shall be at least 20 feet to minimize the number of joints required.

B. Polyvinyl Chloride (PVC) Sewer Pipe Fittings: All PVC sewer pipe fittings shall be SDR 35, Type PSM with elastomeric gasket joints and shall meet the requirements of ASTM D 3034. Service connections to the sewer mains shall be wye fittings. Connections to existing sewer mains may be wye saddles.

C. Force Main: PVC pipe, AWWA Class 160/DR25. Fittings: Ductile iron, AWWA C110. Pipe Joints: Bell and spigot with rubber gaskets, ASTM D3139. Fitting Joints: Mechanical, AWWA C111. No force main required in this project.

## 2.2 Natural Gas Systems

B Gas Piping: Pipe for gas service lines shall be Polyethylene pipe, ASTM D25B, SDR11 IPS pipe, cell classification (pipe & fittings) 355434C per ASTM D3350.

B Fittings: Polyethylene, ASTM D3261, SDR11, PE3408. Joints: Butt, heat fusing ASTM D2657. MFR: Phillips Driscopipe 8000 or equivalent.

## 2.3 Underground Utility Markers

A. The identifying tape shall be as manufactured by the Allen System of Underground Utility Control, Wheaton, Illinois; Griffolyn Company, Inc., Houston, Texas or approved equal; from an inert material such as polyethylene plastic and shall be impervious to alkalis, acid or other chemicals likely to be

encountered in soils. The tape shall be 6" wide in bright colors for contrast with identifying printing in one (1) inch permanent black letters on one side only.

B The tape shall have printed thereon in three rows as following:

CAUTION CAUTION CAUTION

UTILITY DESIGNATION OR NAME

BURIED LINE BELOW

The identifying lettering shall be repeated continuously the full length of the tape. Tapes shall be color coded for various types of utilities as follows:

| **UTILITY** | **COLOR** | **DESIGNATION** |
|---|---|---|
| Gas | Yellow | "G" |
| Sanitary Sewer | Green | "S" |
| Water | Blue | "W" |
| Duct Banks | Orange | "DB" |

## 2.4 Backfill Material

A. In accordance with Section, Earthwork & Backfill.

# PART 3 EXECUTION

## 3.0 General

A. All pipe and accessories shall be of new and unused material. Pipe and accessories shall be handled to ensure they are undamaged. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate the bells and joints. Any pipe that has the grade or joint disturbed after lying shall be taken up and relaid. The interior of the pipe shall be thoroughly cleaned of all foreign matter before being lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods. The pipe shall not be laid in water, or when trench or weather conditions are unsuitable for the work. Water shall be kept out of the trench. When work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substance can enter pipes or fittings. Any section of pipe found to be defective before or after lying should be replaced with new pipe. Minimum depth of water lines shall be 3 feet of cover. Minimum depth of gas lines and sanitary sewer lines shall be 24 inches of cover.

## 3.1 Over-Excavation

A. Whenever solid or loose rock, rocky soil with rocks larger than 3/4" in the largest dimension, or otherwise unsuitable soils which are incapable of properly supporting the pipe or structure are encountered in the trench bottom, such material shall be over-excavated to a minimum depth of 6” below the pipe or structure and removed.

B. Except at locations where over-excavation is required, care shall be taken not to excavate below the depths indicated. In the event of accidental over-excavation, the trench bottom grade will be restored in the same manner as areas intentionally overexcavated.

## 3.2 Trench Excavation

A. The sides of all trenches for the installation of utility piping systems shall be as nearly vertical as soil conditions permit below the level of the top of the pipe. Except for the trenching for 3/4' water service lines, the width of the trench shall not be less than 12” nor more than 24” wider than the outside diameter of the pipe barrel. Trench excavation shall be centered on pipe alignment such that a minimum clear space of 6” is provided on each side of the pipe. Trench width above the level of the top of the pipe may be as wide as necessary for shoring the sheeting, OSHA requirements, and/or for proper installation of the work.

## 3.3 Pavement Cutting

A. Where it is necessary to remove sections of asphalt pavement, the asphalt shall be clean-cut with approved equipment in a neat line 6” back from the outside edge of the excavation.

B. Where it is necessary to remove sections of concrete pavement, the concrete shall be saw-cut to a depth of not less than 1-1/2” with neat, vertical, true lines in such a manner that the adjoining surface will not be damaged.

## 3.2 Existing Utilities

A. The contractor shall verify the location of any utility lines, pipelines, or underground utility lines in or near the area of the work in advance of and during work. The contractor is fully responsible for any and all damage caused by failure to locate, identify and preserve any and all existing utilities, pipelines and underground utility lines. Repair damaged utilities to the satisfaction of the utility owner at no expense to the owner.

B. Should uncharted or incorrectly charted piping or other utilities be encountered during grading, consult the Architect immediately for directions as to procedures.

C. Cooperate with the owner and public or private utility companies in keeping service and facilities in operation.

## 3.3 Bracking and Shoring

A. For all excavation and trenching work, the contractor shall provide necessary underpinning bracing, or bulkheading to safeguard the work, existing structures, workmen, the public, and property. The contractor shall assume all responsibility in connection to bracing and shoring. The contractor shall comply with the requirements of the U.S. Department of Labor Occupational Safety & Health Administration (OSHA), Safety & Health Regulations Part 1926, Subpart P.

## 3.4 Utility Connections

A. All connections to existing water, gas and sewer utilities shall be completed by the contractor.

## 3.5 Setting Valves and Valve Boxes

A. Valves and valve boxes shall be installed in the lines as shown on the contract drawings. Valves and valve boxes shall be set plumb, and centered with valve boxes directly over the valves. Valves and valve box shall be set in such a manner that the valve box does not transmit shock or stress to the valve. Earth fill shall be carefully tamped around the valve box to a distance of four feet on all sides of the box, or to the undisturbed trench face if less than four feet. Valves boxes shall be cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and the valve shall be inspected in opened and closed positions, to see that all parts are in working condition.

## 3.6 Disinfecting and/or Testing

A. The Contractor shall disinfect and/or test utility systems, which will be owned by a public or private utility company in accordance with the utility owner's standards. If the systems are to remain property of the owner, disinfecting and/or testing shall be in accordance with procedures outlined in the project manual.

## 3.7 Water Systems

A. Connections to Existing Water Mains: Connections to existing mains shall be dry connections made in a neat and workmanlike manner. Each connection with an existing water line shall be made at a time and under conditions affected which will least interfere with water service to customers affected thereby as authorized by the operating utility and as evidenced by an approved tapping permit.

Such connections shall be made in a neat manner to the satisfaction of the operating utility, using proper tools and fittings to suit actual conditions

encountered in each case. The cutting of pipe for inserting fittings or closure pieces shall be done in strict accordance with recommendations of the pipe manufacturer and without damage to the pipe or coating and so as to leave a smooth end at right angles to the axis of the pipe.

Great care shall be taken to prevent pipeline contamination when cutting into and making connections with existing pipelines used for the conveyance or distribution of water for domestic of public use.

The Contractor shall cooperate with the operating utility in locating services, and shall conduct his operations in such a manner that no trench water, mud, or other contaminating substances are allowed to enter the connected line or lines at any time during the progress of the work. The interior of all pipe, fittings, and valves, installed in such connections, shall be thoroughly cleaned and then swabbed with or dipped in strong chlorine solution having a chlorine content of 200 parts per million.

Service lines shall be cut using a tool or tools specifically designed to leave a smooth, even and square end on the pipe. Cut ends shall be reamed to the full inside diameter of the pipe. Pipe ends to be connected using fittings which seal to the outside surface of the pipe shall be cleaned to a sound, smooth finish before installation. Splices shall be kept to a minimum and no splices shall be made within 10' of any sewer line.

All service connections to water mains shall be made using saddles. Particular care shall be exercised to assure that the main is not damaged by installation of the saddle. The saddle shall be aligned on the water main so that it is at a 45-degree angle above the springline of the pipe.

B. Pipe Placing and Laying: Pipe shall be laid as shown in the Contract Drawings. While suspended in the sling and before lowering into the trench, the pipe shall be inspected for defects and tapped with a light hammer to detect cracks. Defective, damaged, or unsound pipe shall be rejected. Deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offset, shall not exceed 5/D inches per linear foot of pipe, where D represents the nominal diameter of the pipe expressed in inches, between the center lines extended, for any two connecting pipes. If the alignment requires deflections in excess of these limitations, the Contractor shall provide special bends or a sufficient number of shorter lengths of pipe to provide angular deflections within the limit set forth, as approved by the architect. Unless in conflict with other provisions of these specifications, Section 7 of AWWA C600-54T shall apply in placing and laying of cast iron pipe.

C. Pipe Joints: Pipe joints shall be installed in accordance with the written recommendations of the pipe manufacturer.

D. Incidental Items of Work: Fittings at bends in the pipeline and at ends of lines shall be firmly wedged against the vertical face of the trench by means of concrete thrust blocks as detailed in the Contract Drawings. Where connections are made between new work and existing mains, the connections shall be made using specials and fittings to suit the actual conditions as detailed in the Contract Drawings.

E. Fire Protection Lines: Fire protection lines shall be installed in accordance with NFPA 24.

F. Thrust Blocking: Thrust blocking as detailed in the drawings shall be placed at bends, tees, crosses, and fire hydrants. Blocking shall be concrete mix poured in place. Concrete blocking shall be bearing against solid undisturbed earth at the sides and bottom of the trench excavation and shall be shaped so as not to block weep holes or obstruct access to the joints of the pipe or fittings.

G. Pressure Testing Water Systems: After the pipe is laid, the joints completed, and the trench partially backfilled, leaving valved section of piping shall be subjected to a pressure test of 200 pounds per square inch minimum for a period of at least two (2) hours. All exposed pipe, joints, fittings and valves shall be carefully examined during the open trench test. Cracked or defective pipe, fittings or valves disclosed in the pressure test shall be replaced by the Contractor with sound material, and the test shall be repeated until the test results are satisfactory to the Architect.

H. All fire protection piping shall be tested in accordance with NFPA 24.

I. Disinfecting Water Piping:

1. General: This procedure shall apply to water piping systems (mains & service lines). Disinfection of laid pipes shall be completed before any taps are made. Water piping shall be disinfected in accordance with the latest edition of the AWWA Standard, C651, "Disinfecting Water Mains" and as stated below. Piping shall not be placed into service until the Architect has received documentation from the testing laboratory that test results are acceptable. No potable water piping which has been disinfected and flushed shall stand stagnate for more than thirty (30) days without being reflushed and tested before it is placed in service. The Contractor shall perform additional bacteriological tests on water samples from the piping.
2. Disinfection Procedures:

    a. Pre-flush the main thoroughly at a velocity of not less than 2.5 feet/second until water is clear and free of all foreign matter and debris.

b. Apply chlorine to water from the existing supply to expose all interior surfaces of the new system to approximately 300 mg/L (300 ppm) for 3 hours of at least 10 mg/ml (10 ppm) for 24 hours.
c. After the initial chlorine test has been completed, flush the system for 3 hours with potable water until the chlorine concentration is less than 1 ppm.
d. Arrange chlorine and bacteriologic tests. If the first disinfection does not produce satisfactory samples, repeat b and c until results are satisfactory. No pipe shall be put into service until all test results are satisfactory.

3. Disinfecting Existing Mains and Service Lines:

a. General: Existing water mains which have been damaged so that likely become partially or completely empty of water are more likely to be contaminated than new mains. The special procedures below must be followed however urgent it may be to return a main to service.
b. Pre-Disinfection Procedures: Investigate the locations to which the chlorinated water is to be discharged. (See Appendix B of the AWWA Standard for Neutralizing Chemicals, if required.)
c. Disinfection Procedures:

i. Scrub the inside of all pipe and fittings with a minimum of 5% (50,00 ppm) hypochlorite solution (common household bleach) before installation.
ii. Flush line to clean out contamination introduced during repairs. If possible, flush from both directions. Flush until discolored water is eliminated and the water flows clear. If the line segment cannot be isolated, continue flushing an additional one or two volumes of the affected segment.
iii. Where practical, isolate a section of main in which the break is located, shut off at service connections, flush, and chlorinate the section with 500 ppm (500mg/L) total combined chlorine for 30 minutes. After chlorine treatment flush the line until the water flows clear and the residual chlorine tests less than 2 ppm (mg/L).
iv. Arrange chlorine and bacteriologic tests. If the first disinfection does not produce satisfactory samples, repeat b and c above until test results are satisfactory. No pipe shall be put into service until all test results are satisfactory.

## 3.8 Sewer Systems

A. Pipe Laying: The bottom of the trench shall be shaped to give substantially uniform circumferential support to the lower third of each pipe. Pipe lying shall

proceed upgrade with the spigot ends pointing in the direction of flow. Each pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line.

B. Cleanouts: The size of cleanouts shall be of the same size as the line to which it is connected, except that cleanouts need not be larger than 4". Pipe and fittings for cleanouts shall be cast iron and shall have lead-caulked joints. Cleanouts shall be constructed in accordance with details shown on the Contract Drawings. Plugs shall be brass.

C. Connection to Existing Manhole: The contractor shall obtain a tapping permit from the operating utility prior to making connections to existing manholes. The connection to the existing manhole shall be made in accordance with the Drawings. Care should be exercised when connecting to the existing manhole so that limited fracture and cracking will occur on the existing manhole. Also, placement of the new sewer main should be correctly aligned to the proper invert elevation so as to allow for proper flow of sewage through the manhole. Excessive damage to the existing manhole or improper installation of the new sewer main, as determined by the operating utility, shall be cause for replacement of the existing manhole are by the Contractor. The replacement, if needed, shall be done to the satisfaction of the operating utility.

D. Sewer Service Line Installation: All new construction shall provide a minimum slope of 1/4" per foot (2%) and maintain at least 2' of cover over the line. Services into existing lines may be installed at a slope of 1/8" per foot (1%) under special circumstances.

E. Connection to Wyes or Main: Sewer service lines shall be connected to the sewer wyes provided with the new sewer main. If connecting to an existing main without existing wyes, the connections shall be made with wye saddles. The Contractor shall obtain from the operating utility tapping permits before making sewer service connections to existing sewer mains. The saddle shall be aligned on the sewer main such that it is at about a 45-degree angle with vertical, and in no case shall it deviate by more than 15 degrees from either side of 45 degrees without prior approval. During the installation of the sewer saddle, the Contractor shall not allow the pipe cutout or other foreign objects to enter the sewage collection system.

F. Inspection of Sewers: Sewers shall be thoroughly flushed out and then inspected and approved before being backfilled. Lamp between manholes, or other points as directed, and show full bore-indicating sewer is true to line and grade. Lips at joints on inside of sewer will not be permitted.

G. Testing of Sanitary Sewers: Completely fill the system with water and let stand for 15 minutes. The piping shall then be visually inspected to insure that it is watertight at all points.

## 3.9 Natural Gas System

A. General: The gas distribution system is intended for the distribution of natural gas, and the materials, appurtenances and workmanship used in this system shall be suitable for the accomplishment of this purpose. Any section of the gas distribution system that is found defective in materials or workmanship before acceptance shall be corrected to the satisfaction of the Architect.

B. Pipe Laying: Lines may conform to the surface profile but should be graded as uniformly as practicable between pronounced high and low points. Pipe shall be laid on firm soil for the full length, and where the trench has been excavated below grade, either inadvertently or purposely, it shall be backfilled and thoroughly tamped so as to provide full-length bearing. Laying the pipe on blocks to produce uniform grade shall not be done. Stub ends and fittings installed for future connections shall be closed with metal plugs or caps. No pipe or material of any kind shall be placed inside another pipe or fitting after the coating has been applied. Pipe shall be handled in conformance with the AWWA C204.

C. Testing of Gas System: The Contractor shall provide the entire system to be gas-tight by air test under a pressure of 100 pounds per square inch gauge. When it is necessary to backfill before testing, the following procedure shall be followed. The test may be made on the system as a whole or on the section that can be valved off of the valves shown on the contract drawings. Smaller sections may be tested when backfilling of the trenches in such section in advance of the completion of other sections is essential. The initial test readings of the instruments shall not be made for at least one hour after the pipe has been subjected to the test pressure, and neither the initial nor final readings shall be made at times of rapid changes in atmospheric conditions. The temperatures shall be representative of the actual trench conditions.

## 3.10 Placement and Compaction of Pipe Embedment and Backfill Material

A. Pipe Embedment: Pipe embedment is defined as that material required to bring the trench bottom up to grade and that material placed alongside and above pipe to a level of at least 6” over the top of the pipe. The pipe embedment area is divided into three zones as defined below. Pipe embedment shall be selected earth or sand which contains no stones, dry lumps, or frozen lumps greater than 3/4" in diameter. Embedment and the first 6” of backfill above the top of the pipe in rock excavation shall be done in the presence of the Architect. Any backfilling done in violation of this provision shall be cause for removal and replacement at the expense of the Contractor even though the work is found to be in accordance with these specifications.

B. Bedding: Bedding is that portion of pipe embedment zone beneath the pipe. If the native soil is suitable for bedding the pipe without over-excavation, the bottom of the trench shall be accurately shaped to provide uniform bearing and support for each section for the entire length of the pipe. Bell holes shall be excavated to provide minimum clearance of 2" below the coupling of bell. Imported bedding material shall likewise be placed to provide uniform and adequate longitudinal support under the pipe. Bedding material shall be placed and compacted in lifts not to exceed 6" in loose measure.

C. Haunching: Haunching is that portion of the pipe embedment zone from the bottom of the pipe to the springline of pipe. Haunching material shall be placed and hand tamped to provide adequate side support to the pipe while avoiding both vertical and lateral displacement of the pipe from proper alignment.

## 3.11 Initial Backfill

A. Initial backfill is that portion of the pipe embedment zone from the springline of the pipe to a minimum level of 6" over the top of the pipe. Initial backfill material shall be placed and compacted in lifts not to exceed 6" thick in loose measure.

## 3.14 Final Backfill

A. Final backfill is that portion of the pipe embedment zone from a minimum of 6" over the top of the pipe up to either the improved surfaces subgrade or to the final grade outside the improved surface area. Final backfill material shall be placed and compacted in lifts not to exceed 6" thick in loose measure.

B. Compaction Requirements: Bedding, haunching, initial backfill, final backfill, and gravel resurfacing shall be compacted to the following percent of the maximum density as determined by ASTM D 1557. In-place densities of materials shall be determined by the sand-cone method, ASTM D 1556 or by nuclear methods, ASTM D 2922.

| Backfill Location | Bedding Backfill | Haunching Backfill | Initial Backfill | Final Backfill |
|---|---|---|---|---|
| Roadways, Improved Surfaces | 95 | 95 | 95 | 95 |
| Roadway Right-Of-Way Outside of Roadway Prism | 90 | 90 | 90 | 90 |

C. Water Jetting: The introduction of water in the pipe embedment or final backfill material shall not be permitted as a means of compaction.

D. Imported Backfill

1. Imported Pipe Embedment: If the native soil is unsuitable, the Contractor shall import a suitable pipe embedment material. Pipe embedment shall be selected earth or sand which contains no stones, dry lumps, or frozen lumps greater than 3/4" in diameter. Unsuitable material is defined as solid or loose rock. Soils with rocks larger than 3/4" in the largest dimension, or otherwise unsuitable soils, which are incapable of properly supporting the pipe.
2. Imported Final Backfill: If the native soil is unsuitable for use as final backfill, the Contractor shall import suitable backfill. Imported final backfill may be any material, which is locally available and is capable of being compacted to the required density. This material shall be free of boulders and rocks larger than 6" in their smallest dimension, frozen clumps of dirt, organic material, or rubble, which could damage the pipe.

## 3.17 Bedding and Backfill for Manholes

A. Bedding: Bedding for structures is defined as that material beneath the manholes. This bedding material shall be as specified in the detail for each manhole.

B. Backfill: Backfill for structures is defined as that material from the bottom of the structure to the ground surface. This backfill material and required compaction of such shall be the same as that specified for the final backfill on pipelines.

## 3.18 Surface Restoration and Resurfacing

A. Surface Restoration: The following requirements shall be followed unless stricter specifications are set by road right-of-way crossing permits and/or other right-of-way crossing permits and/or other sections of these specifications and drawings.

After the piping and structures have been installed and all backfilling has been completed, areas which were disturbed shall be brought to true grades. All slopes shall be trimmed and dressed, and all surfaces graded to maintain existing drainage. All streets, alleys, driveways, sidewalks, curbs, or other surfaces, which have been disturbed or damaged, shall be resurfaced. The Contractor shall properly dispose of all excess excavated material

B. Roadway Patching: Whenever existing roadways and/or sidewalks are disturbed, the Contractor shall restore the roads and/or sidewalks to their original condition.

All backfill to be in accordance with backfill specification.

Surfacing shall be replaced where the roadway has gravel, crushed stone, or asphaltic surfacing. Gravel or crushed stone shall be replaced in quantities and

location as directed by the architect. Asphalt mix surfacing shall be in the roadway to a depth equal to what was removed.

For sidewalk replacement, concrete shall be placed in accordance with the Section on Concrete.

## 3.19 Observation of Tests

A. Prior to requesting the architect to witness the tests, the Contractor shall have all equipment set up completely ready for operation and shall have previously successfully performed the test to verify that the test section will pass. The Contractor shall notify the architect a minimum of two working days in advance of the date that the Contractor plans to perform the tests.

The architect shall observe the testing to verify that the testing was performed according to the specifications and that the test data was properly and accurately recorded.

## 3.20 Underground Utility Markers

A. General: The location of all utilities found or installed under these specifications shall be marked by the use of a continuous identifying tape buried in the pipe trench above the pipe.

B. Installation: Identifying tapes shall be buried in the utility line trench. In non-paved areas, the tape shall be located approximately three feet above the line, but no less than 12 inches below the surface. In areas where paving is to be installed over the completed trench, the tape shall be placed immediately below the paving gravel base course. The tape shall be placed in the trench with the printed side up and shall be essentially parallel with the finished surface. The contractor shall take all necessary precautions to insure that the tape is not pulled, distorted or otherwise misplaced in complete

## 3.21 Waste

A. Dispose of all waste off owner's property.

B. Burning of waste not permitted.

**END OF SECTION**

# SANITARY SEWERAGE SYSTEMS

## PART 1 GENERAL

### WORK INCLUDED

A. Sanitary sewerage piping, non-pressure drain lines, sewer service lines, fittings, and accessories.
B. Access manholes, steps, frames, covers, and related appurtenances.

### 1.01 SUBMITTALS

A. Product data for Pipe and Manhole Materials and Accessories

## PART 2 PRODUCTS

### 2.01 MATERIALS

A. Ductile Iron Gravity and Force Mains:
   1. Underground Pipe and Fittings
      a. Pipe AWWA C-151/A21.51-02 and ASTM A746, Fittings AWWA - 153/A21.53-00
      b. Push-on type pipe, mechanical joint fittings.
      c. U.S. Pipe PROTECTO 401® lined, Griffin Pipe H2SewerSafe® or American PolybondPlus® lined.
   2. In Vaults:
      a. Pipe AWWA C-151/A21.51-02 and ASTM A746, Fittings AWWA - 153/A21.53-00
      b. Flanged pipe and fittings.
      c. U.S. Pipe PROTECTO 401® lined, Griffin Pipe 2SewerSafe® or American PolybondPlus® lined.

B. PVC Non-Pressure Mains
   1. Pipe and Fittings:
      a. 18-inch and larger: ASTM F679 (T-1 or T-2 wall thickness and cell class).
      b. 15-inch and Smaller: ASTM D 3034, SDR 35
      c. Laying length: Standard 20 feet or 12.5 feet
   2. Joints:
      a. PVC sleeve and 2 sealing rings
      b. Internally cast bell with one sealing ring.
      c. Leak-proof, rubber rings: ASTM D3212 and F477
      a. Lubricant: Manufacturer's recommendations

C. Sewer Force Main
   1. Pipe and Fittings:
      a. Class 150 C-900 PVC
      b. Fittings shall be mechanical joint ductile iron per AWWA C110 full body or C153 Short body. Fittings shall be fusion-epoxy lined and coated per AWWA C116.
      c. All gaskets of neoprene or other synthetic rubber per ASTM D412 and D395.

D. Sewer Service Lines
   1. Schedule 40 PVC, solvent weld joints with saddle as detailed in Service Standards. dated May 22, 2006 dependent on material of main.

E. Drain Pipe Adapter

1. Style: Neoprene coupling with stainless steel hose clamps.
2. Design: Sized specifically for the pipes to be joined.
3. Shear Rings: Stainless steel shear ring and bushings.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPE

A. General:
1. Trenching and Backfilling : Section 02202
2. Pipe Cutting: Measurement taken at site.

B. Use rigid rubber gasket on exterior of pipe to seal pipe into grout at manholes.

C. Clean sewer lines of all sand, gravel, dirt, and other foreign materials after installation.

D. Service Lines as indicated on Drawings:
1. Locations generally determined by Owner or Engineer at time of construction.
2. Service lines to extend to the edge of the right-of-way or to the edge of the permanent easement.

3.01 FIELD QUALITY CONTROL

A. Exfiltration Test:

1. Performed on 100% of the reaches of sewer between manholes.

a. Single or multiple reaches may be tested at Contractor's option.
b. Provide all necessary piping between the reach to be tested and the water supply, together with all required materials and equipment.
c. Methods used, scheduling, and duration of tests must be approved by Engineer.
d. Water testing or air testing may be used at Contractor's option.
e. Leakage: Less than 0.2 gph/ft above invert
f. Repair all manholes that do not meet leakage test.

2. Water Testing Procedure:
a. Block off all manhole openings except those connecting with the reach under test.
b. Fill the Line:
1) Minimum depth at upper ends: 4 feet above invert or 4 feet above ground water level, which ever is higher.
c. Add and measure water as required to maintain a constant level.
1) Maximum exfiltration: 100 gallons per day per inch nominal diameter per mile of pipe.
2) Manholes considered section of 48-inch pipe.

3. Air Testing Procedure:
a. Block off all manhole and line openings.
b. Introduce low pressure air into the plugged line until the internal line pressure is raised to approximately 4.0 psi.
c. After the internal line pressure has stabilized at or above 3.5 psi, start the test.
d. Run the test for the time duration determined by the equations and standards contained in Uni-Bell Standard UNI-B-6.

B. Infiltration Test

1. Pipe: Locate the leaks and make repairs. If at any time prior to expiration of the correction period, infiltration exceeds 100 gallons per inch of nominal diameter per mile of pipe per day.
2. Manholes:
    a. No visible running or dripping water.
    b. Repair all manholes that do not meet infiltration test.

C. Mandrel Test

1. Performed on all lines made from plastic resin.
2. No sooner than 30 days after placement and compaction of backfill, but prior to placement of permanent surface materials.
3. Use a rigid mandrel with diameter of at least 95% of the pipe's specified average inside diameter and a length of the mandrel circular portion at least equal to the nominal pipe diameter.
4. Pull the mandrel through the pipe by hand.
5. All pipe exceeding the 5% deflection shall be relaid or replaced by the Contractor at no additional cost to the Owner.

D. Lamp Test

1. Each section between manholes will be lamped by Engineer.
2. Contractor shall furnish suitable assistants to help Engineer.
3. A minimum of 50% of a true circle will be required in lamp test relative to horizontal alignment of pipe.
4. A minimum of 90% of a true circle will be required in lamp test relative to vertical alignment of pipe unless otherwise indicated on Drawings.
5. Repair any sections not passing the lamp test.

E. Grade Tolerances

1. Free from noticeable depressions or humps.
2. Invert elevations shall not exceed plus or minus 0.2 inches from elevations shown on Drawings or which can be computed from Drawings.
3. Shall comply with the lesser of the following:
    a. not more than 0.1% difference from grade shown on Drawings
    b. not more than 10% of grade shown on Drawings

F. Hydrostatic Testing- Manholes

1. Manhole on gravity lines when directed by Engineer
    a. Plug all inlets and outlets
    b. Fill manhole to ¾ height
    c. Allow water to stand for 24 hours
    d. Leakage tested during following 24 hour period
    e. Leakage: Less than 0.2 gph/ft above invert
    f. Repair all manholes that do not meet leakage test

G. Contractor shall provide engineer a video of all new sewer main installed prior to acceptance of public sewer lines.

END OF SECTION

# SECTION 02751

# CEMENT CONCRETE PAVEMENT

## PART 1 GENERAL

### 1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 Summary

A. This Section includes exterior cement concrete pavement for the following:

1. Driveways and roadways.
2. Parking lots.
3. Curbs and gutters.
4. Walkways.

### 1.3 Definitions

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

### 1.4 Submittals

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete pavement mix prepared within the year prior to construction. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Samples: 10-lb (4.5-kg) sample of exposed aggregate.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials and aggregates.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Bonding agent or adhesive.
6. Joint fillers.

F. Minutes of preinstallation conference.

## 1.5 Quality Assurance

A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1. Before submitting design mixes, review concrete pavement mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with concrete pavement to attend, including the following:

    a) Contractor's superintendent.
    b) Independent testing agency responsible for concrete design mixes.
    c) Ready-mix concrete producer.
    d) Concrete subcontractor.

## 1.6 Project Conditions

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

# PART 2 PRODUCTS

## 2.1 ORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves of a radius 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

## 2.2 Steel reinforcement

A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

C. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

D. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

E. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6) internally and externally threaded. Design hook-bolt-joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

## 2.3 Concrete Materials

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Portland Cement: ASTM C 150, Type I

1. Fly Ash: ASTM C 618, Class F

C. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:

1. Class: 4S.
2. Maximum Aggregate Size: 1-1/2 inches (38 mm) nominal.
3. Do not use fine or coarse aggregates containing substances that cause spalling.

D. Water: ASTM C 94.

## 2.4 Admixtures

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

1. Air-Tite or Amex 210; Cornix Construction Chemicals.
2. Air-Mix or Perma-Air; Euclid Chemical Co.
3. Darex AEA or Daravair; W.R. Grace & Co.

4. MB-VR or Mibro-Air; Master Builders, Inc.
5. Sealtight AEA; W.R. Grace & Co.
6. Sika AER; Sika Corp, Meadows Inc.

## 2.5 Fiber Reinforcement

A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 2 to 1 inch (13 to 25 mm) long.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

C. Fibrillated Fibers:

1. Fibrasol F, Axim Concrete Technologies.
2. Fibermesh; Fibermesh, Div. Of Synthetic Technologies.
3. Forta CR; Forta Corporation
4. Grace Fibers; W.R. Grace & Co., Construction Products Div.

## 2.6 Curing Materials

A. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

C. Products: Subject to compliance with requirements, provide one of the following:

1. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound:

a) Clear Cure; Anti-Hydro Co.
b) Spartan-Cote; The Burke Co.
c) RX Cure; Conspec Marketing & Manufacturing Co., Inc.
d) Day-Chem Rez Cure; Dayton Superior Corporation.
e) Kurez DR; Euclid Chemical Co.
f) Nitocure S; Fosroc.
g) #64 Resin Cure; Lambert Corporation.
h) L&M Cure DR; L&M Construction Chemicals, Inc.
i) 3100-Clear; W. R. Meadows, Inc.
j) Seal N Kure FDR; Metalcrete Industries.

k) Rich Cure; Richmond Screw Anchor Co.
l) Resi-Chem C309; Symons Corporation.
m) Horncure 30; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
n) Uni Res 150; Unitex.
o) Certi-Vex RC; Vexcon Chemicals, Inc.

## 2.7 Related Materials

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

1. Pavement-Marking Paint: Alkyd-resin type; ready mixed; complying with FS TT-P-115, Type I, or AASHTO M 248, Type N.

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

1.Color: As indicated.

C. Color: Blue for handicapped requirements, white elsewhere.

D. Color: Blue for handicapped requirements, yellow for fire lanes, white elsewhere.

1. Glass Beads: AASHTO M 247.
2. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

E. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

F. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Type: Class II, non-load bearing, for bonding freshly mixed to hardened concrete.
2. Type: Class I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

3. Type: Class IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

## 2.8 Concrete Mixes

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

1. Do not use Owner's field quality-control testing agency as the independent testing agency.

C. Proportion mixes to provide concrete with the following properties:

1. Compressive Strength (28 Days): 3000 psi (20.7 MPa).
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Maximum Allowable Slump: 3 inches (75 mm).

a) Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches (200 mm) after adding admixture to plant- or site-verified, 2- to 3-inch (50- to 75-mm) slump.

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Fly Ash: 25 percent.

G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:

H. Air Content: 5.5 percent for 1-1/2-inch (38-mm) maximum aggregate.

## 2.8 Concrete Mixing

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

B. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## PART 3 EXECUTION

### 3.1 Preparation

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.2 Edge Forms And Screed Construction

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

### 3.3 Steel Reinforcement

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

1. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

## 3.4 Joints

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
3. Provide tie bars at sides of pavement strips where indicated.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at maximum intervals of 50 feet (15.25 m), unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler less than 1/2 inch (12 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.

## 3.5 Concrete Placement

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. When concrete placing is interrupted for more than 2 hour, place a construction joint.

H. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only

square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.

J. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

M. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

N. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

## 3.6 Concrete Finishing

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

C. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surface.

D. Radius 1/4".

E. Radius 3/8"

## 3.7 Concrete Protection And Curing

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a) Water.
    b) Continuous water-fog spray.
    c) Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

## 3.81 Pavement Tolerances

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (9 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).

6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

## 3.9 Pavement Marking

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

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

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

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

## 3.10 Field Quality Control

A. Testing Agency: Contractor will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.

3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m). One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
8. When total quantity of a given class of concrete is less than 50 cu. yd. (38 cu. m), Architect may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).

C. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as the sole basis for approval or rejection.

E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

## 3.11 Repairs And Protection

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

**END OF SECTION**

# SECTION 02764

# PAVEMENT JOINT SEALANTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within cement concrete pavement.
2. Joints between Portland cement concrete and asphalt pavement.

B. Related Sections include the following:

1. Division 2 Section "Hot-Mix Asphalt Paving" for constructing joints between concrete and asphalt pavement.
2. Division 2 Section "Cement Concrete Paving" for constructing joints in concrete paving.
3. Division 7 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

### 1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Compatibility and Adhesion Test Reports: From joint sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backer materials have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Product Test Reports: From a qualified testing agency indicating joint sealants comply with requirements, based on comprehensive testing of current product formulations.

## 1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency, based on testing current sealant formulations within a 36-month period.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

D. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturer, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

    a. Perform tests under environmental conditions replicating those that will exist during installation.

2. Submit not fewer than nine pieces of each type of material, including joint substrates, joint-sealant backer materials, secondary seals, and miscellaneous material.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if joint sealant manufacturer submits joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

## 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F (4.4 deg C).
2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

C. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

D. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:

E. Products: Subject to compliance with requirements, provide one of the following:

1. Type NS Silicone Sealant for Concrete:

    a. Roadsaver Silicone-SL; Crafco Inc.
    b. 888; Dow Corning.

### 2.2 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

### 2.3 PRIMERS

A. Primers: Product recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint- sealant-substrate tests and field tests.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

### 3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of backer materials.
2. Do not stretch, twist, puncture, or tear backer materials.
3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths

that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

## 3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

## 3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

**END OF SECTION**

SECTION 02815 - IRRIGATION

PART 1 - GENERAL

1.01 WORK INCLUDED

Work of this Section generally includes provisions for the design and installation of an underground irrigation system including the following:

A. Design of irrigation system in accordance with standards and guidelines from Sangre de Christo Water Company. Design to be approved by Landscape Architect prior to proceeding with installation.

B. Trenching, stockpiling excavation materials, refilling and compacting trenches.

B. Complete irrigation system including, but not limited to, piping, connections to cistern pumping system, electronic controller and wiring, valves and bubblers, and final adjustments to insure proper coverage.

1.02 SUBMITTALS

A. Record Drawings (As-Builts)

1. Indicate controller and all valve zones on as-built drawings. Upon completion of Project, submit for review, prior to final acceptance, final set of as-built mylar sepias. Dimensions, from two permanent points of reference location of following items:

a. Connection to existing water lines and/or valves..
b. Routing of sprinkler pressure lines
c. Irrigation control valves.
f. Control wire routing if not with pressure mainline.
g. All gate valves.
h. Other related equipment as directed.

B. Operation Instructions: Submit three written operating instructions including winterization procedures and start-up, with cut sheets of products, and coordinate controller/watering operation instruction with maintenance personnel.

1. Controller Charts:

a. Provide one revised controller chart for each automatic controller installed.
b. Identify areas of coverage of each remote control valve, using a distinctly different pastel color drawing over entire area of coverage.
c. Following review of charts by Landscape Architect, they shall be hermetically sealed between two layers of 20 mm thick plastic sheet.

1.06 JOBSITE CONDITION

A. Protection of Property

1. Preserve and protect all trees, plants, structures, and paved areas from damage due to Work of this Section. In the event damage does occur, all damage to inanimate items shall be completely repaired or replaced to satisfaction of Landscape Architect. All costs of such repairs shall be charged to and paid by Contractor.

B. Protection and Repair of Underground Lines

1. Request proper utility company to stake exact location (including depth) of all underground electric, gas, or telephone lines. Take whatever precautions are necessary to protect these underground line from damage. If damage does occur, all damage shall be repaired by Contractor and all costs of such repairs shall be paid by Contractor unless other arrangements have been made.

1.07 WARRANTY/GUARANTY

Refer to General Conditions

1.08 MAINTENANCE

A. Furnish the following maintenance items to Owner prior to final Acceptance:

1. Two sets of special tools required for removing, disassembling, and adjusting each type of irrigation head and valve supplied on this Project.
2. Two 6 foot valve keys for operation of gate valves or stop and waste valves (if applicable).
3. Two aluminum drain valve keys of sufficient length for operation of drain valves.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General Piping

1. Pressure Supply Lines (downstream of connection to valves or mainline): Schedule 40 PVC.
2. Non-Pressure Lines: Class 200 PVC BE.
3. Solvent Weld Pipe: Manufactured from virgin polyvinyl chloride (PVC) compound in accordance with ASTM D2241 an ASTM D1784; cell classification 12454-B, Type 1, Grade 1.

a. Fittings: Standard wright, Schedule 40, injection molder PVC; complying with ASTM D1784 and D2466, cell classification 12454-B.
- Thread: Injection molded type (where required).
- Tees and ells: Side gated.

b. Threaded Nipples: ASTM D2464, Schedule 80 with molded threads.
c. Joint Cement and Primer: Type as recommended by manufacturer of pipe and fittings.

B. Electrical Control Wiring

1. Low Voltage:

a. Electrical Control Wire: AWG UFUL approved No. 14 direct burial copper wire or larger, if required to operate system as designed.
b. Wire Colors:

- Control Wires: Red
- Common Wires: White
- Spare Control Wires: Black
- Spare Common Wires: Yellow

C. Keys - Provide two sets for controller cabinet; for quick coupling valves provide minimum one key and matching hose swivel for every five quick coupling valves installed.

F. Electric Control Valves: Size and type shown on Drawings having manual flow adjustment (except drip valves) and manual bleed nut.

G. Sprinkler or Bubbler Heads: Fabricated riser units in accordance with details on Drawings - with riser nipples of same size as riser opening in sprinkler body.

2.02 SUBSTITUTIONS

A. Substitutions must have written approval of Owner's Representative and must equal the standard of products specified in the Construction Documents.

B. Installation of any approved substitution is the responsibility of the Contractor. Any changes required for installation of any approved substitution must be made ot the satisfaction of Owner's Representative and at no additional cost to Owner.

C. Approval by Owner's Representative of substituted equipment does not waive these requirements.

PART 3 - EXECUTION

3.01 INSPECTION

Examine areas and conditions under which Work of this Section is to be performed. Do not proceed with Work until unsatisfactory conditions have been corrected.

A. Grading operations, with the exception of final grading, shall be completed and approved by Landscape Architect before staking or installation of any irrigation system begins.

3.02 PREPARATION

A. Staking shall occur as follows:

1. Mark, with powdered lime, routing of pressure supply line and flag heads for all zones. Contact Landscape Architect 48 hours in advance and request review of staking. Landscape Architect will review staking and direct changes if required. Review does not relieve Subcontractor from coverage problems due to improper placement of heads after staking.

B. Install sleeving under walks or other paving as required prior to paving operations, to accommodate piping and wiring. Compact backfill around sleeves to 95 percent Modified Proctor Density within 2 percent of optimum moisture content in accordance with STM D1557.

C. Trenching: Dig trenches straight and support pipe continuously on bottom of trench. Trench bottom shall be clean and smooth with all rock and organic debris removed.

1. Clearances:

3.03 DRIP IRRIGATION

D. Install drip tubing and emitters after plants are installed.

E. Lay out drip tubing and flush thoroughly before installing emitters or line flush valves.

F. Install drip emitters directly into drip tubing. Branch and snake drip tubing in planting areas such that emitters are directly adjacent to plant root balls. Do not use small diameter distribution tubing.

G. Install automatic line flush valves as detailed at all ends of drip tubing.

a. Piping smaller than 3 inches: Trenches shall have a minimum width of 7 inches.

b. Line Clearance: Provide not less than 6 inches of clearance between each line, and not less than 12 inches of clearance between lines of other trades.

2. Pipe and Wire Depth:

a. Pressure Supply Piping: 18 inches from top of pipe.
b. PVC Sleeving: 18 inches from top of pipe.
c Non-pressure Piping (pop-up): 12 inches from top of pipe.
d. Control Wiring: Side of pressure main.

1.02 DRIP IRRIGATION COMPONENTS

A. Filter: Hunter or approved equal

B. Pressure regulator: Hunter or approved equal

C. Drip tubing: Hunter or approved equal

D. Drip tubing fittings: Schedule 80 UVR PVC solvent weld. Hunter or approved equal. Install emitters in tubing ring surrounding tree at each new or transplanted tree.

E. Use Hunter pressure compensating bugbler, install on flex PVC riser, Hunter root zone watering system

F. Stakes: Drip tubing, heavy gauge steel wire staples.

G. Drip emitters: Hunter, pressure compensating.

H. Automatic line flush valve: Hunter.

I. Exact location of controller to be determined at jobsite by Owner. 120 V AC electrical supply to be supplied by contractor in immediate vicinity of controller (see Landscaping Drawing A0.1). Make final 120V connections. Use EMT metal conduit for indoor installation and liquid-tite conduit for outdoor installations. Install per Mfgr. instructions. Ground controller and conform to applicable local codes.

J. Full coverage is required; make minor modifications to layout as required to obtain complete coverage and review with Architect.

K. Install pipe and wire under paving in PVC schedule 40 sleeves.

L. Layout emitter tubing parallel to topography wherever possible. Open line ends and flush thoroughly before installation of specified end flush caps at ends of all 1/2" lines. All lines must be thoroughly flushed before installation of emitters.

M. Install emitters directly into 1/2" drip lines. Do not use small diameter distribution tubing.

N. Take care to minimize disturbance to roots of existing trees.

O. Connect to booster pump outlet at cistern. Observe all local codes applicable to cistern, and separation of water sources.

P. Provide alarm connected to level in cistern and mechanism to shut off irrigation system when cistern is below 1/4 full.

Q. Provide two sets for controller cabinet; for quick coupling valves provide minimum one key and matching hose swivel for every five quick coupling valves installed.

3.04 LAYOUT

R. Lay out work as accurately as possible to drawings using stakes and different colored flags to indicate different types of heads and valves. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown.

S. Adjust layout as required to conform to existing site conditions and avoid conflict with trees, light standards and other site elements.

T. Take care to coordinate layout of irrigation bubbler heads and drip circuits with that of planting layout.

U. Full and complete coverage is required. Make any necessary minor adjustments to achieve full coverage at no additional cost to Owner.

V. Do not willfully install the irrigation system as shown on Drawings when it is obvious in the field that obstructions or other discrepancies exist which may not have been considered in the design. Notify Owner's Representative of discrepancies before proceeding.

3.05 INSTALLATION

A. PVC Piping: Snake pipe in trench as much as possible to allow for expansion and contraction. Do not install pipe when air temperature is below 40-F. Place manual drain valves at low points and dead ends of pressure supply piping to insure complete drainage of system. When pipe laying is not in progress, or at end of each day, close pipe ends with tight plug or cap. Perform Work in accordance with good practices prevailing in piping trades.

1. Solvent Weld PVC Pipe: Lay pipe and make all plastic to plastic joints in accordance with manufacturer's recommendations.

B. Control Wiring

1. Low Voltage Wiring:

a. Bury control wiring between controller and electric valves in pressure supply line trenches, strung as close as possible to main pipe lines with such wires to be consistently located below and to one side of pipe, or in separate trenches.
b. Bundle all 24 volt wires at 10 foot intervals and lay with pressure supply line pipe to one side of the trench.
c. Provide an expansion loop at every pressure pipe angle fitting, every electric control valve location (in valve box), and every 500 feet. Form expansion loop by wrapping wire at least 8 times around a 3/4 inch pipe and withdrawing pipe.
d. Make all splices and E.C.V. connections using Rain Bird Pentite connectors or similar dry splice method.
e. Install all control wire splices not occurring at control valve in a separate splice valve box.
f. Install one control wire for each control valve.
g. Run two spare #14 AWG UFUL control wires and one common wire from controller pedestal to the end of each and every leg of mainline. Label spare wires at controller and wire stub box.

C. Electric Control Valves: Install cross-handle 3 inches below finished grade where shown on Drawings as detailed. When grouped together, allow at least 12 inches between valve box sides. Install each remote control valve in a separate valve box. Install individual valve box flush with grade.

D. Drain Valves: Install manual drain valves at all low points in pressure supply line as detailed. Provide a three cubic foot gravel drainage sump for each drain valve.

F. Valve Boxes

1. Install one valve box for each type of valve installed as detailed. Install gravel sump after compaction of all trenches. Place final portion of gravel inside valve box after valve box is backfilled and compacted.

G. Trench Excavations Leave trenches slightly mounded to allow for settlement after backfilling is completed.

1. Materials: Excavated material is generally considered satisfactory for backfill purposes. Backfill material shall be free of rubbish, vegetable matter, frozen materials, and stones larger than 1 inch in maximum dimension. Do not mix subsoil with topsoil. Material not suitable for backfill shall be hauled away. Contractor shall be responsible for providing suitable backfill if excavated material is unacceptable or not sufficient to meet backfill, compaction, and final grade requirements.

2. Do not leave trenches open for a period of more than 48 hours. Open excavations shall be protected in accordance with OSHA regulations.

3. Compact backfill to 90 percent maximum density, determined in accordance with ASTM D155-7 utilizing the following method: Mechanical tamping.

3.06 CONTROLLER

W. Install per manufacturer's instructions and local code.

X. Install valve control wire in conduit from controller to mainline trench or as indicated on Drawings.

Y. Ground controller.

Z. Connect remote control valves to controller in sequence as noted on Drawings.

AA. Label valve wires at controller with non-fading numeric tape.

BB. Install Solar Sync Sensor on structure, based on manufacturer's recommendations. Obtain approval of mounting location from Owner's Representative. Install Solar Sync panel within irrigation controller enclosure. Install wire from sensor unit in conduit.

CC. Prepare two copies of controller chart from reduced copy of irrigation plan. Indicate area covered by each zone using non-fading color pens. Laminate controller charts and place one copy in irrigation controller cabinet. Include second copy in Operations Manual.

3.07 BACKFLOW PREVENTER (IF REQUIRED)

DD. Install per local code and manufacturer's specifications.

EE. Provide pipe supports and accessories as necessary to properly secure the assembly.

FF. Install a freeze protection jacket, "polar parka" or approved equivalent.

3.08 GATE VALVE

GG. Install in valve box with extensions as required. Set valve box flush with finish grade in lawn areas and 1" above finish grade in shrub/groundcover areas. Fill bottom of valve box with 4" depth ¾" drain rock. Do not bury valve.

HH. Provide Owner's Representative with any operating keys required for gate valves installed.

3.09 CONTROL WIRING

II. General landscape: Install control wires in common trench with mainline wherever possible. Bundle and tape wires at 10' intervals. Install wire bundle beside mainline, not beneath. Install to provide 3" minimum between wire bundle and mainline pipe.

JJ. Install one extra valve control wire from controller, looping through each remote control valve box along entire mainline route.

KK. Make expansion coils in wires by wrapping 36" of wire around a piece of 1" pipe. Provide expansion coils at each remote control valve, at bends in trench of 45° or greater, and at 100' intervals.

LL. Wire splices are to be sealed with specified splicing materials. Splices are allowed on wire runs longer than 2000 feet only. All splices are to be in valve boxes.

3.10 CHECK VALVES

MM. Install per manufacturer's instructions on lateral lines as necessary to control line drainage.

3.11 CLOSING PIPES AND FLUSHING LINES

NN. Cap or plug all openings in pipe or fittings throughout installation to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.

OO. Thoroughly flush all main lines before installing remote control valves. Thoroughly flush all lateral lines before installing irrigation heads or drip equipment.

3.12 BACKFILLING & COMPACTING

PP. After system is operating and required tests and observations have been made, backfill trenches with finely divided soil free of rubbish and rocks.

QQ. Compact backfill for trenches to equal surrounding undisturbed soil.

RR. Dress off all areas to finish grades. Adjust grades if settlement occurs.

3.13 FIELD QUALITY CONTROL

A. Flushing: After piping, risers, and valves are in place and connected, but prior to installation of heads, thoroughly flush piping system under full head of water pressure from dead end fittings. Maintain flushing for five minutes through furthermost valves. Cap risers after flushing.

B. Testing: Conduct tests in presence of Landscape Architect and Arrange for testing 48 hours in advance of testing. Supply force pump and all other test equipment.

1. After backfilling, and installation of all control valves, fill pressure supply line with water, and pressurize to 40 PSI over the designated static pressure of 120 PSI, whichever is greater, for a period of two hours.
2. Leakage, Pressure Loss: Test is acceptable if no loss of pressure is evident during the test period.
3. Leaks: Detect and repair leaks.
4. Retest system until test pressure can be maintained for duration of test.

5. Before final acceptance, pressure supply line shall remain under pressure for a period of 48 hours.

C. Walk-Through for Substantial Completion

1. Arrange for Landscape Architect's presence 48 hours in advance of walk-through.
2. Operate each zone in its entirety for Landscape Architect at time of walk-through and additionally, open all valve boxes if directed.
3. Generate a list of items to be corrected prior to Final Completion.
4. Furnish all materials and perform all work required to correct all inadequacies of coverage due to deviations from Contract Documents.

D. Walk-Through for Final Completion

1. Arrange for Landscape Architect's presence 48 hours in advance of walk-through.
2. Show evidence to Landscape Architect that Landscape Architect has received all accessories, charts, record drawings, and equipment as required before Final Completion walk-through is scheduled.
3. Operate each zone, in its entirety for Landscape Architect at time of walk-through to insure correction of all incomplete items.
4. Items deemed not acceptable by Landscape Architect shall be reworked to complete satisfaction of Landscape Architect

3.14 CLEANING

Maintain continuous cleaning operation throughout duration of work. Dispose of, off-site, at no additional cost to Landscape Architect, all trash or debris generated by installation of irrigation system.

# SECTION 02821 - FENCES AND GATES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Chain-Link Fences: Industrial.
2. Gates: Chain link pedestrian swing gates.
3. Gates: Chain link swing gates for cars/trucks
4. Barbed wire fencing
5. Gates: tubesteel farm gates
6. Gates: double pipe gates

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for site excavation, fill, and backfill where chain-link fences and gates are located.
2. Division 3 Section "Cast-in-Place Concrete" for concrete equipment bases/pads for gate operators, drives, and controls and post concrete fill.
3. Division 16 Sections for electrical service and connections for motor operators, controls, limit and disconnect switches, and safety features and for system disconnect switches.

### 1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:

a. Wind Speed: 80 mph (129 km/h)
b. Fence Height: 8 feet.
c. Line Post Group: IA, ASTM F 1043, Schedule 40 steel pipe.
d. Wind Exposure Category: B

2. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to 12 feet (3.66 m) high, and post spacing not to exceed 10 feet (3 m).

B. Lightning Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

## 1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

1. Fence and gate posts, rails, and fittings.
2. Chain-link fabric, reinforcements, and attachments.
3. Gates and hardware.
4. Gate operators, including operating instructions.
5. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

1. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
2. Wiring Diagrams: Power and control wiring and communication features.
3. For installed products indicated to comply with design loads, include structural analysis data.

C. Samples for Initial Selection: Manufacturer's color charts or 6-inch (150-mm) lengths of actual units showing the full range of colors available for components with factory-applied color finishes.

D. Samples for Verification: For each type of chain-link fence and gate indicated.

1. Polymer-coated steel wire (for fabric) in 6-inch (150-mm) lengths.

E. Product Certificates: For each type of chain-link fence, operator, and gate, signed by product manufacturer.

1. Strength test results for framing according to ASTM F 1043.

F. Qualification Data: For Installer.

G. Field quality-control test reports.

H. Maintenance Data: For the following to include in maintenance manuals:

1. Polymer finishes.
2. Gate operator.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1. Engineering Responsibility: Preparation of data for chain-link fences and gates, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified according to NETA ETT, or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. UL Standard: Provide gate operators that comply with UL 325.

E. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators serving as a required means of access.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

## 1.6 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Gate Operator:

a. Elite

## 2.2 CHAIN-LINK FENCE FABRIC

A. General: 8 feet. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: 9 gauge Polymer-coated wire.

a. Mesh Size: 2 inches (50 mm).
b. Polymer Coating: ASTM D 668 over galvanized steel wire.

1) Color: As selected by Architect from manufacturer's full range, complying with ASTM F 934.

## 2.3 INDUSTRIAL FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:

1. Group: IA, round steel pipe, 2 3/8”, Schedule 40.
2. Fence Height: 6 feet (1.83 m).
3. Strength Requirement: Light industrial according to ASTM F 1043.
4. Post Size and Thickness: According to ASTM F 1043.

a. Top Rail: 1.66 inches (42 mm).
b. Line Post: 2.375 inches (60 mm).
c. End, Corner and Pull Post: 2.875 inches (73 mm).
d. Horizontal-Slide Gate Post: According to ASTM F 1184.
1) Openings Wider Than 12 Feet (3.7 m): Steel post, 4-inch (102-mm) diameter, and 8.65-lb/ft. (12.88-kg/m) weight.

5. Coating for Steel Framing:

a. Polymer coating over galvanized coating.

## 2.4 TENSION WIRE

A. General: Provide horizontal tension wire at the following locations:

1. Location: Extended along bottom of fence fabric.

B. Galvalized Steel Wire: 0.177-inch- (4.5-mm-) diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824, and the following:

## 2.5 INDUSTRIAL SWING GATES

A. General: Comply with ASTM F 1184 for single slide gate types.

1. Classification: Standard Slide with ground track (concrete ribbon); ground track to extend across gate opening in paving material as well as extending in ground to accept gate in open position.
2. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1184 for materials and protective coatings.

B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 1184 and the following:

1. Gate Fabric Height: 6 feet (1.83 m).
2. Gate Opening Width: As indicated on drawings.
3. Frame Members:
a. Perimeter 2 3/8” Schedule 40
b. Bottom rail 2x4 steel

4. Bracing Members:
a. 2 3/8” Schedule 40.

C. Hardware: Latches permitting operation from both sides of gate, stops, chain with knoxbox padlock all fabricated from galvanized steel.

## 2.6 PEDESTRIAN SWING GATES

A. General: Comply with ASTM F 900 for single swing gate types.

1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.

B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 900 and the following:

1. Gate Fabric Height: same as adjacent fence height
2. Leaf Width: 36 inches (914 mm).
3. Frame Members:

    a. Tubular Steel: 1.66 inches (42 mm) round

C. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame as required to attach barbed wire assemblies.

D. Hardware: Latches permitting operation from both sides of gate and hinges. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.
1. Provide padlock and chain.

2.7 TUBESTEEL FARM GATE

A. 10' each (latch in the middle), 7 bar horizontal, 4 vertical bars each

B. 2" tube

C. mount on 8" concrete filled tubesteel bollards

D. galvanized

E. provide and install hinges (attach to bollards) as required, provide and install latching hardware as well as a chain and padlock with knoxbox

2.8 DOUBLE PIPE GATE

A. 10' each, triangular

B. 2" tube

C. mount on 8" concrete filled tubesteel bollards, provide two additional bollards so that gate can be latched in the open position

D. galvanized

E. provide and install hinges (attach to bollards) as required, provide and install latching hardware as well as a chain and padlock with knoxbox

2.9 BARBED WIRE FENCING

A. 4-strand barbed wire, class 3 galvanized

B. steel posts - drive each post so that post anchor is 3" below ground, tamp and compact ground, 8' spacing

2.10 FITTINGS

A. General: Comply with ASTM F 626.

B. Post and Line Caps: Provide for each post.

1. Line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches (152 mm) long.
2. Rail Clamps: Line and corner boulevard clamps for connecting bottom rails in the fence line-to-line posts.

E. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
   a. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames.

## 2.11 CAST-IN-PLACE CONCRETE

A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94/C 94M.

1. Concrete Mixes: Normal-weight concrete with not less than 3000-psi (20.7- MPa) compressive strength (28 days), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum size aggregate.

B. Materials: Dry-packaged concrete mix complying with ASTM C 387 for normal-weight concrete mixed with potable water according to manufacturer's written instructions.

## 2.12 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

## 2.13 POLYMER FINISHES

A. Supplemental Color Coating: Provide fence components with polymer coating.

B. Metallic-Coated Steel Tension Wire: PVC-coated wire complying with ASTM F 1664.

C. Metallic-Coated Steel Framing and Fittings: Comply with ASTM F 626 and ASTM F 1043 for polymer coating applied to exterior surfaces and, except inside cap shapes, to exposed interior surfaces.

1. Polymer Coating: Not less than 10-mil- (0.254-mm-) thick PVC or 3-mil- (0.076-mm-) thick polyester finish.

D. Color: Match chain-link fabric.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.

1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

1. Install fencing on established boundary lines inside property line.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

a. Exposed Concrete: Extend ½" above grade; shape and smooth to shed water.
b. Posts Set into Concrete in Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.
c. Posts Set into Voids in Concrete: Form or core drill holes not less than 12 inches deep and 3/4 inch (20 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.
d. Provide enough concrete so that posts do not move with existing wind loads and continued use of gate.

C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

D. Line Posts: Space line posts uniformly at 8 feet (2.44 m) o.c.

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 6 feet (1.83 m) or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- (3.05-mm-) diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches (610 mm) o.c. Install tension wire in locations indicated before stretching fabric.

1. Bottom Tension Wire: Install tension wire within 6 inches (150 mm) of bottom of fabric and tie to each post with not less than same diameter and type of wire.

G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch (25.4 mm) etween finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

I. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches (300 mm) o.c. and to braces at 24 inches (610 mm) o.c.

J. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.

## 3.5 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

## 3.6 GROUNDING AND BONDING

A. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet (45 m) on each side of crossing.

B. Gate operator must be grounded.

C. Grounding-Resistance Testing: Engage a qualified independent testing and inspecting agency to perform field quality-control testing.

## 3.7 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Automatic Gate Operator: Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices and limit switches.
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lubricate hardware, gate operator, and other moving parts.

## 3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain gates. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 02821

# SECTION 02920 - NATIVE GRASSES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes the following:

1. Hydroseed Grass Seeding

B. Related Sections include the following:
1. Section 02930 - Plants and Landscape Material

### 1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Planting Soil: Native or surface soil modified to become topsoil; mixed with soil amendments.

C. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

### 1.3 SUBMITTALS

A. Product Data: Grass seed mixes.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for native grass, identifying source, including name and telephone number of supplier.

C. Planting Schedule: Indicating anticipated planting dates for each type of planting.

### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful grass seeding establishment.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.6 SCHEDULING

A. Planting Restrictions: Plant during the following period when possible. Do not seed in winter season. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Summer Seeding: July15 – August 31

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.7 NATIVE GRASS MAINTENANCE

A. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch.

B. Watering: Provide and maintain temporary piping, hoses, and watering equipment to convey water from sources and to keep native grass uniformly moist.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water native grass at a minimum rate of ½" per week for 3 weeks after seeding unless there is adequate rainfall in same period.

PART 2 - PRODUCTS

2.1 HYDROSEED
Native Grass Seed Hydroseed (erosion control and seed mix)

2.2 TOPSOIL

1. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Clean surface soil of debris, construction debris, stones, clay lumps, and other extraneous materials harmful to plant growth.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

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

C. Mechanical Preparation: After significant building and paving construction and removal of construction equipment from seeding areas, seed beds shall be loosened to a minimum depth of 6" by means of disc or harrow. Areas of heavy or compacted soil may require additional preparation such as chiseling or ripping if discing alone does not result in preparation to the full minimum depth of 6". Soil shall be worked to a

smooth surface free of clods, stones 4" and larger, or any other debris or foreign material that could interfere with seeding operations.

D. Areas which cannot be prepared with mechanized equipment because of small or irregular shape may be prepared to a minimum of 2" using hand tools or rototiller.

E. Prior to the start of any seed bed preparation, the final grades of all earth work shall be inspected and approved by engineer.

F. Areas that are disturbed by the Contractor that are outside the construction limits shown on the plans shall be seeded with Blue Grama/Buffalo Grass seed mix at no cost to Owner.

## 3.2 SEEDING

A. Sow seed with drill seeding machine. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Areas that are too small for drill seeding machine or have irregular shapes may be seeded with hand tools or by broadcast seeding.

C. Evenly distribute seed by sowing equal quantities. Seed shall be drilled to a maximum depth of ½". Direction of seeding shall be across slopes and on the contour whenever possible.

D. Sow seed at the following rates:
1. Blue Grama/Buffalo Grass: 3-4 lbs. per 1000 s.f.
2. Streambank Wheatgrass: 2 lbs. per 1000 s.f.

E. Protect seeded areas with slopes exceeding 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.

## 3.3 MULCHING

A. Straw Mulch: Straw shall be applied at a minimum rate of 2.5 tons per acre of air dry straw.

B. Straw Crimping: Straw mulch shall be crimped into the soil. Mulch shall be spread uniformly over the area either by hand or with a mechanical mulch spreader. When spread by hand, the bales of mulch shall be torn apart and fluffed before spreading. Mulching will not be permitted when wind velocity exceeds 15 miles per hour. Mulch shall be wetted down and allowed to soften for 15-20 minutes prior to crimping. A heavy disc such as a mulch-tiller, with flat serrated discs at least ¼" in thickness, having dull edges and the disc spaced 6" to 8" apart shall be used to crimp or anchor mulch into the soil to a minimum depth of 2 inches. Discs shall be of sufficient diameter to prevent the frame of the equipment from dragging the mulch.

Crimping shall be in a general north-south direction or by tight interlocking "S" curves. If small grain straw mulch is used, it shall be crimped in two (2) directions in a cross-hatch pattern.

## 3.4 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by seeding from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary warning tape and warning signs as required to protect newly planted areas from traffic. Remove after grasses are established.

C. Remove erosion-control measures after grass establishment period.

END OF SECTION 02920

SECTION 02930 - EXTERIOR PLANTS AND LANDSCAPE MATERIALS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Trees
2. Shrubs
3. Plants
4. Compost and Soil Amendments
5. Mulches
6. Weed Fabric
7. Edgings
8. Rock

B. Related Sections include the following:
1. Section 02810 - Irrigation
2. Section 02920 – Native Grasses

### 1.3 DEFINITION

A. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.

B. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.

C. Finish Grade: Elevation of finished surface of planting soil. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year. Submit before expiration of required maintenance periods.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when exterior planting is in progress.

2. Report suitability of topsoil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

B. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes.

C. Observation: Architect may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver exterior plants freshly dug.

1. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

B. Do not prune trees and shrubs before delivery, except as approved by Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

C. Handle planting stock by root ball.

D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.
1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

## 1.7 COORDINATION

A. Planting Restrictions: Plant during the following periods unless approved otherwise.

1. Spring/Summer Planting: April 15 – August 31
2. Fall Planting: September 1 – November 1

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

## 1.8 WARRANTY

A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.

1. Warranty Period for Trees: One year from date of Substantial Completion.

2. Warranty Period for Transplanted Trees: One year from date of Substantial Completion.
3. Warranty Period for Plants: Six months from date of Substantial Completion.
4. Remove and replace dead exterior plants immediately.
5. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
6. A limit of one replacement of each exterior plant will be required, except for losses or replacements due to failure to comply with requirements.

## 1.9 MAINTENANCE

A. Trees and Shrubs: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.

1. Maintenance Period: Six months from date of Substantial Completion.

B. Ground Cover and Plants: Maintain for the following maintenance period by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings:

1. Maintenance Period: Six months from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 TREE AND PLANT MATERIAL

A. General: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement. For perennials, provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed.

2.2 TOPSOIL

1. Topsoil: Reuse and amend existing and stockpiled surface soil on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

B. Soil Amendments:
Gro-Power Plus
Earth Magic

2.3 MULCHES

A. Gravel Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances. 7/16" aggregate - brown, gray, and tan.

Buildology Brown (or approved equal)
Source: Buildology Inc.
3601 Pan American Freeway NE
Albuquerque, NM 87107
(505)344-6626
www.buildologyinc.com

2.4 WEED FABRIC
Preen Landscape Weed Fabric and Pins (or approved equal)

2.6 STAKES AND GUYS

A. Upright and Guy Stakes: Round, lodgepole pine stakes free of knots, holes, cross grain, and other defects, 2 inch diameter, pointed at one end.

B. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch diameter, black, cut to lengths required to protect tree trunks from damage.

2.5 LANDSCAPE EDGINGS

A. Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes. 3/16"x5.5"x16', black, anodized.

Sure-Loc Crisp Edge (or approved equal)
(800)787-3562
www.surelocedging.com

2.8 ROCK

A. Hard, durable stone, washed free of loam, sand, clay, and other foreign substances. Tan, gray, and brown color mixture, 2"-4" aggregate, smooth. Use at rock swale areas.

Grey Round (or approved equal)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

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

C. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before planting. Make minor adjustments as required.

D. Lay out exterior plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

### 3.3 PLANTING BED ESTABLISHMENT

A. Loosen subgrade of planting beds to a minimum depth of 8 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Spread planting soil mix to a depth of 6 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

2. Apply soil amendment at following rates:
   a. Gro-Power Plus: Apply at 15 lbs per 1000 s.f.
   b. Earth Magic: Apply at .60 c.f. per 1000 s.f.

B. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Restore planting beds if eroded or otherwise disturbed after finish grading and before planting.

### 3.4 EDGING INSTALLATION

A. Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches apart driven below top elevation of edging.

## 3.5 WEED FABRIC INSTALLATION

A. Install weed fabric as per manufacturer's instructions. Install fabric pins at 5' max o.c. Overlap fabric sections at minimum of 4". See landscape plan for location of planting beds for weed fabric. Cover entire area of indicated beds except at rock swales and plant excavations.

## 3.6 ROCK SWALE INSTALLATION

A. Install Grey Round aggregates in areas shown on landscape plan. Taper down to centerline of swales. Mix rocks sizes evenly across swales.

## 3.5 TREE AND SHRUB EXCAVATION

A. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.

1. Trees: Excavate approximately three times as wide as rootball diameter.

2. Shrubs and Perennials: Excavate approximately twice as wide as rootball diameter.

B. Subsoil removed from excavations may be used as backfill with soil amendments.

C. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

## 3.6 TREE AND SHRUB PLANTING

A. Set balled and burlapped stock plumb and in center of pit or trench with top of root ball 4 inch above adjacent finish grades.

1. Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

B. Set container grown stock plumb and in center of pit or trench with top of root ball 2 inch above adjacent finish grades.

1. Carefully remove root ball from container without damaging root ball or plant.
2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

## 3.7 GUYING AND STAKING

A. Upright Staking and Tying: Stake trees of 2” caliper or more. Stake trees of less than 2” caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18” below bottom of backfilled excavation and to extend at least 72” above grade. Set vertical stakes and space to avoid penetrating root balls or root masses. Support trees with two strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree. Use the number of stakes as follows:

1. Use 2 stakes for trees up to 12 feet high and 2-1/2” or less in caliper; 3 stakes for trees less than 14 feet high and up to 4” in caliper. Space stakes equally around trees.

## 3.8 PLANTERS

A. Planters: Place a layer of gravel at least 4 inches thick in bottom of planters, cover with nonwoven fabric, and fill with planter soil mix. Place soil in lightly compacted layers to an elevation of 6” below top of planter, allowing natural settlement.

1. Planter Soil Mix: Existing on-site top soil with soil amendments.

## 3.9 PLANTING BED MULCHING

A. Install weed-control barriers before mulching. Mulch backfilled surfaces of planting beds and raised planters indicated.

1. Gravel Mulch: Apply 4” average thickness of mineral mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.

B. Mulching: Apply 4” inch average thickness of mulch to edge of planting beds and also extending 12” beyond edge of planting pit or trench. Do not place mulch within 2” of trunks or stems.

## 3.10 CLEANUP AND PROTECTION

A. During exterior planting, keep adjacent pavings and construction clean and work area in an orderly condition.

B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.

## 3.11 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 02930

SECTION 02999 - WELL

PART 1 - GENERAL

Scope consists of a well and well-housing as well as connection to the cistern. All coordination as required shall be included. Testing of the well (including pumping for 5 hours total and water testing) is part of the scope of work.

The well provides water for the collection center including potable and landscape water. The fire protection tank will be filled separately and is not connected to the well.

Additional requirement: add one (1) additional 20 amp 2-pull circuit breaker in Panel A for the well pump.

The Contractor shall provide pricing for a well of a depth of 200 feet total.

See chart (Figure 5) which shows the depth of other wells within 300 meters of the site; this is for information only.

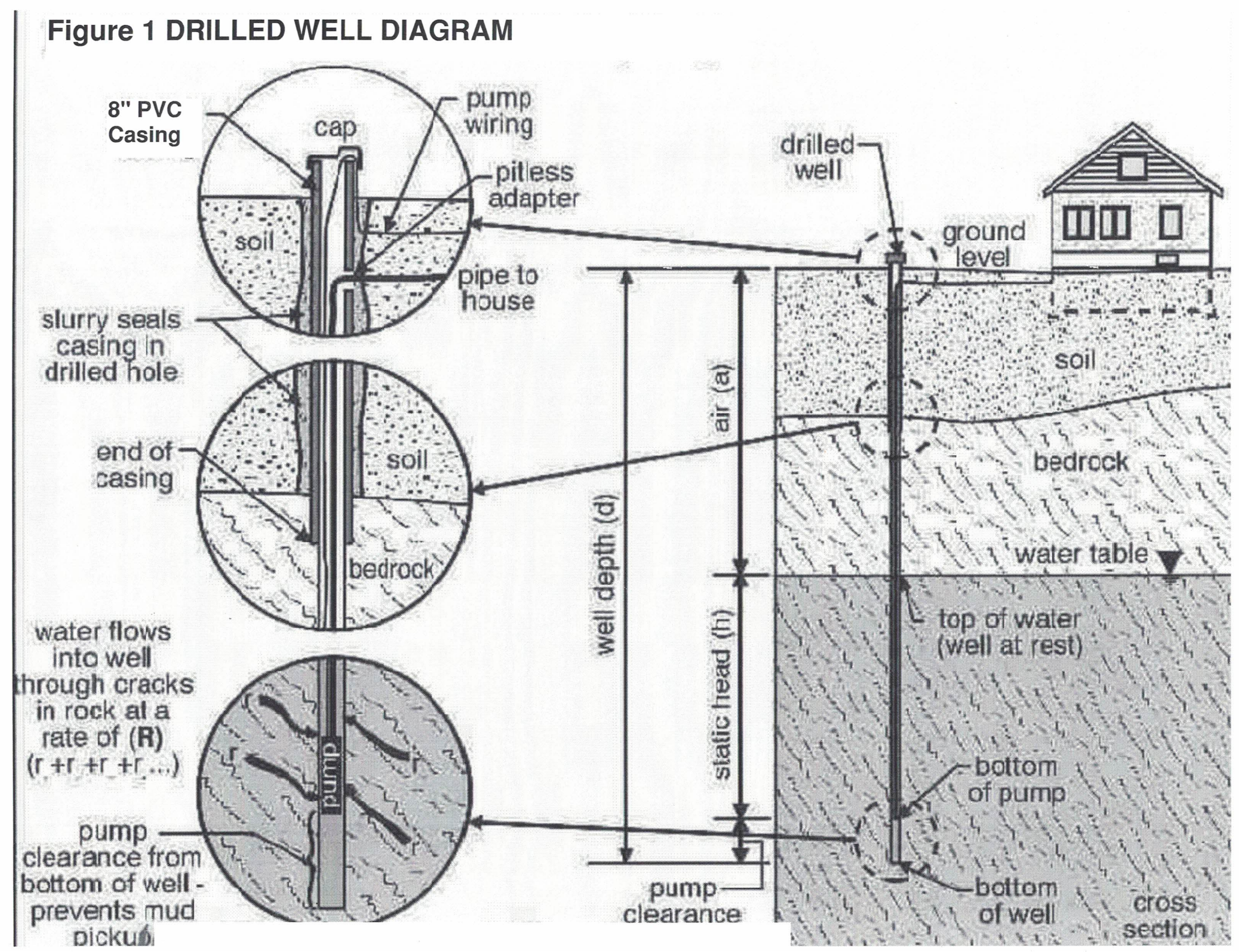
Work hours are 9 to 5 weekdays.

Water can be discharged on-site into the existing arroyo.

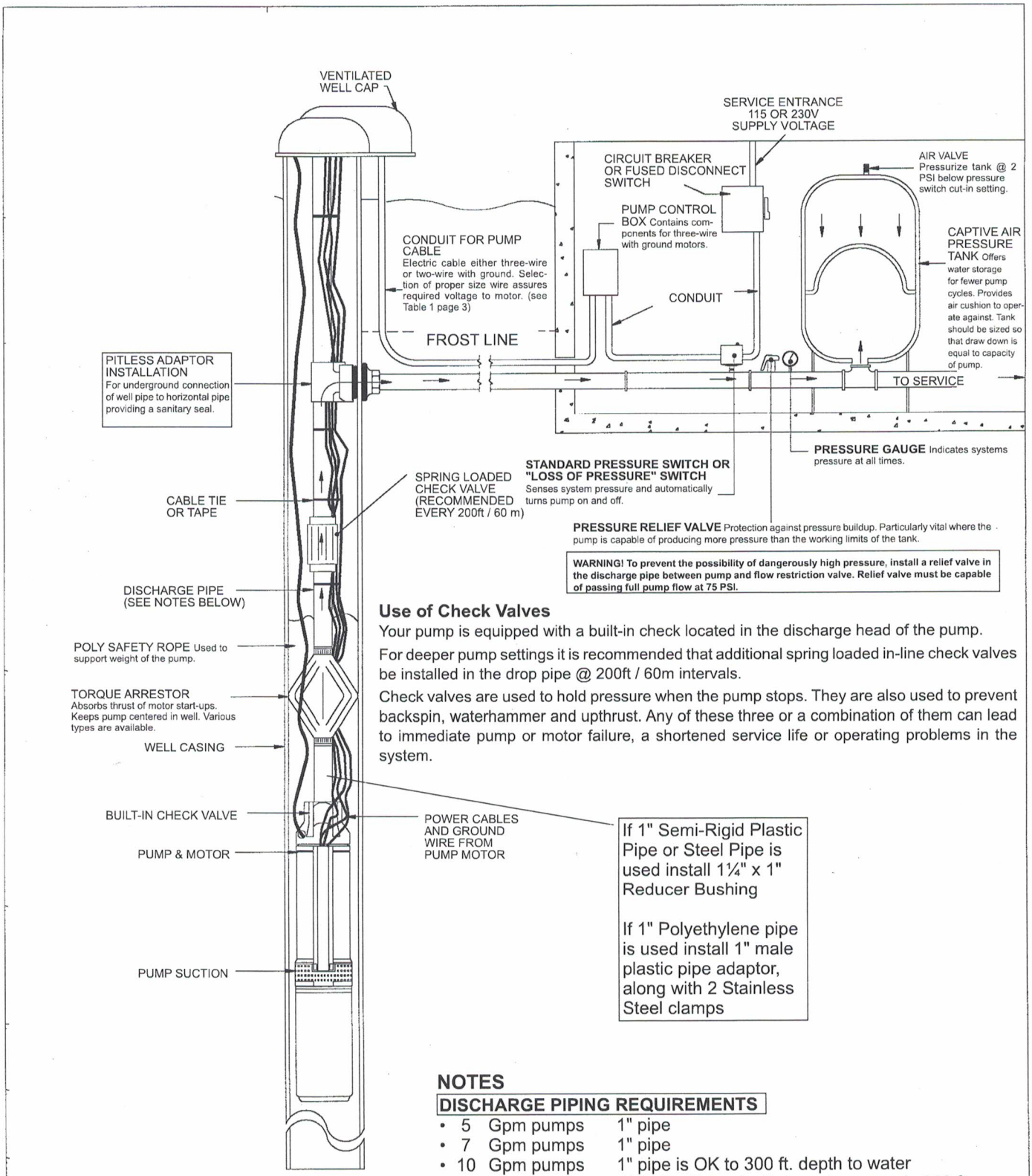
Provide pricing using the attached Well Bid Sheet. (Figure 6). This Well Bid Sheet shall be included with the Contractor's bid. The Contractor shall provide pricing for items on the Well Bid Sheet (by length and quantity); this is for procurement purposes and will be used based on the final actual depth of the well. The Well Bid Sheet may not include all items in the Specification; the Contractor is still responsible for the entire Specification.

Attachments:
Figure 1 - Drilled Well Diagram (1 page)
Figure 2 - Pump Installation Diagram (1 page)
Figure 3 - Well-Housing Details (1 page)
Figure 4 - Existing Wells with in 630 meters of the Site (11 pages)
Figure 5 - Technical Specifications (6 pages)
Figure 6 - Well Bid Sheet (1 pages)

## Figure 1 DRILLED WELL DIAGRAM



# Figure 2 Pump Installation Diagram




## Use of Check Valves

Your pump is equipped with a built-in check located in the discharge head of the pump.

For deeper pump settings it is recommended that additional spring loaded in-line check valves be installed in the drop pipe @ 200ft / 60m intervals.

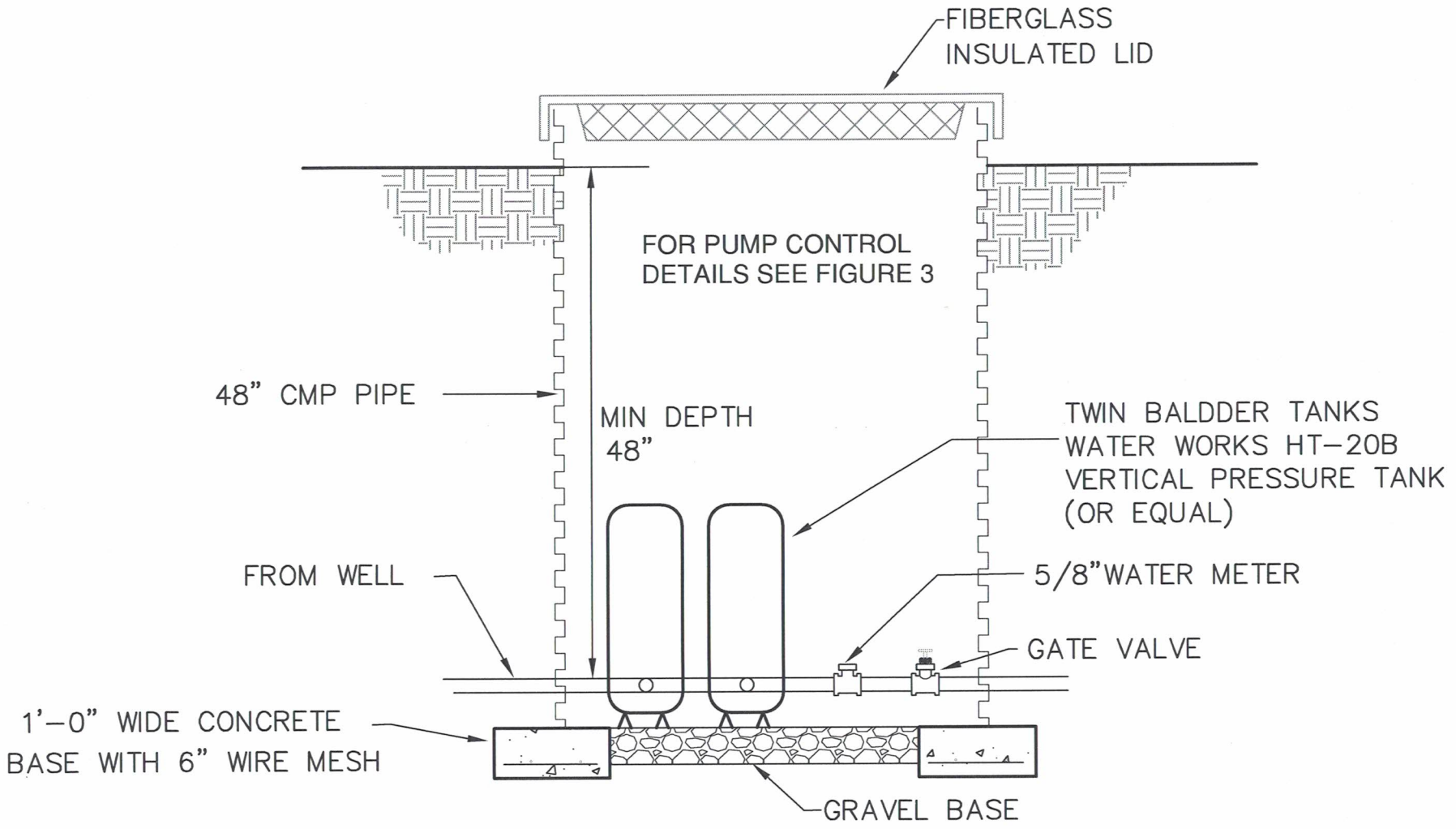
Check valves are used to hold pressure when the pump stops. They are also used to prevent backspin, waterhammer and upthrust. Any of these three or a combination of them can lead to immediate pump or motor failure, a shortened service life or operating problems in the system.

## NOTES

**DISCHARGE PIPING REQUIREMENTS**

- 5 Gpm pumps 1" pipe
- 7 Gpm pumps 1" pipe
- 10 Gpm pumps 1" pipe is OK to 300 ft. depth to water
- 10 Gpm pumps 1¼" pipe if the depth to water exceeds 300 ft.

# Figure 3 WELL HOUSING DETAILS



# JACONA COLLECTION CENTER

## Figure 4 Existing Wells within 630 meters of site

Site: X = 403247

Y = 3971276

| POD # | Distance (meters) | Casing Dia (inches) | Total Depth (feet) | Water Depth (feet) | Yield (gpm) | Perforation (feet) |
|---|---|---|---|---|---|---|
| | | | | | | |
| RG 58498 | 207 | 4.5 | 200 | 60 | 15 | 40 |
| RG 77458 | 367 | 6.63 | 120 | 90 | 15 | 15 |
| RG 26092 | 473 | 6 | 140 | 90 | 20 | 10 & 20 |
| RG 37877 | 494 | 5 | 200 | 78 | 15 | 20 & 20 |
| RG 93341 | 506 | 4.5 | 220 | 82 | 30 | 20 & 15 |
| RG 39759 | 606 | 5 | 170 | 70 | N/A | 40 |
| RG 19950 | 631 | 6.63 | 80 | 12 | N/A | 20 |

# *New Mexico Office of the State Engineer*
# Wells with Well Log Information

(A CLW##### in the POD suffix indicates the POD has been replaced & no longer serves a water right file.)

(R=POD has been replaced, O=orphaned, C=the file is closed)

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest)

(NAD83 UTM in meters)

(in feet)

| POD Number | POD Sub-basin Code | County | Source | q q q 6416 4 | Sec | Tws | Rng | X | Y | Distance | Start Date | Finish Date | Log File Date | Depth Well | Depth Water | Driller | License Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RG 58498 | NPT | SF | Shallow | 2 2 2 | 14 | 19N | 08E | 403336 | 3971463 | 207 | 11/03/1993 | 11/03/1993 | 12/01/1993 | 200 | 60 | | 622 |
| RG 77458 | NPT | SF | Shallow | 4 1 1 | 14 | 19N | 08E | 403540 | 3971498* | 367 | 04/05/2002 | 04/08/2002 | 09/11/2002 | 120 | 90 | ROYBAL, JAKE E. | 227 |
| RG 26092 | NPT | SF | Shallow | 1 4 | 12 | 19N | 08E | 403470 | 3971693 | 473 | 07/08/1975 | 07/22/1975 | 07/31/1975 | 140 | 90 | ROYBAL, JAKE E. | 227 |
| RG 37877 | NPT | SF | Shallow | 2 1 1 | 14 | 19N | 08E | 403455 | 3971724 | 494 | 06/28/1982 | 06/29/1982 | 07/07/1982 | 200 | 78 | ROYBAL, JAKE E. | 227 |
| RG 93341 POD1 | NPT | SF | Shallow | | | | | 403369 | 3971767 | 506 | 06/04/2012 | 06/05/2012 | 06/08/2012 | 220 | 82 | ROYBAL, JOSEPH (LD) | 622 |
| RG 39759 | NPT | SF | Shallow | | | | | 403250 | 3971882 | 606 | 06/17/1983 | 06/17/1983 | 06/29/1983 | 170 | 70 | JOSEPH ROYBAL | 622 |
| RG 19950 | NPT | SF | Shallow | 3 3 3 | 11 | 19N | 08E | 403343 | 3971900* | 631 | 12/23/1971 | 12/31/1971 | 01/12/1972 | 80 | 12 | ROYBAL, JAKE E. | 227 |
| RG 34341 | NPT | SF | Shallow | 3 3 3 | 11 | 19N | 08E | 403343 | 3971900* | 631 | 05/19/1980 | 05/20/1980 | 06/02/1980 | 40 | 14 | J.E. ROYBAL | 227 |
| RG 88503 | | SF | Shallow | | | | | 403640 | 3971815 | 667 | 10/10/2006 | 10/11/2006 | 10/19/2006 | 300 | 58 | | 622 |
| RG 67679 | NPT | SF | Shallow | | | | | 403609 | 3971844 | 673 | 05/22/1997 | 05/23/1997 | 05/29/1997 | 200 | 67 | | 622 |
| RG 19330 | NPT | SF | Shallow | 4 3 3 | 11 | 19N | 08E | 403543 | 3971900* | 690 | 08/09/1971 | 08/11/1971 | 08/20/1971 | 120 | 57 | J.E. ROYBAL | 227 |
| RG 35740 | NPT | SF | Shallow | 4 3 3 | 11 | 19N | 08E | 403543 | 3971900* | 690 | 03/01/1981 | 03/30/1981 | 03/30/1981 | 155 | 100 | ROMERO, JERRY & ORTIZ, JOE | 606 |
| RG 39154 | NPT | SF | Shallow | 4 3 3 | 11 | 19N | 08E | 403543 | 3971900* | 690 | 08/05/1983 | 08/05/1983 | 08/12/1983 | 76 | 34 | BOYLAN, MIKE | 253 |
| RG 62686 | NPT | SF | Shallow | | | | | 403901 | 3971504 | 692 | 07/30/1995 | 08/04/1995 | 08/08/2008 | 160 | 40 | | 227 |
| RG 34370 | NPT | SF | Shallow | 3 4 4 | 10 | 19N | 08E | 402944 | 3971904* | 697 | 05/28/1980 | 05/29/1980 | 06/09/1980 | 144 | 15 | ROYBAL, JAKE E. | 227 |
| RG 66207 | NPT | SF | Shallow | 4 4 4 | 10 | 19N | 08E | 403135 | 3971970 | 704 | 02/09/1998 | 02/10/1998 | 08/05/1998 | 160 | 36 | | 227 |

***UTM location was derived from PLSS - see Help**

(A CLW##### in the POD suffix indicates the POD has been replaced & no longer serves a water right file.)

(R=POD has been replaced, O=orphaned, C=the file is closed)

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest)

(NAD83 UTM in meters)

(in feet)

| POD Number | POD Sub-basin Code | County | Source | q q q 6416 4 | Sec | Tws | Rng | X | Y | Distance | Start Date | Finish Date | Log File Date | Depth Well | Depth Water | Driller | License Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RG 64974 | NPT | SF | Shallow | | 14 | 19N | 08E | 403887 | 3971582 | 709 | 10/10/1996 | 10/12/1996 | 01/26/1998 | 200 | 40 | ROYBAL | 227 |
| RG 90958 POD1 | NPT | SF | Shallow | | | | | 403947 | 3971392 | 709 | 05/04/2009 | 05/08/2009 | 05/12/2009 | 800 | 182 | ROYBAL, JOSEPH (LD) | 622 |
| RG 65399 | NPT | SF | Shallow | | | | | 403902 | 3971589 | 725 | 10/12/1996 | 10/14/1996 | 01/26/1998 | 200 | 70 | | 227 |

**Record Count:** 19

**Basin/County Search:**

**County:** Santa Fe

**UTMNAD83 Radius Search (in meters):**

**Easting (X):** 403247.44 **Northing (Y):** 3971275.59 **Radius:** 750

# New Mexico Office of the State Engineer
# Point of Diversion Summary

| POD Number | (quarters are 1=NW 2=NE 3=SW 4=SE) (quarters are smallest to largest) Q64 | Q16 | Q4 | Sec | Twp | Rng | (NAD83 UTM in meters) X | Y |
|---|---|---|---|---|---|---|---|---|
| RG 58498 | 2 | 2 | 2 | 14 | 19N | 08E | 403336 | 3971463 |

**Driller License:** 622

**Driller Name:**

| | | | | | |
|---|---|---|---|---|---|
| **Drill Start Date:** | 11/03/1993 | **Drill Finish Date:** | 11/03/1993 | **Plug Date:** | |
| **Log File Date:** | 12/01/1993 | **PCW Rcv Date:** | | **Source:** | Shallow |
| **Pump Type:** | | **Pipe Discharge Size:** | | **Estimated Yield:** | 15 GPM |
| **Casing Size:** | 4.50 | **Depth Well:** | 200 feet | **Depth Water:** | 60 feet |

| Water Bearing Stratifications: | Top | Bottom | Description |
|---|---|---|---|
| | 140 | 180 | Sandstone/Gravel/Conglomerate |

| Casing Perforations: | Top | Bottom |
|---|---|---|
| | 140 | 180 |

# New Mexico Office of the State Engineer
# Point of Diversion Summary

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters)

| POD Number | Q64 | Q16 | Q4 | Sec | Twn | Rng | X | Y |
|---|---|---|---|---|---|---|---|---|
| RG 77458 | 4 | 1 | 1 | 14 | 19N | 08E | 403540 | 3971498* |

**Driller License:** 227
**Driller Name:** ROYBAL, JAKE E.

| | | | | | |
|---|---|---|---|---|---|
| **Drill Start Date:** | 04/05/2002 | **Drill Finish Date:** | 04/08/2002 | **Plug Date:** | |
| **Log File Date:** | 09/11/2002 | **PCW Rcv Date:** | | **Source:** | Shallow |
| **Pump Type:** | | **Pipe Discharge Size:** | | **Estimated Yield:** | 15 GPM |
| **Casing Size:** | 6.63 | **Depth Well:** | 120 feet | **Depth Water:** | 90 feet |

| Water Bearing Stratifications: | Top | Bottom | Description |
|---|---|---|---|
| | 90 | 110 | Sandstone/Gravel/Conglomerate |

| Casing Perforations: | Top | Bottom |
|---|---|---|
| | 105 | 120 |

***UTM location was derived from PLSS - see Help**

# New Mexico Office of the State Engineer
# Point of Diversion Summary

| POD Number | (quarters are 1=NW 2=NE 3=SW 4=SE) (quarters are smallest to largest) Q64 | Q16 | Q4 | Sec | Twn | Rng | (NAD83 UTM in meters) X | Y |
|---|---|---|---|---|---|---|---|---|
| RG 26092 | 1 | 4 | | 12 | 19N | 08E | 403470 | 3971693 |

**Driller License:** 227
**Driller Name:** ROYBAL, JAKE E.

| | | | | | |
|---|---|---|---|---|---|
| **Drill Start Date:** | 07/08/1975 | **Drill Finish Date:** | 07/22/1975 | **Plug Date:** | |
| **Log File Date:** | 07/31/1975 | **PCW Rcv Date:** | | **Source:** | Shallow |
| **Pump Type:** | | **Pipe Discharge Size:** | | **Estimated Yield:** | 20 GPM |
| **Casing Size:** | 6.00 | **Depth Well:** | 140 feet | **Depth Water:** | 90 feet |

| Water Bearing Stratifications: | Top | Bottom | Description |
|---|---|---|---|
| | 90 | 140 | Sandstone/Gravel/Conglomerate |

| Casing Perforations: | Top | Bottom |
|---|---|---|
| | 90 | 100 |
| | 120 | 140 |

# New Mexico Office of the State Engineer
# Point of Diversion Summary

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters)

| POD Number | Q64 | Q16 | Q4 | Sec | Twn | Rng | X | Y |
|---|---|---|---|---|---|---|---|---|
| RG 37877 | 2 | 1 | 1 | 14 | 19N | 08E | 403455 | 3971724 |

**Driller License:** 227
**Driller Name:** ROYBAL, JAKE E.

| | | | | | |
|---|---|---|---|---|---|
| **Drill Start Date:** | 06/28/1982 | **Drill Finish Date:** | 06/29/1982 | **Plug Date:** | |
| **Log File Date:** | 07/07/1982 | **PCW Rcv Date:** | | **Source:** | Shallow |
| **Pump Type:** | | **Pipe Discharge Size:** | | **Estimated Yield:** | 15 GPM |
| **Casing Size:** | 5.00 | **Depth Well:** | 200 feet | **Depth Water:** | 78 feet |

| Water Bearing Stratifications: | Top | Bottom | Description |
|---|---|---|---|
| | 78 | 150 | Sandstone/Gravel/Conglomerate |
| | 170 | 200 | Sandstone/Gravel/Conglomerate |

| Casing Perforations: | Top | Bottom |
|---|---|---|
| | 120 | 140 |
| | 180 | 200 |

# *New Mexico Office of the State Engineer*
# Point of Diversion Summary

| POD Number | (quarters are 1=NW 2=NE 3=SW 4=SE) (quarters are smallest to largest) Q64 Q16 Q4 Sec Tws Rng | (NAD83 UTM in meters) X | Y |
|---|---|---|---|
| RG 93341 POD1 | | 403369 | 3971767 |

**Driller License:** 622
**Driller Name:** ROYBAL, JOSEPH (LD)

| | | | | | |
|---|---|---|---|---|---|
| **Drill Start Date:** | 06/04/2012 | **Drill Finish Date:** | 06/05/2012 | **Plug Date:** | |
| **Log File Date:** | 06/08/2012 | **PCW Rcv Date:** | | **Source:** | Shallow |
| **Pump Type:** | | **Pipe Discharge Size:** | | **Estimated Yield:** | 30 GPM |
| **Casing Size:** | 4.50 | **Depth Well:** | 220 feet | **Depth Water:** | 82 feet |

| Water Bearing Stratifications: | Top | Bottom | Description |
|---|---|---|---|
| | 80 | 210 | Sandstone/Gravel/Conglomerate |

| Casing Perforations: | Top | Bottom |
|---|---|---|
| | 155 | 175 |
| | 195 | 210 |

# New Mexico Office of the State Engineer
# Point of Diversion Summary

| POD Number | (quarters are 1=NW 2=NE 3=SW 4=SE) (quarters are smallest to largest) Q64 Q16 Q4 Sec Twn Rng | (NAD83 UTM in meters) X | Y |
|---|---|---|---|
| RG 39759 | | 403250 | 3971882 |

**Driller License:** 622
**Driller Name:** JOSEPH ROYBAL

| | | | | | |
|---|---|---|---|---|---|
| **Drill Start Date:** | 06/17/1983 | **Drill Finish Date:** | 06/17/1983 | **Plug Date:** | |
| **Log File Date:** | 06/29/1983 | **PCW Rcv Date:** | | **Source:** | Shallow |
| **Pump Type:** | | **Pipe Discharge Size:** | | **Estimated Yield:** | |
| **Casing Size:** | 5.00 | **Depth Well:** | 170 feet | **Depth Water:** | 70 feet |

| Water Bearing Stratifications: | Top | Bottom | Description |
|---|---|---|---|
| | 70 | 150 | Other/Unknown |

| Casing Perforations: | Top | Bottom |
|---|---|---|
| | 100 | 160 |

| | | | |
|---|---|---|---|
| **Meter Number:** | 5840 | **Meter Make:** | HAYS |
| **Meter Serial Number:** | 20102163 | **Meter Multiplier:** | 10.0000 |
| **Number of Dials:** | 6 | **Meter Type:** | Diversion |
| **Unit of Measure:** | Gallons | **Return Flow Percent:** | |
| **Usage Multiplier:** | | **Reading Frequency:** | Quarterly |

**Meter Readings (in Acre-Feet)**

| Read Date | Year | Mtr Reading | Flag | Rdr | Comment | Mtr Amount |
|---|---|---|---|---|---|---|
| 04/12/2002 | 2002 | 0 | A | vc | initial reading | 0 |
| 06/30/2002 | 2002 | 2110 | A | bg | | 0.065 |
| 09/30/2002 | 2002 | 2533 | A | bg | | 0.013 |
| 01/06/2003 | 2002 | 2835 | A | bg | | 0.009 |
| 04/08/2003 | 2003 | 2888 | A | bg | | 0.002 |
| 07/02/2003 | 2003 | 3883 | A | vc | | 0.031 |
| 12/31/2003 | 2003 | 7140 | A | vc | | 0.100 |
| 04/01/2004 | 2004 | 7485 | A | vc | | 0.011 |
| 09/20/2004 | 2004 | 8710 | A | ks | | 0.038 |
| 01/06/2005 | 2004 | 9774 | A | vc | | 0.033 |
| 02/28/2006 | 2005 | 15515 | A | vc | | 0.176 |
| 04/09/2006 | 2006 | 16346 | A | vc | | 0.026 |
| 04/09/2007 | 2006 | 23882 | A | vc | | 0.231 |
| 01/26/2008 | 2007 | 30177 | A | jp | | 0.193 |
| 02/01/2009 | 2008 | 37653 | A | jp | | 0.229 |

**Meter Readings (in Acre-Feet)**

| Read Date | Year | Mtr Reading | Flag | Rdr | Comment | Mtr Amount |
|---|---|---|---|---|---|---|
| 10/22/2009 | 2009 | 43666 | A | jp | | 0.185 |
| 12/31/2009 | 2009 | 43993 | E | jp | | 0.010 |
| 02/15/2010 | 2010 | 44208 | A | jp | | 0.007 |
| 02/03/2011 | 2010 | 52615 | A | la | | 0.258 |
| 10/05/2011 | 2011 | 56618 | A | vc | | 0.123 |
| 05/12/2012 | 2012 | 58401 | A | la | | 0.055 |
| 01/15/2013 | 2012 | 61618 | A | la | | 0.099 |
| 02/10/2013 | 2013 | 61618 | A | lp | | 0 |
| 08/21/2013 | 2013 | 65611 | A | et | | 0.123 |

| **YTD Meter Amounts: | Year | Amount |
|---|---|---|
| | 2002 | 0.087 |
| | 2003 | 0.133 |
| | 2004 | 0.082 |
| | 2005 | 0.176 |
| | 2006 | 0.257 |
| | 2007 | 0.193 |
| | 2008 | 0.229 |
| | 2009 | 0.195 |
| | 2010 | 0.265 |
| | 2011 | 0.123 |
| | 2012 | 0.154 |
| | 2013 | 0.123 |

# New Mexico Office of the State Engineer
# Point of Diversion Summary

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters)

| POD Number | Q64 | Q16 | Q4 | Sec | Twp | Rng | X | Y |
|---|---|---|---|---|---|---|---|---|
| RG 19950 | 3 | 3 | 3 | 11 | 19N | 08E | 403343 | 3971900* |

**Driller License:** 227
**Driller Name:** ROYBAL, JAKE E.

| | | | | | |
|---|---|---|---|---|---|
| **Drill Start Date:** | 12/23/1971 | **Drill Finish Date:** | 12/31/1971 | **Plug Date:** | |
| **Log File Date:** | 01/12/1972 | **PCW Rcv Date:** | | **Source:** | Shallow |
| **Pump Type:** | | **Pipe Discharge Size:** | | **Estimated Yield:** | |
| **Casing Size:** | 6.63 | **Depth Well:** | 80 feet | **Depth Water:** | 12 feet |

| Water Bearing Stratifications: | Top | Bottom | Description |
|---|---|---|---|
| | 12 | 50 | Sandstone/Gravel/Conglomerate |
| | 65 | 80 | Sandstone/Gravel/Conglomerate |

| Casing Perforations: | Top | Bottom |
|---|---|---|
| | 48 | 68 |

***UTM location was derived from PLSS - see Help**

Figure 5

TECHNICAL SPECIFICATIONS

1. **GENERAL**: Final design will be determined by Santa Fe County. Delineation of special work is indicated in the following specifications and on the plans:

    A. Project Title, Vicinity. and Location Map, Sheet No. 1 & 2.
    B. Water Well Site Plot Plan, and Details Sheet No.3 & 4.

2. **SUBMITTALS**: The Contractor shall provide the following:

    A. Materials
    B. Sediment samples
    C. Gravel pack samples testing results
    D. Grouting proposal
    E. Step pumping test rates, results and recovery data graphed
    F. Proposed method of disposal of water pumped from the well
    G. Sample logs and drilling records
    H. Disinfection plan
    I. OSE Permit

3. **GEOLOGY:** Geophysical data suggest that the geological formation consists of formation of sand, silty sand and clay in layers and at various depths. See attached well logs for information on nearby wells.

4. **WELL PERMIT:** The Contractor shall be responsible for securing all necessary permits for the well installation from the New Mexico Office of the State Engineer (OSE). Within 30 days of completing the project, the Contractor shall furnish a completed well permit approved by OSE to the County. Failure to provide a well permit approved by OSE may constitute grounds for rejection of the completed well by the County.

5. **MATERIALS:** Materials furnished for and permanently installed shall be new and conform to the requirements below.

    A. Well Casing: PVC - Well casing shall have a minimum inside diameter of 6.0 inches. shall be manufactured to ASTM F 480 and ASTM 2241 and shall have sufficient wall thickness to withstand formation and hydrostatic pressures placed on the casing during installation, well development and use. Casing shall meet requirements of the American Water Works Association and the National Sanitary Foundation and carry its seal with the following minimum specifications:

| Interior Diameter in Inches | SDR | Wall Thickness in inches | Weight per Foot | Pressure Class | Hydraulic Collapse Pressure |
|---|---|---|---|---|---|
| 5 | 17 | 0.327 | 3.49 | 250 psi | 224 psi |

PVC well casing shall be similar to Certa-Lok PVC Well Casing by CertainTeed Corp.• or approved equal.

    B. Surface Casing: The surface casing shall have a minimum outside diameter ranging from 10 inches and extend a minimum of eighteen (18) inches above the land surface. The surface casing material shall be either PVC or single ply carbon-steel

PVC - Well casing shall have a maximum inside diameter of 8 or 10 inches, shall be manufactured to ASTM F 480 and ASTM 2241and be a class 12545 psi 109 with an SDR of 21 or less. Wall thickness shall not be less than 0.511 inch (10"). The minimum acceptable weight per foot shall be 10.5 (10").

Pipe shall be manufactured in accordance with 1120/220 white polyvinyl chloride. Casing shall meet requirements of the American Water Works Association and the National Sanitary Foundation and carry its seal with the following minimum specifications:

Steel - Well casing shall have a maximum inside diameter of 10 inches. Minimum wall thickness shall not be less than 0.188 inches. The minimum acceptable weight per foot is 40.48 (10"). Pipe shall be new and manufactured in accordance with API Standard 5LX or AWWA C200. Casings shall be fabricated of steel conforming to ASTM A139 Grade B; ASTM A283 Grade C with minimum carbon content of 0.3 percent and a maximum manganese content of 1 percent; ASTM A570 Grade B or API Standard 5LX Grade X42.

C. **Well Screen**: The well screen shall be of the continuous slot, wire-wound type fabricated from a corrosion-resistant Type 304 stainless steel. The screen shall be fabricated by circumferential wrapping a triangularly shaped wire around a circular array of internal rods designed in order to provide maximum inlet area consistent with strength requirements. The wire configuration must produce inlet slots with sharp outer edges, widening inwardly so as to minimize clogging. For maximum collapse strength each juncture between the horizontal wire and the vertical rods will be made by sonic welding. The screen slot size will be selected on the basis of a mechanical size or sieve analysis of either the natural water-bearing sediments or the artificially introduced gravel pack material. For bidding purpose use Screen Size of 030.

D. **Gravel Pack**: Graded commercial gravel pack material is required and should be appropriately sized with the screen slot size to keep out approximately 70% of natural sand drilled through. All material used for construction of the gravel wall around the inner well casings and screens shall be clean, well founded, particles of sound material, which has been thoroughly cleaned of silt, dust, and other foreign matter. For bidding purpose use packing gradation of 812 Sand Pack.

E. **Grout**: Cement grout or bentonite-based sealing material conforming to AWWA standards shall be used.

6. **CONSTRUCTION/DRILLING METHOD:** Well shall be of the gravel wall type constructed by the rotary, cable tool and/or air rotary drilling methods. If rotary method is used, the Contractor shall take care to provide a continuous and sufficient supply of water so that the- drill hole will be kept full of water at all times during the entire drill operation and during the placing of gravel. The water may be re-circulated through temporary sumps of adequate size and depth to remove the drillings from the water. Any such sumps shall not be located closer than 10-feet from the well. After completion of the job the sumps shall be drained and cleaned as required by the Santa Fe County and filled with earth and the site brought to grade. During drilling and for as long thereafter as necessary adequate barriers shall be provided around the sumps to prevent accidental entry.

   All drilling mud necessary will be provided by the Contractor. The contractor shall have the services of a mud engineer available if the need arises during drilling.

   Cuttings shall be hauled away from the site and disposed of in a manner consistent with Santa Fe County Disposal Regulations.

7. **SCREEN AND CASING**: After the drilling of the well has been completed, the screen and well casing sections shall be assembled, , and installed in the well. The casing and screen shall be so centered that the completed string will be plumb and true. The casing shall be fitted with proper centering brackets spaced not more than fifty-feet (50') apart. At all times during casing and screen installation, gravel installation and grouting, the casing shall be properly supported.

   The end of the bottom section of the well shall be tightly sealed by means of a plate, not less than 0.318-inch in nominal thickness, attached to the screen or casing by means of a continuous weld

all around its circumference.

8. **JOINTS:**

   Stainless Steel-Steel
   All joints between steel pipe and screen shall be welded or threaded and coupled in accordance with AWWA C206. All welders must be certified in accordance with AWWA C206.

   PVC
   All joints between PVC pipe and screen shall be threaded and coupled, solvent-welded or key locked in accordance with ASTMF480.

9. **GRAVEL PACK**: Gravel pack shall be placed in the annular space between the casing or screen and the side of the bore hole from the bottom up to the top of the screen. All gravel used shall be screened and otherwise processed as necessary to provide a material of a size and gradation suitable and proper for use in connection with the character of the water bearing formation encountered in each case. It shall be the responsibility of the contractor to sample the alluvium material and perform a sieve analysis of these samples. Based upon the results of these tests, the Contractor shall recommend a size and gradation for the gravel wall material, which shall be subject to the review of Santa Fe County. The quantity of gravel used will be recorded.

10. **ANNULAR SEAL**: A permanent protective surface casing extending 3 inches greater than the outside diameter of the outermost casing shall be installed and shall extend from the land surface to a sufficient distance below the land surface. Casings shall be centered in the bore hole so grout or sealing materials may be placed evenly around the casing.

    Sealing operations shall be made with cement grout or bentonite-based sealing material placed by a tremie pipe or by pressure-grouting through the well casing and up the annulus. The annular space between the surface casing and the hole shall be filled with cement grout from the bottom of the casing to finish grade.

    Before proceeding with the placing of grout, the Contractor shall submit to the County for review the method to be used. A suitable retainer, packer or plug shall be provided at the bottom of the inner casing so that grout will not leak through into the gravel pack or bottom of the well. The grouting shall be done continuously and in such a manner as to insure the entire filling of the annular space in *one* operation before initial set occurs. No drilling operations will be permitted within 48 hours after the grouting of casings. If quick-setting cement is used, this period may be reduced to twenty-four (24) hours.

    The Contractor shall provide a suitable casing cap to seal the casing while working in the event the well is artesian.

11. **WATER LEVEL MONITORING**: The well shall be constructed with a wellhead opening of at least one half (1") inch in diameter to allow the water level to be measured. A water-tight removable cap or plug shall be securely placed in the opening.

12. **PLUMBNESS AND ALIGNMENT**: The well shall be constructed round, true to line, and shall not depart from the vertical more than 0.05 inch per foot of depth. The Contractor shall furnish equipment to test the plumbness of the well. Procedures and equipment to be used to test the well for plumbness and alignment shall be submitted to the County for review. The Contractor shall furnish an acceptable alignment graph showing the results of the test. No well will be accepted if the straightness or vertical alignment is unsatisfactory to the extent that it interferes with the installation of the pump.

13. **DEVELOPMENT**:

    Preliminary Development
    A variety of methods can be applied for preliminary development of the well including such

commonly used techniques as bailing, surging, flushing, pumping, jetting and airlifting. Following the use of one or more of these preliminary methods, a well pump shall be used for final development and for testing development.

Final Development
Each well shall be developed for a minimum of ten (10) hours or as required to properly develop the well. Sand content shall average not more than 5 mg/L for a complete pumping cycle of 2 hour duration when pumping at the design discharge capacity. Upon completion of the development, the well shall be allowed to recover prior to beginning the pumping test. The time duration allowed for recovery shall be acceptable to the County.

14. **CLEANING AND DISINFECTION**: After the well has been completely constructed but prior to test pumping, it shall be thoroughly cleaned of all foreign substances, including tools, timbers, rope, debris of any kind, cement, oil, grease, joint dope and scum. The casing pipe shall be thoroughly swabbed to remove oil, grease or joint dope. The well shall then be disinfected with a chlorine solution.

    The chlorine solution used for disinfecting the well shall be of such volume and strength and shall be so applied that a concentration of at least 250 parts per million of chlorine is obtained in all parts of the well. Chlorine solution shall be prepared and applied in accordance with the directions of, and to the satisfaction of the County and shall remain in the well for a period of at least two (2) hours. Proper disposal of the chlorinated water is the Contractor's responsibility.

    After the well has been test pumped until all traces of chlorine are removed, the Contractor on the site will collect samples for bacteriological analysis. The analysis shall be conducted by a State-certified Laboratory acceptable to the County. If the bacteriological analysis indicates that the water is not safe for public use the Contractor shall chlorinate the well again until suitable bacteriological analyses are obtained.

15. **WELL PUMP TEST:**

    A. **TEST PUMP**: A deep-well turbine or submersible test pump shall be furnished by the Contractor and temporarily installed in the well to completely develop the well and to conduct a final pumping test hereinafter specified. The pump and prime mover shall have a capacity in excess of the anticipated lift and final production capacity of the well. The pump shall be set to a depth in excess of the anticipated pumping level and shall be capable of pumping at least fifty (50) gallons per minute. The Contractor shall furnish motive power for the pump. A valve shall be installed in the discharge pipe from the pump to control the rate of pumping and a freely discharging pipe with a water meter for measuring the rate of pumping from the well. Measuring device shall have a minimum accuracy of 95 percent.

    B. **PUMPING TEST**: After development of the well, a pumping test shall be conducted for the purpose of selecting the permanent well pumping equipment. The rate of pumping during the test will be a minimum of 10 gpm and the duration of the test shall be no less than 3 hrs. Water level measurements shall be made in the well prior, during and following the test at frequent intervals with a device, subject to review by the County, which allows continuous monitoring of the water level in the well. The test shall document the static level at the start of the test, the lowest elevation pumping level observed and the time to recharge to the original static level. At the end of the pumping test, the Contractor shall submit to the County four (4) copies of the drawdown and recovery versus time logs for the specified pumping rates.

16. **SELECTION AND INSTALLATION OF WELL PUMP:** Following the successful well test, the Contractor shall select and install the permanent well pump and discharge piping in the well. The pump shall be of the submersible type and powered by 220V AC electrical power. The Contractor shall make all necessary connections to allow the well to function, including installation of a below ground pit to house the hydro-pneumatic tank, pressure control switch and

other appurtenances for the well. The Contractor is responsible for all wiring, conduit and electrical connections necessary to complete the well in a fully functional state. Well pump: 1 1/2 HP submersible pump, Red Lion RL 12G15-3W2V or approved equal and control box with pressure switch (Red Lion RLCM15-230 or equal) complete.

17.

18. **WATER METER STANDARD:** County water meter standard is 5/8"x3/4" Neptune T-10 Water Meter w/E-coder R900i Register and Radio Transmitter.

19. **DISPOSAL OF WATER PUMPED FROM WELL** : During construction, the initial and final well development stages and during the period of final testing of the well, the Contractor is required to manage the discharged water in a manner that is consistent with all state and federal rules and regulations and In a manner that prevents damage from flooding and/or saturation.

    All responsibility for compliance with state and federal rules and regulations for disposal of the water pumped from the well in association with the well construction, development and testing lies with the Contractor. The contractor shall ensure at all times that water from the well is not allowed to discharge into any surface water body or waters of the State of New Mexico or water of the United States, as defined by the New Mexico Water Quality Act or the federal Clean Water Act.

20. **PROTECTION OF WELL**: At all times during the construction and pumping process of the work the Contractor shall protect the well in such a manner as to effectively prevent either tampering with the well or the entrance of any foreign matter into it. Upon completion of the well the Contractor shall install a sanitary seal on the top of the casing in an acceptable manner to eliminate entry of contaminants into the well and vandalism. Security of the well shall be the Contractor's obligation until final acceptance of the well by the County.

21. **SAMPLES, LOGS. AND RECORDS**: The Contractor shall obtain samples, log information and submit records as follows:

    A. During the drilling operation a sample shall be taken at each ten (10') foot interval of depth or at each change of stratum and log the boring using the Unified Soil Classification System. Standard sieve analysis shall be performed on the representative samples and the samples shall be characterized in a log of the bore hole using the Unified Soil Classification System. An accumulative logarithmic curve shall be plotted showing the weight retained on each screen for each sample. Four (4) copies of the curve shall be furnished to the County. All costs for these sieve tests will be paid by the Contractor.

    B. During the drilling operation the Contractor shall keep an accurate record of the drilling time, depth and rate of drilling. The record shall show any sudden changes in drilling rate, the weight of drilling tools, and the speed of drilling.

    C. During the drilling operation, the Contractor shall also maintain a written log showing depth and thickness or each stratum, fluid loss, weight, soil classification, and viscosity.

    D. Logs showing the depth and exact construction of the well, and giving all dimensions regarding lengths and diameters of well casing slotted casing and/or well screen, size of slot openings, depth, and length of screens, and other pertinent details and dimensions.

    E. All plumbness and alignment graph for the well showing the results of the required test.

    F. Following the final pumping test the Contractor shall obtain representative water quality samples from the well to be analyzed for the following constituents:

       $NO_3$-N (nitrate-nitrogen), Total Dissolved Solids (TDS), Chloride ($CL^-$), $CaCO_3$ (Calcium Carbonate), Uranium (U), and Radium 226, 228 (R 226/228) by a laboratory approved by the County.

The contractor shall be responsible for sample collection, preservation and transport to the approved laboratory and for supplying copies of the sample results to the County Hydrologist for review. All sample collection, preservation, transport and analysis shall be conducted in accordance with recognized standard methodologies.
All cost associated with the sampling and analysis shall be borne by the Contractor.

G. The Contractor shall submit four (4) copies of the well log and all records of the well installation to the County Hydrologist. Additionally, one copy of the log shall be given to the County's Project Manager and one copy shall be provided to OSE in the well permit completion submittal.

**CONTRACTOR'S RESPONSIBILITY**: The Contractor shall be responsible for performing all of the work in strict accordance with these specifications. If evidence indicates that the screen or casing in a well is broken or that the well is not constructed in accordance with the specifications to the satisfaction of the County, the County may order that proper changes cannot be made, and may order the Contractor to abandon such well and to drill a new well without cost to the County. The contractor shall comply with the New Mexico OSE **Well Driller Licensing; Construction, Repair and Plugging of Wells** regulations (19.27.4 NMAC).

22. **ESTIMATED QUANTITIES**: The quantities shown in the proposal are for the purpose of comparing bids only. Measurement and payment will be based upon actual quantities measured in the field.

23. **MATERIALS FOR TESTING**: The contractor will furnish all equipment and materials for testing of the completed works including water, oil, gasoline, electricity, lubrication and any other required items and no extra payment therefore will be allowed.

24. **FENCES**: The Contractor shall maintain all existing fences affected by the work until completion of the work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence and the period the fence may be left relocated or dismantled has been agreed upon. Where fences must be maintained across the construction easement, adequate gates shall be installed. Gates shall be kept closed and locked at all times when not is use.

    On completion of the work across any tract of land the Contractor shall restore all fences to their original condition or to a better condition and their original location.

25. **TREE AND PLANT PROTECTION**: All trees and other vegetation, which must be removed to perform the work, shall be removed by the Contractor and disposed of as directed by the County; however, no trees or cultured plants shall be removed unless their removal has been specifically identified and approved for removal by the County. All trees and plants not removed shall be protected against injury from construction operations.

**WALKER ENGINEERING**
**905 Camino Sierra Vista**
**Santa Fe, NM 87501**

BID SHEET
JACONA COLLECTION CENTER - WELL FIGURE 6

Prices listed will be used in the event well is deeper or shallower. Do not total pricing on this sheet. Contractor is responsible for all items in the spec whether or not they are listed here.

| Item Number | Item Description | Unit | Quantity | Unit Cost | Total Cost |
|---|---|---|---|---|---|
| 1 | Mobilization | L.S. | 1 | | |
| 2 | 8" PVC Surface Casing | Lin. Ft. | 50 | | |
| 3 | Drill, Install and Grout PVC Surface Casing | Lin. Ft. | 50 | | |
| 4 | Drill Hole for 5" Casing 50' to 100' Depth | Lin. Ft. | 50 | | |
| 5 | Drill Hole for 5" Casing 100' to 200' Depth | Lin. Ft. | 100 | | |
| 6 | Furnish and Install 5" PVC Casing | Lin. Ft. | 200 | | |
| 7 | Furnish and Install Stainless Steel Well Screen | Lin. Ft. | 50 | | |
| 8 | Gravel Packing in Place | Lin. Ft. | 100 | | |
| 9 | Surging and Development | Hour | 10 | | |
| 10 | Test Pumping for Pump | Hour | 5 | | |
| 11 | Water Well Cleaning & Disinfection | L.S. | 1 | | |
| 12 | Testing Services Soil Water & Material (Allowance) | L.S. | 1 | | |
| 13 | 1 1/2 HP Submersible Pump Install complete | L.S. | 1 | | |
| | Red Lion RL12G15-3W2V or approved equal | | | | |
| 14 | Furnish 1 1/4" Water Supply pipe from well | Lin. Ft. | 200 | | |
| | to well housing. Include torque arrestor & | | | | |
| | pitless adaptor per manufacture specs | | | | |
| 15 | Furnish Pump control box with pressure | L.S. | 1 | | |
| | switch (Red Lion RLCM15-230 or equal) complete | | | | |
| 16 | Furnish 8 gauge electrical wire from | Lin. Ft. | 200 | | |
| | well housing to pump per manufacture specs | | | | |
| 17 | Well housing with bladder tanks, meter, valves, | L.S. | 1 | | |
| | well controls and piping (complete) | | | | |
| 18 | (1) 20 amp 2-pull circuit breaker in Panel A | L.S. | 1 | | |

Optional Costs

| | | | | | |
|---|---|---|---|---|---|
| 1A | Drill Hole for 5" Casing 200' to 300' Depth | Lin. Ft. | 100 | | |
| 2A | Drill Hole for 5" Casing 300' to 400' Depth | Lin. Ft. | 100 | | |
| 3A | Furnish and Install 5" PVC Casing to 300' | Lin. Ft. | 100 | | |
| 4A | Furnish and Install 5" PVC Casing from 300' to 400' | Lin. Ft. | 100 | | |
| 5A | Additional Gravel Packing for 300' well | Lin. Ft. | 100 | | |
| 6A | Additional Gravel Packing for 400' well | Lin. Ft. | 100 | | |

# Jacona Transfer Station
# Drainage Study

**By**

**Walker Engineering**
**905 Camino Sierra Vista**
**Santa Fe, NM  87505**

**May 13, 2015**

**Walker Engineering**
905 Camino Sierra Vista
Santa Fe, NM 87501

**Stormwater Drainage Calculations**

**Project:** Jacona Transfer Station

**Project No:** 15-121
**Date:** 5/13/2015

**Developable Area:** **4.13** Acres
179719.00 Sq Ft
0.0064 sq.mi.

**Present Onsite Land Use**

| Description | Area (SF.) | Area (Ac.) | CN | C*A |
|---|---|---|---|---|
| Undeveloped | 179719.00 | 4.13 | 58 | 239.295 |
| Composite | 179719.00 | 4.13 | 58.0 | 239.295 |

**Proposed Onsite Land Use**

| Description | Area (SF.) | Area (Ac.) | CN | CN*A |
|---|---|---|---|---|
| Imprevious Area | 67903.00 | 1.56 | 98 | 152.77 |
| Undeveloped/Landscape | 111816.00 | 2.57 | 58 | 148.88 |
| Composite | 179719.00 | 4.13 | 73.1 | 301.65 |

**Discharge Calculations from TR-20**

| Land Use Description | CN | Runoff (in) | Discharge (cfs) |
|---|---|---|---|
| Onsite Undeveloped (Current) | 58.0 | 0.37 | 0.96 |
| Onsite Developed (w/ Transfer Station) | 73.1 | 0.67 | 2.41 |
| Difference | | 0.30 | **1.45** |

**Drainage Pond Design**

**Drianage Area to Pond:** **111,037** **sq.ft.** **0.003983 sq.mi.**
**% Imprevious :** **61.2%**
**Composite CN :** **82.5**
**Outflow Pipe Diameter :** **20** **inches**
**Uncrontrolled Drianage Area:** **68,682.0** **sq.ft.** **0.002464 sq.mi.**
**% Imprevious :** **84.1%**
**Composite CN :** **91.6**

Time of Concetration (Kirpich Formula)
Tof C= ((11.9*L^3)/H)^0.385

| Basin | Length of Water Course (L) | Upper Elevation | Lower Elevation | Diffence Elev. (H) | Time of C (hrs) |
|---|---|---|---|---|---|
| ***Basin 1*** | **0.10** | **5795** | **5749** | **46.00** | **0.043** |

| | Elev. (ft) | Area ($ft^2$.) | Vol. (AC-FT.) | Head | Flow (cfs) |
|---|---|---|---|---|---|
| **Onsite Drainage Pond w/20" drain** | 5749.00 | 586 | 0.0000 | 0.00 | **0** |
| | 5750.00 | 2160 | 0.0315 | 1.00 | **1.309** |
| | 5751.00 | 3208 | 0.0931 | 2.00 | **2.083** |
| | 5751.50 | 3664 | 0.1326 | 2.50 | **2.419** |

**TR-20 Pond Routing Results**

**Flow into Pond =** **12.80** cfs
**Flow out of Pond =** **2.42** cfs **Max. WSE = 5751.5**
**Existing Flow=** **3.12** cfs

**Results: The pond will control the onsite discharge to predeveloped flows.**

```
JOB TR-20                                                SUMMARY   NOPLOTS
TITLE 001 15-121 Jacona Transfer Station   100 Year Storm
TITLE     Pond 1
 5 RAINFL 2             0.25
 8          0.0000      0.0034      0.0067      0.0101      0.0134
 8          0.0174      0.0214      0.0254      0.0294      0.0344
 8          0.0395      0.0445      0.0495      0.0564      0.0632
 8          0.0701      0.0769      0.0859      0.0948      0.1071
 8          0.7302      0.7573      0.7758      0.7901      0.8004
 8          0.8107      0.8187      0.8266      0.8324      0.8382
 8          0.8440      0.8498      0.8543      0.8587      0.8632
 8          0.8676      0.8712      0.8749      0.8785      0.8821
 8          0.8852      0.8884      0.8915      0.8946      0.8974
 8          0.9002      0.9030      0.9058      0.9086      0.9114
 8          0.9142      0.9170      0.9195      0.9220      0.9245
 8          0.9270      0.9294      0.9319      0.9344      0.9369
 8          0.9391      0.9414      0.9436      0.9459      0.9481
 8          0.9503      0.9526      0.9548      0.9568      0.9589
 8          0.9609      0.9630      0.9650      0.9670      0.9691
 8          0.9711      0.9730      0.9749      0.9767      0.9786
 8          0.9805      0.9823      0.9842      0.9861      0.9878
 8          0.9896      0.9913      0.9931      0.9948      0.9965
 8          0.9983      1.0000      1.0000      1.0000      1.0000
 9 ENDTBL
 3 STRUCT      01
 8                     5749.0       0.0        0.000
 8                     5750.0       1.309      0.032
 8                     5751.0       2.083      0.093
 8                     5751.5       2.419      0.133
 9 ENDTBL
 6 RUNOFF 1 001       6 0.0064     58.00       0.10        0 0   0   1 Pre-Development
 6 RUNOFF 1 001       1 0.0064     73.10       0.10        0 0   0   1 Post Development
 6 RESVOR 2     1 1   3 5749.0
   ENDATA
 7 LIST
 7 INCREM 6             .10
 7 COMPUT 7 001       1 0.0        3.3         1.0         2 2  01 01
   ENDCMP 1
   ENDJOB 2
```

```
 EXECUTIVE CONTROL OPERATION ENDJOB
                       RECORD ID
1
```

```
 TR20 XEQ 05-11-15  13:49       15-121 Jacona Transfer Station   100 Year Storm
                          JOB  1   SUMMARY
      REV PC 09/83(.2)           Pond 1
                                  PAGE   7
```

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED

(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

| SECTION/ STRUCTURE ID | STANDARD PEAK DISCHARGE CONTROL OPERATION TIME (HR) | DRAINAGE AREA (SQ MI) | RAIN TABLE # RATE (CFS) | ANTEC MOIST COND (CSM) | MAIN TIME INCREM (HR) | PRECIPITATION BEGIN (HR) | PRECIPITATION AMOUNT (IN) | PRECIPITATION DURATION (HR) | RUNOFF AMOUNT (IN) |
|---|---|---|---|---|---|---|---|---|---|
| ELEVATION (FT) | | | | | | | | | |
| ALTERNATE 1 STORM 10 | | | | | | | | | |
| XSECTION 1 | RUNOFF 5.02 | .01 3.12 | 2 486.9 | 2 | .10 | .0 | 3.30 | 22.75 | .36 |
| XSECTION 1 | RUNOFF 5.00 | .01 12.80 | 2 2000.3 | 2 | .10 | .0 | 3.30 | 22.75 | 1.01 |
| STRUCTURE 1 | RESVOR 5.17 | .01 2.42 | 2 378.0 | 2 | .10 | .0 | 3.30 | 22.75 | 1.04 |
| 5751.50 | | | | | | | | | |

1

```
 TR20 XEQ 05-11-15  13:49       15-121 Jacona Transfer Station   100 Year Storm
                          JOB  1   SUMMARY
      REV PC 09/83(.2)           Pond 1
                                  PAGE   8
```

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

| XSECTION/ STRUCTURE ID | DRAINAGE AREA (SQ MI) | STORM NUMBERS..... 10 |
|---|---|---|
| 0 STRUCTURE 1 | .01 | |
| ALTERNATE 1 | | 2.42 |
| 0 XSECTION 1 | .01 | |
| ALTERNATE 1 | | 12.80 |

```
1END OF  1 JOBS IN THIS RUN
```

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and General Supplemental Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

Footings.
Foundation walls.
Slabs-on-grade.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.

E. Samples: For water stops and vapor retarder.

F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

G. Material Certificates: For each of the following, signed by manufacturers:

Cementitious materials.
Admixtures.
Form materials and form-release agents.
Steel reinforcement and accessories.
Fiber reinforcement.
Water stops.
Curing compounds.
Floor and slab treatments.
Bonding agents.
Adhesives.
Vapor retarders.
Semi-rigid joint filler.
Joint-filler strips.
Repair materials.

H. Field quality-control test and inspection reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Water stops: Store water stops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

## 2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

Plywood, metal, or other approved panel materials.

B. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

## 2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

## 2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

## 2.5 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

Portland Cement: ASTM C 150, Type II

a. Fly Ash: ASTM C 618, Class F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 3S, 3M coarse aggregate or better, graded. Provide aggregates from a single source.

Maximum Coarse-Aggregate Size: 1 inch nominal.
Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

## 2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
Retarding Admixture: ASTM C 494/C 494M, Type B.
Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

## 2.7 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

Available Manufacturers:

a. Greenstreak.
b. Progress Unlimited, Inc.
c. Williams Products, Inc.

B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

Available Products:

a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.
b. Concrete Sealants Inc.; Conseal CS-231.
c. Greenstreak; Swellstop.
d. Henry Company, Sealants Division; Hydro-Flex.
e. JP Specialties, Inc.; Earthshield Type 20.
f. Progress Unlimited, Inc.; Superstop.
g. TCMiraDRI; Mirastop.

## 2.8 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

Available Products:

a. Fortifiber Corporation; Moistop Ultra A.
b. Raven Industries Inc.; Vapor Block 15
c. Reef Industries, Inc.; Griffolyn Type-65G

## 2.9 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing 3/8-inch sieve.

Available Products:

a. Anti-Hydro International, Inc.; Emery.
b. Dayton Superior Corporation; Emery Non-Slip.
c. Emeri-Crete, Inc.; Emeri-Topcrete.
d. Lambert Corporation; EMAG-20.
e. L&M Construction Chemicals, Inc.; Grip It.
f. Metalcrete Industries; Metco Anti-Skid Aggregate.

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

Available Products:

a. Burke by Edoco; Titan Hard.
b. ChemMasters; Chemisil Plus.
c. ChemTec International; ChemTec One.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Intraseal.
e. Curecrete Distribution Inc.; Ashford Formula.
f. Dayton Superior Corporation; Day-Chem Sure Hard.
g. Euclid Chemical Company (The); Euco Diamond Hard.
h. Kaufman Products, Inc.; SureHard.
i. L&M Construction Chemicals, Inc.; Seal Hard.
j. Meadows, W. R., Inc.; Liqui-Hard.
k. Metalcrete Industries; Floorsaver.
l. Nox-Crete Products Group, Kinsman Corporation; Duranox.
m. Symons Corporation, a Dayton Superior Company; Buff Hard.
n. US Mix Products Company; US Spec Industraseal.
o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS.

## 2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

Available Products:

a. Axim Concrete Technologies; Cimfilm.
b. Burke by Edoco; BurkeFilm.
c. ChemMasters; Spray-Film.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
e. Dayton Superior Corporation; Sure Film.
f. Euclid Chemical Company (The); Eucobar.
g. Kaufman Products, Inc.; Vapor Aid.
h. Lambert Corporation; Lambco Skin.
i. L&M Construction Chemicals, Inc.; E-Con.
j. MBT Protection and Repair, Div. of ChemRex; Confilm.
k. Meadows, W. R., Inc.; Sealtight Evapre.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
n. Sika Corporation, Inc.; SikaFilm.
o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
p. Unitex; Pro-Film.
q. US Mix Products Company; US Spec Monofilm ER.
r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

Available Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. Burke by Edoco; Aqua Resin Cure.
c. ChemMasters; Safe-Cure Clear.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
f. Euclid Chemical Company (The); Kurez DR VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; Aqua Kure-Clear.
i. L&M Construction Chemicals, Inc.; L&M Cure R.
j. Meadows, W. R., Inc.; 1100 Clear.
k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
m. Tamms Industries, Inc.; Horncure WB 30.
n. Unitex; Hydro Cure 309.
o. US Mix Products Company; US Spec Maxcure Resin Clear.
p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

Available Products:

a. Anti-Hydro International, Inc.; AH Clear Cure WB.
b. Burke by Edoco; Spartan Cote WB II.
c. ChemMasters; Safe-Cure & Seal 20.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
e. Dayton Superior Corporation; Safe Cure and Seal (J-18).
f. Euclid Chemical Company (The); Aqua Cure VOX.
g. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
h. Lambert Corporation; Glazecote Sealer-20.
i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
j. Meadows, W. R., Inc.; Vocomp-20.
k. Metalcrete Industries; Metcure.
l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 150E.
m. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
n. Tamms Industries, Inc.; Clearseal WB 150.
o. Unitex; Hydro Seal.
p. US Mix Products Company; US Spec Hydrasheen 15 percent
q. Vexcon Chemicals, Inc.; Starseal 309.

## 2.11 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

Types I and II, non-load bearing; IV and V, load bearing; for bonding hardened or freshly mixed concrete to hardened concrete.

D. Reglets: Fabricate reglets of not less than 0.0217-inch- thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

## 2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

Fly Ash: 25 percent.
Combined Fly Ash and Pozzolan: 25 percent.
Ground Granulated Blast-Furnace Slag: 50 percent.
Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
Silica Fume: 10 percent.
Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
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## 2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

Minimum Compressive Strength: 4000psi at 28 days.
Maximum Water-Cementitious Materials Ratio: 0.45
Slump Limit: 4 inches, 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

B. Foundation Walls: Proportion normal-weight concrete mixture as follows:

Minimum Compressive Strength: 4000 psi at 28 days.
Maximum Water-Cementitious Materials Ratio: 0.45.
Slump Limit: 3 inches, 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

Minimum Compressive Strength: 3000 psi at 28 days (4000 psi for exterior).
Minimum Cementitious Materials Ratio: 0.45.
Slump Limit: 3 inches plus or minus 1 inch.
Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate.

## 2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.

When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

# PART 3 - EXECUTION

## 3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Construct forms tight enough to prevent loss of concrete mortar.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

Install keyways, reglets, recesses, and the like, for easy removal.
Do not use rust-stained steel form-facing material.

E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

G. Chamfer exterior corners and edges of permanently exposed concrete.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

## 3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
Install dovetail anchor slots in concrete structures as indicated.

## 3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

## 3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

## 3.5 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

Lap joints 6 inches and seal with manufacturer's recommended tape.

## 3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

## 3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section 07 92 00 "Joint Sealants," are indicated.

Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

D. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

## 3.8 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

## 3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
Maintain reinforcement in position on chairs during concrete placement.
Screed slab surfaces with a straightedge and strike off to correct elevations.
Slope surfaces uniformly to drains where required.
Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

## 3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

Apply to concrete surfaces not exposed to public view

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

Apply to concrete surfaces exposed to public view.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

## 3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.

Apply scratch finish to surfaces indicated to receive concrete floor toppings.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

Apply a trowel finish to surfaces indicated.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:

Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
After broadcasting and tamping, apply float finish.
After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

## 3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

d. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
e. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
f. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..

Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

g. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

## 3.14 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
Do not apply to concrete that is less than 28 days' old.
Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

## 3.15 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

## 3.16 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

After concrete has cured at least 14 days, correct high areas by grinding.

Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

## 3.17 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a uniform inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

Steel reinforcement placement.
Steel reinforcement welding.
Headed bolts and studs.
Verification of use of required design mixture.
Concrete placement, including conveying and depositing.
Curing procedures and maintenance of curing temperature.
Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

Compression Test Specimens: ASTM C 31/C 31M.

b. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

Test results shall be reported in writing to Architect, concrete supplier, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

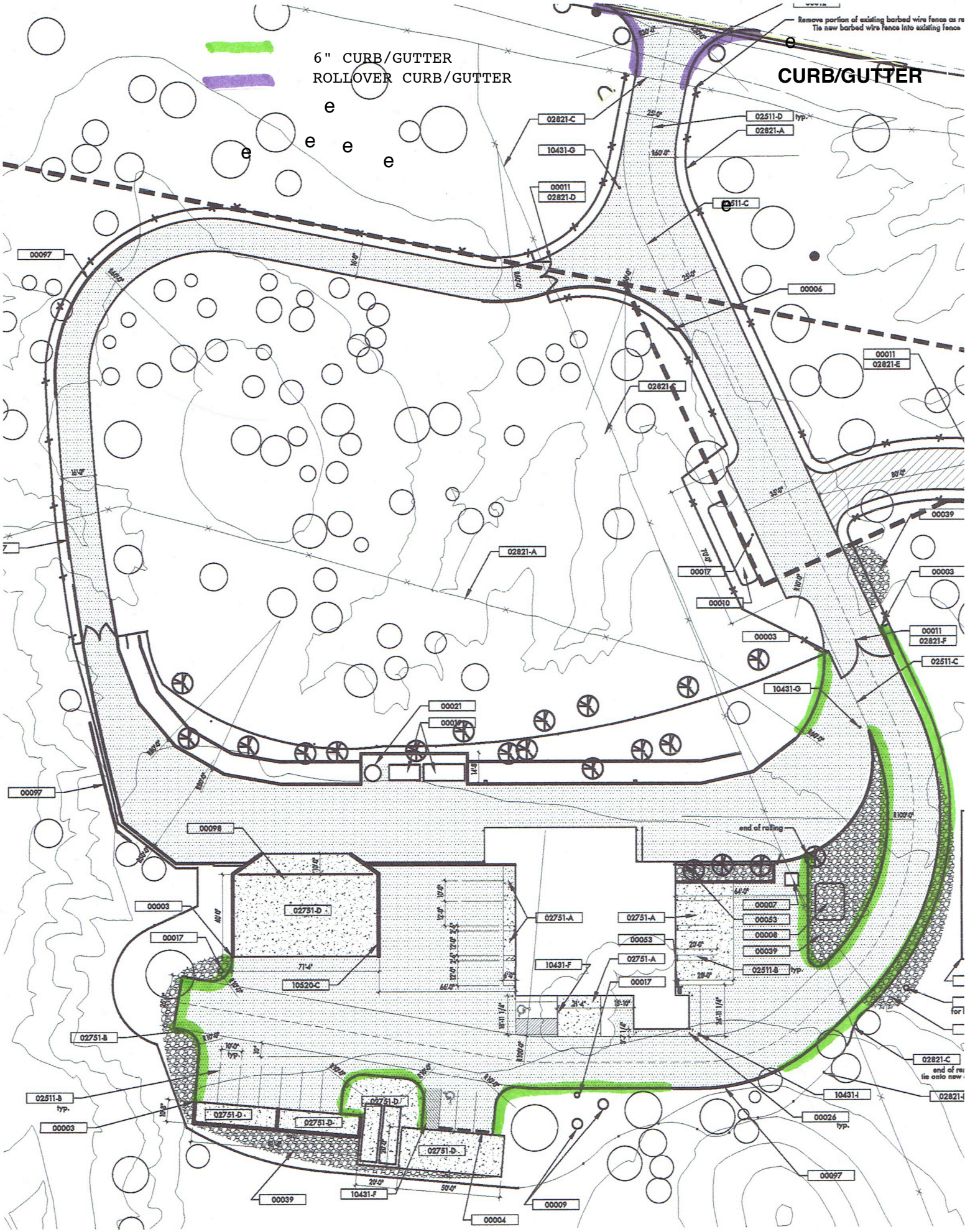
Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 033000




SPEC SEC. 03999

# SECTION 051200 - STRUCTURAL STEEL FRAMING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental General Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

B. Related Sections:
1. Division 05 Section 05 31 00 "Steel Decking"

### 1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

### 1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents.

1. Select and complete connections using schematic details indicate**d** on drawings.

### 1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pre-tensioned and slip-critical high-strength bolted connections.

C. Qualification Data: For qualified testing agency.

D. Welding certificates.

E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

## 1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
   1. In lieu of participation in the AISC Quality Certification Program or AISC-Certified, the fabricator/erector may employ the services of an approved independent qualified inspector for structural steel. Inspector qualifications and special inspections shall conform to the requirements of the International Building Code, Chapter 17 and shall be in accordance with AWS D1.1.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE
   1. In lieu of participation in the AISC Quality Certification Program or AISC-Certified, the fabricator/erector may employ the services of an approved independent qualified inspector for structural steel. Inspector qualifications and special inspections shall conform to the requirements of the International Building Code, Chapter 17 and shall be in accordance with AWS D1.1.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 P2 P3 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and relubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

## 1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M, Grade 50.

B. Channels, Angles, M, S-Shapes: ASTM A 572/A 572M, Grade 50.

C. Plate and Bar: ASTM A 36/A**.**

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B structural tubing.

E. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts.

B. Headed Anchor Rods: ASTM F 1554, Grade 36.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Hot-dip zinc coating, ASTM A 153.

C. Threaded Rods: ASTM A 36.

1. Nuts: ASTM A 563 heavy**-**hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened; ASTM A 36 carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A 15.

2.3 PRIMER

A. Primer: Comply with Division 09 Section. 09 91 00 “Painting”.

B. Galvanizing Repair Paint: SSPC-Paint 2ASTM A 780.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.

3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning"

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

H. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

## 2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
5. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
6. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
7. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
8. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
9. SSPC-SP 8, "Pickling."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

## 2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels, shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

## 2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

### 3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Plates: Clean concrete and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

## 3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tab where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

## 3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections if deemed necessary by the Structural Engineer of Record.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

    a. Liquid Penetrant Inspection: ASTM E 165.
    b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    c. Ultrasonic Inspection: ASTM E 164.
    d. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

## 3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 Section 09 91 00 “Painting”.

END OF SECTION 051200

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Roof deck.

B. Related Sections may include the following:

1. Division 03 Section 03 30 00 "Cast-in-Place Concrete" for concrete fill.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: For each type of steel deck, signed by product manufacturer.

D. Welding certificates.

E. Field quality-control test and inspection reports.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.
2. Acoustical roof deck.

G. Research/Evaluation Reports: For steel deck.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

D. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

E. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

## 1.6 COORDINATION

A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 07 Section 07 21 00 "Building Insulation" to ensure protection of insulation strips against damage from effects of weather and other causes.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck:

a. ASC Profiles, Inc.
b. Canam Steel Corp.;The Canam Manac Group.
c. Consolidated Systems, Inc.
d. DACS, Inc.
e. D-Mac Industries Inc.
f. Epic Metals Corporation.
g. Marlyn Steel Decks, Inc.
h. New Millennium Building Systems, LLC.

i. Nucor Corp.; Vulcraft Division.
j. Roof Deck, Inc.
k. United Steel Deck, Inc.
l. Valley Joist; Division of EBSCO Industries, Inc.
m. Verco Manufacturing Co.
n. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

## 2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 zinc coating.
2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, , Grade, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

    a. Color: Manufacturer's standard
3. Deck Profile: As indicated.
4. Profile Depth: As indicated.
5. Span Condition: As indicated.
6. Side Laps: Overlapped.

## 2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

C. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

## 3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

## 3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members TEK Screws of size and spacing as indicated on drawings.

B. Side-Lap and Perimeter Edge Fastening: Mechanically fasten with TEK Screws of size and spacing ss indicated on drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum**.**

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space Mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in in Division 07 Section 07 21 00 “Building Insulation”.

3.4 FIELD QUALITY CONTROL

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

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 09 Section 09 91 00 “Painting”.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior load-bearing wall framing.
2. Interior load-bearing wall framing.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated**.**

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height.
b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft..
c. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing

channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

C. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. Allied Studco.
2. AllSteel Products, Inc.
3. California Expanded Metal Products Company.
4. Clark Steel Framing.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Craco Metals Manufacturing, LLC.
7. Custom Stud, Inc.
8. Dale/Incor.
9. Design Shapes in Steel.
10. Dietrich Metal Framing; a Worthington Industries Company.
11. Formetal Co. Inc. (The).

12. Innovative Steel Systems.
13. MarinoWare; a division of Ware Industries.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. Steel Construction Systems.
18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade**:** ST33H or ST50H as required by structural performance.
2. Coating: G90 or equivalent.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.

B. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dietrich Metal Framing; a Worthington Industries Company.
b. MarinoWare, a division of Ware Industries.
c. SCAFCO Corporation
d. The Steel Network, Inc.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.

8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

## 2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

**B.** Anchor Bolts: ASTM F 1554, Grade 36 threaded carbon-steel and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

## 2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## 2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.

2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 07 Section 07 21 00 "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As indicated

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced as indicated on Shop Drawings. Fasten at each stud intersection.
1. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

## 3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports if deemed necessary by the Structural Engineer of Record.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 05501 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Definition: Metal fabrications include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of metal systems specified elsewhere.

B. Extent of metal fabrication is indicated on the Drawings and schedules.

C. Types of work in this section include metal fabrications for:

1. Rough hardware.

2. Bollards.

3. Steel pipe fabrications.
4. Metal angles for edges of Corrugated Siding
5. Stair Nosings

D. Structural steel is specified in another section within Division 5.

1.2 QUALITY ASSURANCE

A. Reference Standards: See Section 01090.

1. American Institute for Steel Construction (AISC)

a. Work shall conform to the AISC Manual of Steel Construction and the Code of Standard Practice for Steel Buildings and Bridges, except as modified by deleting the following sentence: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any connection designed by the fabricator in preparation of the shop drawings.

2. American Society for Testing and Materials (ASTM)

| | | |
|---|---|---|
| a. | ASTM A 27<br>A 27M-95 | Standard Specification for Steel<br>Castings, Carbon, for General Application |
| b. | ASTM A 36/<br>A36M-97a | Standard Specification for Carbon-<br>Structural Steel |
| . | ASTM A 47-90 | Standard Specification for Ferritic Malleable Iron Castings (Metric) |
| d. | ASTM A 53-98 | Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |
| e. | ASTM A 153/<br>A 153M-98 | Standard specification for Zinc<br>Coating (Hot-Dip) on Iron and Steel Hardware |
| f. | ASTM A 283/<br>A 283M-98 | Standard Specification for Low and<br>Intermediate Tensile Strength Carbon Steel Plates |

| | | |
|---|---|---|
| g. | A 307-97 | Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength |
| h. | ASTM A 366/ 366M-97 | Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality |
| i. | ASTM A 501-98 | Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing |
| j. | ASTM A 570/ A 570M-98 | Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality |

B. Take field measurements prior to the preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. Allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the work. Coordinate measurements prior to the preparation of shop drawings and fabrication to ensure proper fitting of the work.

C. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

D. Qualifications for Welding Work: Use welding processes and welding operations which qualify with AWS "Standard Qualification Procedure".

1.3 SYSTEM PERFORMANCES

A. Structural Performances: Provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

B. Provide handrails capable of withstanding the following loads applied as indicated when tested per ASTM E 935.

1. Concentrated loads of 200 lbs. applied at any point in any direction.

2. Uniform load of 50 lbs. per linear ft. applied simultaneously in both vertical and horizontal directions.

3. Concentrated and uniform loads above need not be assumed to act concurrently.

1.4 SUBMITTALS

A. See Sections 01300 and 01700.

1. Catalog Data: Submit manufacturer's catalog data, specifications, and anchor details for products used in miscellaneous metal fabrications, including paint products and grout.

2. Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Furnish templates for anchor bolt installation.

3. Where materials or fabrications are to comply with stated requirements for design loading, include structural computations, material properties and other information used in structural analysis.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metals:

1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

2. Use steel plates, shapes and bars complying with ASTM A 36.

3. Use bent or cold formed steel plates complying with ASTM A 283, Grade C.

4. Use steel bars and bar-size shapes complying with ASTM A 36.

5. Use hot-rolled steel tubing complying with ASTM A 501.

6. Use hot-rolled structural steel sheet complying with ASTM A 570, Grade 33; or use cold-rolled complying with ASTM A 611, Class 1; or grade required for design loading.

7. Use steel pipe complying with ASTM A 53, Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.

8. Use cold finished steel bars complying with ASTM A 108, Grade as selected by fabricator.

9. Use cold rolled carbon steel sheets complying with ASTM A 366.

10. Use cast or formed metal brackets, flanges and anchors of the same type material and finish as supported rails, unless otherwise indicated.

11. Use threaded or wedge type concrete inserts with galvanized ferrous casting, either malleable iron complying with ASTM A 47 or cast steel complying with ASTM A 27. Furnish and install hot-dip galvanized bolts, washers and shims as required to comply with ASTM A 153.

B. Fasteners:

1. General: Furnish and install zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

2. Use regular hexagon head type anchor bolts and nuts, ASTM A 307, Grade A.

3. Use square head type lag bolts, FS FF-B-561.

4. Use cadmium plated steel machine screws, FS FF-S-92.

5. Use flat head carbon steel wood screws, FS FF-S-111.

6. Use round plain carbon steel washers, FS FF-W-92.

7. Use anchors conforming to the following requirements:

a. Use threaded type concrete inserts with galvanized ferrous castings, internally threaded to receive 3/4" diameter machine bolts; either malleable iron complying with ASTM A 47, or cast steel complying with ASTM A 27 hot-dip galvanized complying with ASTM A 153.

8. Use helical spring type carbon steel lock washers, FS FF-W-84.

C. Paint:

1. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Division 9.

2. Use high zinc dust content paint for regalvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20.

2.2 FABRICATION, GENERAL

A. Workmanship: Use materials of size and thickness indicated, or if not indicated, as required to produce strength and durability in the finished product for use intended. Use type of materials indicated or specified for various components of work.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.

C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flathead (countersunk) screws or bolts.

E. Provide for anchorage of the type shown and required to support the structure either as shown on the Drawings or for temporary or permanent erection. Fabrication and spacing of anchoring devices shall provide adequate support for their intended use.

F. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

G. Use hot-rolled steel bars for work fabricated from bar stock, unless work is indicated to be fabricated from cold finished or cold-rolled stock.

H. Galvanizing: Provide a zinc coating for those items shown or specified to be galvanized, as follows:

1. ASTM A 153 for galvanizing iron and steel hardware.

2. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.

I. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

J. Apply shop primer to surfaces of metal fabrication except those which are galvanized or indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

K. Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications.

1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning".

2. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".

2.3 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division-6 sections.

B. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.4 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.

B. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes and plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

C. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

1. Except as otherwise indicated, space anchors 24" o.c. and provide minimum anchor units of 1-1/4" X 1/4" X 8" steel straps.

D. Galvanize miscellaneous frames and supports where indicated.

2.6 MISCELLANEOUS STEEL TRIM

A. Provide shapes and sections indicated for profiles shown. Unless otherwise indicated fabricate units from structural steel shapes, plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

2.7 STAIR NOSINGS

A. American Safety Tread Company style 801 or Balco P-200 or equal. Nosings shall be cast in aluminum, single component, cast-in-place with mfgr. anchors, #24 virgin grain Silicon Carbide granules embedded into the walking surface. Nosings shall terminate not more than 3" from ends of steps for poured concrete stairs. All metals shall be furnished in natural metal finish.

2.8 STEEL PIPE FABRICATIONS

A. Fabricate steel pipe fabrications to meet design requirements for location indicated. Provide members formed of pipe sizes and wall thickness not less than that required to support design loading.

B. Interconnect members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

1. At tee and cross intersections provide coped joints.

2. At bends interconnect pipe by means of prefabricated elbow fittings of flush radius bends, as applicable, of radiuses indicated.

D. Close exposed ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated fittings.

E. Brackets, Flanges, Fittings and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings and anchors for attachment of handrails to other work. Furnish inserts and other anchorage devices for connecting handrails to concrete or masonry work.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

### 3.2 INSTALLATION

A. General:

1. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, through-bolts, wood screws and other connectors as required.

2. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete or similar construction.

3. Fit exposed connections accurately together to form tight hairline joints. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

4. Field welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

5. Setting Loose Plates: Clean concrete bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

6. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.

   a. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUST AND CLEAN

A. Touch-up Painting: Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal is specified in a section within Division 9.

B. For galvanized surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05501

# SECTION 06100 - ROUGH CARPENTRY

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:
1. Rooftop equipment bases and support curbs.
2. Wood blocking, cants, and nailers.
3. Utility shelving.
4. Plywood backing panels.

### 1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. RIS - Redwood Inspection Service.
4. SPIB - Southern Pine Inspection Bureau.
5. WCLIB - West Coast Lumber Inspection Bureau.
6. WWPA - Western Wood Products Association.

### 1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

C. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
2. Use treatment that does not promote corrosion of metal fasteners.
3. Use Exterior type for exterior locations and where indicated.
4. Use Interior Type A High Temperature (HT), unless otherwise indicated.

2.3 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:

1. Rooftop equipment bases and support curbs.
2. Blocking (provide blocking at all wall/ceiling-mounted devices, accessories, equipment).
3. Cants.
4. Nailers.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:

1. Mixed southern pine; SPIB.
2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods; NELMA.
5. Northern species; NLGA.
6. Western woods; WCLIB or WWPA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Hem-fir or Hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir, Construction or 2 Common grade; NELMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods, No. 2 Common grade; NELMA.

5. Northern species, No. 2 Common grade; NLGA.
6. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.4 SHEATHING

A. Paper-Surfaced Gypsum Wall Sheathing: ASTM C 79/C 79M, with water-resistant material incorporated into the core and with water-repellent paper bonded to core's face, back, and long edges.

1. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
2. Edge and End Configuration: Square.
3. Size: 24 by 96 inches (610 by 2438 mm) for horizontal, 48 by 96 inches (1219 by 2438 mm) for vertical installation.

## 2.5 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch (12.7 mm) thick.

## 2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).

G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

# PART 3 - EXECUTION

## 3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven fasteners.
2. Published requirements of metal framing anchor manufacturer.
3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in the Uniform Building Code.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

## 3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

## 3.3 GYPSUM SHEATHING

A. General: Fasten gypsum sheathing to supports with galvanized roofing nails; comply with GA-253 and manufacturer's recommended spacing and referenced fastening schedule. Keep perimeter fasteners 3/8 inch (9.5 mm) from edges and ends of units.

B. Install 24-by-96-inch (609-by-2438-mm) sheathing horizontally with long edges at right angles to studs with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent board without forcing. Abut ends of boards over centers of studs and stagger end joints of adjacent boards not less than one stud spacing, two where possible.

C. Install 48-by-96-inch (1219-by-2438-mm) and longer sheathing vertically with long edges parallel to, and centered over, studs. Install solid wood blocking where end joints do not occur over framing. Fit units tightly against each other.

## 3.4 SHEATHING TAPE APPLICATION

A. Apply sheathing tape to joints between sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

END OF SECTION 06100

# SECTION 061600 - SHEATHING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Wall sheathing.

### 1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
6. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.

### 1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Oriented strand board.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

A. Oriented Strand Board: DOC PS 2.

B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

C. Factory mark panels to indicate compliance with applicable standard.

2.2 WALL SHEATHING

A. Oriented-Strand-Board Wall Sheathing: Exposure 1, Structural I sheathing.

1. Span Rating: Not less *than **24/16***
2. Nominal Thickness: Not less than 7/16 inch.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

F. Screws for Fastening Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's "Uniform Building Code."
4. Table 2305.2, "Fastening Schedule," in BOCA's "BOCA National Building Code."
5. Table 2306.1, "Fastening Schedule," in SBCCI's "Standard Building Code."
6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's "International One- and Two-Family Dwelling Code."

D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:

a. Nail to wood framing
b. Screw to cold-formed metal framing.
c. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600

# SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:
1. Plastic-laminate cabinets.
2. Plastic-laminate countertops.
3. Thermoset decorative overlay (Melamine) cabinets.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
2. Division 9 Section "Painting" for field finishing of interior architectural woodwork.

### 1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

B. Rough carriages for stairs are a part of interior architectural woodwork. Platform framing, headers, partition framing, and other rough framing associated with stairwork are specified in Division 6 Section "Rough Carpentry."

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories, and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, and other items installed in architectural woodwork.
3. Apply WIC-certified compliance label to first page of Shop Drawings.

C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
1. Plastic laminates.
2. Thermoset decorative overlay (Melamine).

D. Samples for Verification: For the following:
1. Plastic-laminate-clad panel products, for each type, color, pattern, and surface finish.

2. Thermoset decorative-overlay surfaced panel products, for each type, color, pattern, and surface finish.

3. Exposed cabinet hardware and accessories, one unit for each type.

E. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork.

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.

1. Provide AWI Quality Certification Program labels or certificate indicating that woodwork complies with requirements of grades specified.

E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

F. Warranty – Furnish a written warranty that all work will be free from defects in material and workmanship for a period of one year after Owner acceptance of the project and the repairs/replacements of said defects shall be performed in a timely manner at no expense to the Owner.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## 1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 8 Section "Door Hardware" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species for Opaque Finish: Any closed-grain hardwood.

C. Wood Products: Comply with the following:
1. Particleboard and Fiberboard: ANSI A208.1, Grade M-2 /MD; formaldehyde-free, Medite II or similar product
2. Hardwood Plywood and Face Veneers: HPVA HP-1.

D. Thermoset Decorative Overlay: Particleboard/fiberboard complying with ANSI A208.1, Grade M-2/MD, (Alternate No. 8: formaldehyde-free, Medite II or similar product) with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
   a. Nevamar

F. Adhesive for Bonding Plastic Laminate: contact cement.

## 2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

C. Butt Hinges: 2-3/4-inch (70-mm), 5-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:

1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
3. Classrooms: Heavy duty, 5 knuckle, 2 ½" institutional type, Mill ground, hospital tip, tight pin feature with all edges eased, Full wrap around type of tempered steel .083" thick. (Grass – 950 Series Institutional Barrel Hinges or MEPLA SSP Hinge System no. 73) – one pair for each door 48" height, one and one half pari for each door 48" and over.
4. Offices: Blum full concealed 176 degree number 9066 with one number 91660 self closing hinge per door or Grass Snap-on 3000 HInge Series 165 degreee number 3913 with one #3903 self-closing hinge per door or Salice #C2RFA99-165 full overlay self closing hinge with dowels.

D. Pulls: Door and drawer pulls shall be wire pulls, 4".

E. Catches: Magnetic catches, BHMA A156.9, B03141. One for each door on base and wall cabinets, two per door on tall cabinets. Minimum of 5 lb. pull.

F. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:

1. Box Drawer Slides: 75 lbf (330 N), Type KV-1300
2. File Drawer Slides: 150 lbf (670 N), Type KV-1460.
3. File drawers recieve standard file hangers with option of letter or legal size KV-476

G. Locks: BHMA A156.11, E07121. 5 disc tumbler locks keyed alike each room and master keyed. Dull chrome finish on doors and drawers. Provide on all drawers and doors.

H. Bases – For proper leveling bases shall be continuous 4 1/8" high and ¾" thick plywood bridged 2'-0" on center. Two positioning strips permanently attached to bottom of cabinets for self aligning cabinets with bases shall be provided.

I. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Product: Subject to compliance with requirements, provide grommets by Doug Mockett and Co., Inc.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
2. Satin Stainless Steel: BHMA 630.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

## 2.3 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide Premium grade interior woodwork complying with the referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Complete fabrication, including assembly, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

D. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

2.5 WOOD CABINETS FOR OPAQUE FINISH

A. Quality Standard: Comply with AWI Section 400 requirements for wood cabinets.

B. Grade: Custom.

C. Species for Exposed Lumber Surfaces: Any closed-grain hardwood.

D. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Match materials indicated for exposed surfaces.

E. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

F. Shelves: solid hardwood edge.

2.6 PLASTIC-LAMINATE CABINETS

A. Quality Standard: Comply with AWI Section 400 requirements for laminate cabinets.

B. Quantity of laminate colors and colors as shown on Drawings.

C. Grade: Premium.

D. Insure stablility and prevent racking when fully loaded.

E. Bottom and sides of base cabinets of ¾” indsutrial particleboard/fiberboard, 45-47 lb. density.

F. AWI Type of Cabinet Construction: Flush overlay, ¾” overlap top, bottom and sides.

G. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements and NEMA:

1. Horizontal Surfaces Other Than Tops: HGS.
2. Postformed Surfaces: HGP.
3. Vertical Surfaces: HGS.
4. Edges: HGS.

H. Materials for Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative overlay, 8-9 mil, white.
2. Drawer Sides and Backs: Thermoset decorative overlay.
3. Drawer Bottoms: Thermoset decorative overlay.

I. Base cabinets:

1. Bottom and sides – ¾" industrial particle board, 45-47 lb. density, face side laminated with 8-9 mil white melamine resin-saturated overaly and the non-exposed side laminated with a phenolic backing sheet.
2. Back panel – ¼" 45-47 lb. density industrial particleboard/fiberboard with 8-9 mil white melamine resin-saturated overaly on face side and non-exposed side with sealer.
3. top of base cabinet and below top set of drawers to full framed in wood or full sheet of 3/8" particle board sub top
4. Back panel – full bound, captured in grooves on cabinet sides, top and bottom and secured with staples and a hot weld glue around entire back perimeter.

J. Upper and Full Height cabinets:

1. Units shall be made of similar materials and construction as described above, excpet top member shall be solid ¾" 45047 lb. density indsutrial particleboard/fiberboard laminated with 8-9 mil melamine resin-saturated overlay rather than a wood frame.
2. On wall units a 3/8" x 2 ½" hanging filler strip shall be screwed and glued to the top and bottom of the cabinet.
3. On full height cabinets a 3/8" x 2 ½" fill strip shall be screwed and glued to the top of the cabinet.

K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Match Architect's samples – see Finish Schedule and Cabinet Details.

L. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

M. Exposed edging – Same as laminate cladding on horizontal surfaces.

N. Shelves – ¾" industrial particleboard/fiberboard 45-47 lb. density laminated both sides with 8-9 mil white melamine resin saturated overlay/ Shelves ≥36" long, 1" thick. Front and sides with T edge.

O. Adjustable shelves – on recessed KV-255 standards and KV-256 brackets or LH heavy duty nylon or metal shelf supports with dirlled holes 2" oc.

P. 4" Wire pulls, brushed chrome finish.

Q. Drawers:

1. Sides, backs, sub-fronts – ½" solid red oak or ½" 7 ply baltic birch plywood. Dovetailed front and back and securely glued to form a positive joint. Shoulder lock joints not allowed.

2. Bottoms – ¼" hardboard, rabbeted into sides and back, stapled and secured with a hot weld glue around entier perimeter of bottom.

3. After fabrication and prior to drawer front assembly, apply one coat sealer and one coat clear industrial lacquer.

4. Front fastened with screws from inside of drawer.

5. Blum Metabox System – backs and bottoms of ¾" particleboard/fiberboard with white melamine finish. Metabox system shall be white. Standard drawers shall be 4", File drawers shall be 6" full extension.

6. G*Grass Drawer slides – Unigrass 100-lb. load capacity classic and metallic series. Backs and bottoms of ¾" particleboard/fiberboard with white melamine finish.

## 2.7 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure decorative laminate countertops.

B. Grade: Premium.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. Match Architect's samples. Quantity of laminate colors and colors as shown on Drawings.

D. Grain Direction: Parallel to cabinet fronts.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: 1" particleboard/fiberboard 42 lb. density of greater. Formaldehyde free.

G. Standards – NEMA for thermosetting laminates.

H. Counterbalance all tops with appropriate backer to the underside to assure blanced construction. All exposed edges shall be self edged with the same material as top. No rolled edges.

I. Supports for countertops:
   1. Base cabinets where they occur

## 2.8 SHOP FINISHING

A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.

B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

C. General: The entire finish of interior architectural woodwork is specified in this Section, regardless of whether shop applied or applied after installation. The extent to which the final finish is applied at fabrication shop is Contractor's option, except shop apply at least the prime coat before delivery.

D. General: Priming and finishing of interior architectural woodwork required to be performed at fabrication shop are specified in this Section. Refer to Division 9 Section "Painting" for final finishing of installed architectural woodwork and for material and application requirements for woodwork not specified to receive final finish in this Section.

E. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

   1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of

plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

### 3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

E. Protect adjacent surfaces.

F. Handle all materials in strict accordance with manufacturer’s instructions.

G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.
3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c.
4. Sides, top and bottom fastened in accordance with approved manufacturers standard to prevent racking and insure stability when fully loaded.

H. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
3. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

I. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in shop.

J. Refer to Division 9 Sections for final finishing of installed architectural woodwork.

K. Finish/seal/paint all exposed woodwork.

L. Provide blocking as required.

## 3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

D. Adjust all doors, catches, drawers, etc. to provide proper operation.

END OF SECTION 06402

# SECTION 07141 – COLD FLUID-APPLIED WATERPROOFING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Cold fluid-applied asphalt waterproofing. (07141-A)
2. Cold-applied cut-back asphalt dampproofing (07141-B)

### 1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified, including data substantiating that materials comply with requirements for each waterproofing material specified. Include recommended method of application, recommended primer, number of coats, coverage or thickness, and recommended protection course.

### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed bituminous waterproofing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Single-Source Responsibility: Obtain primary waterproofing materials and primers from one source and by a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

### 1.5 PROJECT CONDITIONS

A. Substrate: Proceed with waterproofing only after substrate construction and penetrating work have been completed.

B. Weather Limitations: Proceed with waterproofing only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Cold Fluid-Applied Asphalt Waterproofing Membrane (moisture-cure, solvent free elastomeric waterproofing compound):
   a. Henry CM100 1 coat Elastomeric waterproofing Membrane

2.2 BITUMINOUS WATERPROOFING (COLD FLUID-APPLIED WATERPROOFING)

A. General: Provide products recommended by manufacturer for designated application.

1. Trowel Grade: Asphalt roof cement, consisting of an asphalt base with petroleum solvents and mineral stabilizers, complying with ASTM D 4586, Type I.

A. Primary waterproofing membrane shall be Henry CM100 Cold Applied Elastomeric Membrane manufactured by Henry, a moisture cure, solvent free elastomeric waterproofing compound having the following characteristics:

Conforms to ASTM C 836,
Solvent content: 0%,
Non Flammable, Flash point > 450 F,
Elongation: >500%,
V.O.C < 40 grams/ Liter,
Can be applied to “green” concrete.

2.3 MISCELLANEOUS MATERIALS

2.3a FABRIC REINFORCEMENT

A. Fabric reinforcement shall be Polyester Fabric with a minimum thickness of 8 mils and:
   1. Grab Tensile Strength (ASTM 5034):
      MD: 25 lbs/in
      CD: 13 lbs./in
   2. Trapezoid Tear (ASTM D1117):
      MD: 3 lbs
      CD: 6 lbs.
   3. Mullen Burst: 17 psi

2.3b FLASHING AND CRACK TREATMENT MEMBRANE

A Flashing and crack treatment membrane shall be 990-25 Elastomeric flashing sheet as supplied by Henry, a butyl/EPDM type, elastomeric membrane having a thickness of 47 mils.

2.3c PROTECTION COURSE/SEPARATION SHEET

A. Protection course/separation sheet membrane for horizontal surfaces shall be Filter Fabric GR08 as supplied by Henry, a 100% post consumer recycled polyester fabric having a minimum thickness of 120 mils.

2.4 BITUMINOUS DAMPPROOFING (COLD FLUID-APPLIED WATERPROOFING)

A. General: Provide products recommended by manufacturer for designated application.

B. Cold-Applied, Cut-Back Asphalt Dampproofing: Asphalt and solvent compound mixed to a smooth, uniform consistency to provide a firm, moisture-resistant, vapor-resistant, elastic coating recommended by the manufacturer for dampproofing use when applied according to the manufacturer's instructions.

1. Trowel Grade: Asphalt roof cement, consisting of an asphalt base with petroleum solvents and mineral stabilizers, complying with ASTM D 4586, Type I.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.

B. Install cant strips and similar accessories as shown and as recommended by prime materials manufacturer even though not shown.

C. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, with particular attention at construction joints.

D. Install separate flashings and corner protection stripping, as recommended by prime materials manufacturer, where indicated to precede application of waterproofing. Comply with details shown and with manufacturer's recommendations. Pay particular attention to requirements at building expansion joints, if any.

E. Prime substrate as recommended by prime materials manufacturer.

F. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work by masking or otherwise protecting adjoining work.

3.2 INSTALLATION, GENERAL

3.2.1 SINGLE COAT COLD APPLIED ELASTOMERIC MEMBRANE APPLICATION

A. Application of Single Coat Vertical Layer:
   1. Ensure substrates are ready to receive primary waterproofing membrane.
   2. Apply membrane by squeegee, roller or trowel ensuring full bond of membrane to substrate.
   3. Apply single coat layer of primary membrane evenly to a minimum thickness of 55 mils to form a continuous monolithic coating over vertical surfaces including previously reinforced areas.

B. Application of Single Coat Horizontal Layer:
   1. Ensure substrates are ready to receive primary waterproofing membrane.
   2. Apply membrane by squeegee, roller or trowel ensuring full bond of membrane to substrate.
   3. Apply single coat layer of primary membrane evenly to a minimum thickness of 110 mils to form a continuous monolithic coating over vertical surfaces including previously reinforced areas.

3.2.2 INSTALLATION OF PROTECTION COURSE/SEPARATION SHEET (Horizontal)

A. Place specified protection course/separation sheet onto top coat layer of primary membrane while it is still wet and has not skinned over.

B. Lap protection course 2 inches on side laps and 6 inches on end laps.

C. Start at the low points or drains, lay the protection course membrane in full continuous sheets in a shingle pattern. Stager all end laps.

3.2.3 CURING AND PROTECTION

A. Allow membrane to dry thoroughly. Protect from rain until fully cured. Allow membrane to fully cure prior to installing drainage composite, covering material or backfilling. Patch or repair damaged areas using same material as original coating.

B. Protect cured membrane from damage caused by backfilling with drain boards prior to commencing backfill.

3.3 PROTECTION AND CLEANING

A. Protect exterior, below-grade waterproofing membrane from damage until backfill is completed. Remove overspray and spilled materials from surfaces not intended to receive waterproofing.

3.4 INSTALLATION OF PROTECTION COURSE

A. General: Where indicated, install protection course of type indicated over completed-and-cured waterproofing treatment. Comply with waterproofing materials manufacturer's recommendations for method of support or attaching of protection materials. Support with spot application of trowel-grade mastic where not otherwise indicated.

END OF SECTION 07141

# SECTION 07210 - BUILDING INSULATION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:
   1. Perimeter footing insulation.
   2. Wall insulation (exterior walls) – cavity and rigid board.
   3. Roof insulation.
   4. Interior wall sound attenuation blankets.

B. Related Sections include the following:
   1. Division 9 Sections "Gypsum Board Assemblies" for installation in metal-framed assemblies of insulation specified by reference to this Section.
   2. Division 15 Sections for duct, equipment and pipe insulation.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

### 1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

   1. Surface-Burning Characteristics: ASTM E 84.
   2. Fire-Resistance Ratings: ASTM E 119.
   3. Combustion Characteristics: ASTM E 136.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Extruded-Polystyrene Board Insulation/Foam Thermal Breaks:

a. DiversiFoam Products.
b. Dow Chemical Company.
c. Owens Corning.
d. Tenneco Building Products.
e. Insulfoam

2. Formaldehyde-Free Glass-Fiber Insulation:
a. Johns Manville Corporation.
b. Owens Corning.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:

1. Type IV, 1.60 lb/cu. ft. (26 kg/cu. m), unless otherwise indicated.

C. Unfaced Mineral-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics. Formaldehyde-free.

D. Faced Mineral-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame spread of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on one face; consisting of fibers manufactured from glass, slag wool, or rock wool. Formaldehyde-free.

E. Blown-in cellulose insulation
1. Manufactured from recycled newspapers treated with boric acid and sodium polyborate
2. Thermal Performance - R-Value of 3.8 per inch.
3. CPSC standard 16 CFR Parts 1209 and 1404, ASTM C-739, E-84 and E-119, and UL-723.
4. Flammability Characteristics. Critical Radiant Flux: greater than or equal to 0.12 watts/cm2. Smoldering Combustion: less than or equal to 15%.
5. E.P.A. registered fungicide for resistance to mold growth.
6. Surface Burning Characteristics - Flame Spread: 15, Smoke Developed: 5

2.3 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

B. Protection Board: Premolded, semirigid asphalt/fiber composition board, 1/4 inch (6 mm) thick, formed under heat and pressure, of standard sizes.

## 2.4 INSULATION FASTENERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Adhesively Attached, Spindle-Type Anchors:

   a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
   b. Eckel Industries of Canada Limited; Stic-Klip Type N Fasteners.
   c. Gemco; Spindle Type.

2. Adhesively Attached, Angle-Shaped, Spindle-Type Anchor:
   a. Gemco; 90-Degree Insulation Hangers.

3. Insulation-Retaining Washers:

   a. AGM Industries, Inc.; RC150.
   b. AGM Industries, Inc.; SC150.
   c. Gemco; Dome-Cap.
   d. Gemco; R-150.
   e. Gemco; S-150.

4. Anchor Adhesives:

   a. AGM Industries, Inc.; TACTOO Adhesive.
   b. Eckel Industries of Canada Limited; Stic-Klip Type S Adhesive.
   c. Gemco; Tuff Bond Hanger Adhesive.

B. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
2. Spindle: Copper-coated, low carbon steel, fully annealed, 0.105 inch (2.67 mm) in diameter, length to suit depth of insulation indicated.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.

1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
   a. Ceiling plenums.

D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.

B. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board. Set in adhesive according to insulation manufacturer's written instructions.

3.5 INSTALLATION OF CAVITY WALL AND MASONRY CELL INSULATION

A. On units of plastic insulation, install small pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face, as recommended by manufacturer. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 4 Section "Unit Masonry Assemblies."

## 3.6 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:

1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

E. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

## 3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210

SECTION 07410 – METAL ROOF

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Metal roof panels.

B. Related Sections include the following:

1. Division 1 Section “Substitutions” for prior approval requirements for standing-seam roof panels.
2. Division 6 Section "Rough Carpentry" for wood framing and sheathing.
3. Division 7 Section “Sheet Metal Flashing and Trim” for coping for parapets.
4. Division 7 Section "Joint Sealants" for field-applied sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide manufactured roof panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

B. Air Infiltration: Provide manufactured roof panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. of fixed roof area when tested according to ASTM E 1680 at a static-air-pressure difference of 4.0 lbf/sq. ft.

C. Water Penetration: Provide manufactured roof panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 1646 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 6.24 lb/sq. ft. and not more than 12.0 lb/sq. ft.

D. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements of UL 580 for Class 90 wind-uplift resistance.

E. Structural Performance: Provide manufactured roof panel assemblies capable of safely supporting design loads indicated under in-service conditions with vertical deflection no greater than the following, based on testing manufacturer's standard units according to ASTM E 1592 by a qualified independent testing and inspecting agency.

1. Maximum Deflection: 1/180 of the span.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

B. Shop Drawings: Show layouts of panels on roofs, details of edge conditions, joints, panel profiles, supports, anchorages, trim, flashings, underlayment, closures, snow guards, and special details. Distinguish between factory- and field-assembled work.

1. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: Manufacturer's color charts or chips showing the full range of colors, textures, and patterns available for roof panels with factory-applied finishes.

D. Samples for Verification: Provide sample panels 12 inches long by actual panel width, in the profile, style, color, and texture indicated. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.

E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product Test Reports: Indicate compliance of manufactured roof panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed metal roof panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.

B. Handling: Exercise care in unloading, storing, and erecting roof panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

## 1.7 PROJECT CONDITIONS

A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## 1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal roof panels within the specified warranty period and agreeing to repair finish or

replace roof panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.

C. Finish Warranty Period: 20 years from date of Substantial Completion.

D. Special Weathertight Warranty: Submit a written warranty executed by manufacturer agreeing to repair or replace metal roof panel assembly that fails to remain weathertight within the specified warranty period.

E. Weathertight Warranty Period: 5 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 EXPOSED-FASTENER, LAP-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.

B. Exposed-Fastener Metal Roof Panels:

1. Basis-of-Design Product: Rigid, PBR panels, with Spectralite 2000, 36”, 26 gauge minimum or a comparable product

2. Material: Zinc-coated (galvanized) steel sheet, 26 gauge.

   a. Exterior Finish: Fluoropolymer or Siliconized polyester.
   b. Color: Per Drawings, sheet 11.0

3. Panel Coverage: 36” approximately.

### 2.2 METALS AND FINISHES

A. Manufacturer’s standard factory finish to comply with the following requirements:

1. Siliconized polyester finish.
2. Finish: Apply the following organic coating in manufacturer’s standard thickness. Furnish appropriate air-drying spray finish in matching color for touchup.
3. Color:
   a. As selected by architect from both standard and premium colors

### 2.3 ROOF PANEL ASSEMBLIES

A. Standing-Seam Roof Panels: Manufacturer's standard factory-formed, standing-seam roof panel assembly designed for concealed mechanical attachment of panels to roof purlins or deck.

1. Clips: Provide minimum 0.0625-inch-thick, stainless-steel panel clips designed to meet negative-load requirements.

### 2.4 UNDERLAYMENT MATERIALS

A. Per Metal Building Manufacturer.

2.5 MISCELLANEOUS MATERIALS

A. General: Provide materials and accessories required for a complete roof panel assembly and as recommended by panel manufacturer, unless otherwise indicated.

B. Provide roof flashing, trim, coping and other accessories by standing seam roof panel manufacturer to match material and color of standing seam roof panels.

C. Thermal Spacers: Where panels attach directly to purlins, provide thermal spacers recommended by panel manufacturer.

D. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Use stainless-steel fasteners for exterior applications.
2. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.

E. Accessories: Unless otherwise specified, provide components required for a complete roof panel assembly including trim, fasciae, clips, seam covers, battens, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.

1. Closure Strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or cross-linked, polyolefin-foam flexible closure strips. Cut or premold to match configuration of panels. Provide closure strips where indicated or necessary to ensure weathertight construction.
2. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
3. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to seal joints in panel roofing and remain weathertight. Provide sealant recommended by panel manufacturer.

F. Expansion-Joint Sealant: For hooked-type expansion joints that must be free to move, provide nonsetting, nonhardening, nonmigrating, heavy-bodied polyisobutylene sealant.

G. Primer: Rust-inhibitive primer recommended by panel manufacturer for finish coat.

2.6 FABRICATION

A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate panel joints with captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panel roofing.

1. Panel Supports and Anchorage: Examine roof framing to verify that purlins, angles, channels, and other secondary structural panel support members and anchorage have been installed according to written instructions of panel manufacturer.

2. Do not proceed with roof panel installation until unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Coordinate metal panel roofing with rain drainage work; flashing; trim; and construction of parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

B. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

## 3.3 PANEL INSTALLATION

A. General: Comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting exterior panels by torch is not permitted.
2. Install panels with concealed fasteners, unless otherwise indicated.
3. Install panels over solid substrate with minimum 3:12 slope. Install 1 ply of felt from lower edge up, with at least 3-inch side laps and 4-inch end laps.

B. Accessories: Install components required for a complete roof panel assembly including trim, copings, fasciae, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items.

C. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.

D. Install felt underlayment and building-paper slip sheet on roof deck under metal panels, unless otherwise recommended by panel manufacturer. Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under metal panels. Apply from eave to ridge in shingle fashion and lap joints a minimum of 2 inches.

E. Coat back side of metal panels with bituminous coating where it will contact wood, ferrous metal, or cementitious construction.

F. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.

1. Flash and seal panels at eave and rake with rubber, neoprene, or other closures to exclude weather.
2. Seal panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by panel manufacturer.
3. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

G. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

## 3.4 CLEANING AND PROTECTING

A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION 07410

# SECTION 07412 - METAL WALL PANELS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Factory-formed and field-assembled, exposed-fastener, lap-seam metal wall panels.

B. Related Sections include the following:

1. Division 5 Section "Cold-Formed Metal Framing" for secondary support framing supporting metal wall panels.
2. Division 7 Section "Sheet Metal Flashing and Trim" for fasciae, copings, flashings and other sheet metal work not part of metal wall panel assemblies.
3. Division 7 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

### 1.3 DEFINITION

A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight system.

### 1.4 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

B. Air Infiltration: Air leakage through assembly of not more than [0.06 cfm/sq. ft. (0.3 L/s per sq. m)] of wall area when tested according to ASTM E 283 at a static-air-pressure difference of [6.24 lbf/sq. ft. (300 Pa)].

C. Water Penetration: No water penetration when tested according to ASTM E 331 at a minimum differential pressure of [20 percent of inward-acting, wind-load design pressure of not less than [6.24 lbf/sq. ft. (300 Pa)] and not more than 12 lbf/sq. ft. (575 Pa).

D. Water Penetration: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than [6.24 lbf/sq. ft. (300 Pa) and not more than 12 lbf/sq. ft. (575 Pa).

1. Water Leakage: As defined according to AAMA 501.1.
2. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

E. Water Absorption: Maximum 1.0 percent absorption rate by volume when tested according to ASTM C 209.

F. Thermal Movements: Provide metal wall panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal wall panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Wall Panels: 12 inches (300 mm) long by actual panel width.
2. Exposed Gaskets: 12 inches (300 mm) long.
3. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of metal wall panels adjacent to joint sealants.

D. Maintenance Data: For metal wall panels to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of 5 years experience in the installation of metal siding of similar size and scope.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain each type of metal wall panel through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal wall panels and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect strippable protective covering on metal wall panels from exposure to sunlight and high humidity, except to extent necessary for period of metal wall panel installation.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal wall panels without field measurements, or allow for field trimming of panels. Coordinate wall construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.9 COORDINATION

A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal wall panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Weathertight Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PANEL MATERIALS

A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
1. Rigid Spectralite 2000
2. PBM Panel
3. Hot dipped aluminum zinc alloy coated Galvalume 26 gauge
4. Surface: smooth flat finish.
5. Exposed Finishes: Apply the following coil coating, as specified or indicated on Drawings.

Factory applied, baked-on siliconized Polyester. Color: as selected by Architect from both standard and premium colors.

B. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.3 THERMAL INSULATION FOR FIELD-ASSEMBLED METAL WALL PANELS

A. None

2.4 SUBSTRATE BOARDS

A. By metal building manufacturer

2.5 MISCELLANEOUS METAL FRAMING

A. Steel Sheet Components, General: Complying with ASTM C 645 requirements for metal and with [ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized] [ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized] [manufacturer's standard corrosion-resistant] zinc coating.

B. Subgirts: C- or Z-shaped sections fabricated from 0.0598-inch (1.5-mm) bare steel thickness, shop-painted, cold-formed, metallic-coated steel sheet.

C. Zee Clips: 0.079-inch (2.0-mm) bare steel thickness, cold-formed, galvanized steel sheet.

D. Base or Sill [Angles] [Channels]: 0.079-inch (2.0-mm) bare steel thickness, cold-formed, galvanized steel sheet.

E. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

## 2.6 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating.

1. Fasteners for Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM or neoprene sealing washer.
2. Fasteners for Wall Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
3. Exposed Fasteners for Composite Panels: Stainless steel.
4. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
5. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

## 2.7 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.

B. Corrugated-Profile, Exposed-Fastener Metal Wall Panels :
1. Available Manufacturers:
   a. Rigid Spectralite 2000

2. Material: Zinc-coated (galvanized) steel sheet, 26 gauge

   a. Exterior Finish: Siliconized polyester
   b. ColorValspar As selected from both standard and premium colors

3. Panel Coverage: 36"

## 2.8 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Formed from 0.0179-inch- (0.45-mm-) thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

C. Downspouts: Formed from 0.0179-inch- (0.45-mm-) thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; in 10-foot- (3-m-) long sections, complete with formed elbows and offsets. Finish downspouts to match metal wall panels.

## 2.9 FABRICATION

A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
2. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.

B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Where indicated, fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

## 2.10 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

1. Examine primary and secondary wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

B. Substrate Board: Install substrate board over wall sheathing on entire wall surface. Attach with substrate-board fasteners.

1. Install substrate board with long joints in continuous straight lines, perpendicular to direction of metal wall panel seams with end joints staggered between rows. Tightly butt substrate boards together.
2. Comply with requirements for fire-rated construction.

C. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

D. Install fasciae and copings to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

E. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

3.3 METAL WALL PANEL INSTALLATION, GENERAL

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting of metal wall panels by torch is not permitted.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
4. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.

5. Install screw fasteners in predrilled holes.
6. Locate and space fastenings in uniform vertical and horizontal alignment.
7. Install flashing and trim as metal wall panel work proceeds.
8. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners:

1. Steel Wall Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

## 3.4 FIELD-ASSEMBLED METAL WALL PANEL INSTALLATION

A. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal wall panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
6. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps, and on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.
7. At panel splices, nest panels with minimum 6-inch (150-mm) end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

B. Zee Clips: Provide Zee clips of size indicated or, if not indicated, as required to act as standoff from subgirts for thickness of insulation indicated. Attach to subgirts with fasteners.

## 3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Tie downspouts to underground drainage system indicated.

D. Translucent Wall Panels: Provide end laps of not less than 6 inches (150 mm) and side laps of not less than 1-1/2-inch (38-mm) corrugations. Align horizontal laps with adjacent translucent wall panels. Seal intermediate end laps and side laps of translucent panels with translucent mastic.

## 3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

## 3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft. (300 Pa).

C. Water-Spray Test: After completing the installation of 75-foot- (23-m-) by-2-story minimum area of metal wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.

D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories. Report results in writing.

E. Remove and replace applications of metal wall panels where inspections indicate that they do not comply with specified requirements.

F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

## 3.8 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07412

# SECTION 07620 - SHEET METAL FLASHING AND TRIM

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:
1. Metal flashing.
2. Reglets.
3. Roof expansion-joint covers.

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

1. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
2. Division 7 Section "Joint Sealants" for elastomeric sealants.
3. Division 7 Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

### 1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

B. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:

1. Wind Zone 2: Wind pressures of 31 to 45 psf.

### 1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

D. Colors, full manufacturer range, to be selected by Architect.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.6 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:

1. Mill-Finish Aluminum Sheet: ASTM B 209, 3003-H14, with a minimum thickness of 0.040 inch, unless otherwise indicated.

B. Galvanized Steel Sheet: ASTM A 526, G 90, commercial quality, or ASTM A 527, G 90, lock-forming quality, hot-dip galvanized steel sheet with 0.20 percent copper, mill phosphatized where indicated for painting; not less than 0.0396 inch thick, unless otherwise indicated.

C. All metal flashing and trim by Metal Building Manufacturer including flashing, trim , downspouts (to match wall panels) and gutters (to match wall panels and roof panels) to match wall or roof panels

2.2 REGLETS

A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.

Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.

Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.

1. Material: Aluminum, 0.024 inch thick.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

2. Fry Reglet Corporation.
3. Hickman: W.P. Hickman Co.
4. Keystone Flashing Company.

2.3 DOWNSPOUTS

A. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Color as selected by architect, from full range of manufacturer's colors

2. Downspouts by same manufacturer as roof gutter.

3. Size - 4x6 inches
4. Fabricate downspouts from the following material:
   a. Prepainted, Metallic-Coated Steel: 0.0217 inch (0.55 mm) thick.
   b. Match wall panels
   c. 26 gauge

## 2.4 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Solder: ASTM B 32, Grade Sn50, used with rosin flux.

B. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

C. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.

D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

E. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

F. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.

G. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

H. Paper Slip Sheet: 5-lb/square red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

I. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil-thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

J. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

K. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

## 2.5 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

E. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

G. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

H. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

I. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

## 2.6 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Scuppers: Fabricate from the following material:

1. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch thick.

C. Base Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch thick.

D. Counterflashing: Fabricate from the following material:

1. Galvanized Steel: 0.0217 inch thick.

E. Flashing Receivers: Fabricate from the following material:

1. Galvanized Steel: 0.0217 inch thick.

F. Drip Edges: Fabricate from the following material:

1. Galvanized Steel: 0.0217 inch thick.

G. Eave Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0217 inch thick.

H. Equipment Support Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch thick.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches, except where pretinned surface would show in finished Work.

1. Do not solder the following metals:

    a. Aluminum.

2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

E. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.

1. Use joint adhesive for nonmoving joints specified not to be soldered.

F. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

G. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

H. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches and bed with sealant.

I. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

## 3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07620

SECTION 07720 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Roof curbs.
2. Equipment supports.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for ladders and miscellaneous metal framing and supports.
2. Division 6 Section "Rough Carpentry" for roof sheathing, wood cants, and wood nailers.
3. Division 7 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, scuppers, gutters and downspouts, fasciae, roof expansion-joint covers, valleys, and miscellaneous sheet metal trim and accessories.
4. Division 7 Section "Plastic Unit Skylights" for small individual skylights.
5. Division 7 Sections for roofing accessories included as part of roofing Work.
6. Division 9 Section "Painting" for shop primers and field painting.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other Work.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for roof accessories with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples in manufacturer's standard sizes, and of same thickness and material indicated for the Work. If finishes involve normal color or shade variations, include sample sets showing the full range of variations expected.

1.4 QUALITY ASSURANCE

A. Standards: Comply with the following:

1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Roof Curbs and Equipment Supports:

a. AES Industries, Inc.
b. Colony Custom Curbs.
c. Commodity Products Company, Inc.
d. Conn-Fab Sales, Inc.
e. Curbs Plus, Inc.
f. Custom Curb, Inc.
g. Gieske Custom Metal Fabricators.
h. Goeller Enterprises.
i. LMCurbs.
j. Loren Cook Company.
k. Metallic Products Corporation.
l. Pate Co.(The).
m. Roof Products & Systems Corp.
n. ThyCurb, Inc.
o. Uni-Curb, Inc.
p. Vent Products Co., Inc.

2.2 MATERIALS, GENERAL

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M) for alclad alloy 3005H25 or alloy and temper required to suit forming operations, with mill finish, unless otherwise indicated.

B. Extruded Aluminum: ASTM B 221 (ASTM B 221M) alloy 6063-T52 or alloy and temper required to suit structural and finish requirements, with mill finish, unless otherwise indicated.

C. Galvanized Steel Sheet: ASTM A 653/A 653M with G90 (Z275) coating designation; commercial quality, unless otherwise indicated.

1. Structural Quality: Grade 40 (Grade 275), where indicated or as required for strength.

D. Insulation: Manufacturer's standard rigid or semirigid glass-fiber board of thickness indicated.

E. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

F. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

1. Where removing exterior exposed fasteners affords access to building, provide nonremovable fastener heads.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

H. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coating.

I. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

J. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25, and Uses NT, G, A, and, as applicable to joint substrates indicated, O.

K. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

## 2.3 ROOF CURBS

A. General: Provide roof curbs capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

B. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.0747-inch-(1.9-mm-) thick, structural-quality, hot-dip galvanized or aluminum-zinc alloy-coated steel sheet; factory primed and prepared for painting with welded or sealed mechanical corner joints.

## 2.4 EQUIPMENT SUPPORTS

A. General: Provide equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

B. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.0747-inch-(1.9-mm-) thick, structural-quality, hot-dip galvanized or aluminum-zinc alloy-coated steel sheet; factory primed and prepared for painting with welded or sealed mechanical corner joints.

## 2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.6 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

2.7 GALVANIZED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply the air-dried primer specified below immediately after cleaning and pretreating.

1. Shop Primer: Exterior galvanized metal primer per Division 9 Section "Painting."

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written instructions. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction involving roof accessories to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.

B. Install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated,

C. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.

D. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

E. Cap Flashing: Where required as component of accessory, install cap flashing to provide waterproof overlap with roofing or roof flashing (as counterflashing). Seal overlap with thick bead of mastic sealant.

F. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.2 CLEANING AND PROTECTION

A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION 07720

# SECTION 07920 - JOINT SEALANTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes joint sealants for the following applications:

1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
   a. Control and expansion joints in unit masonry.
   b. Joints in exterior plaster and finish systems.
   c. Joints between different materials listed above.
   d. Perimeter joints between materials listed above and frames of doors, windows and louvers.
   e. Control and expansion joints in ceilings.
   f. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:
   a. Isolation and contraction joints in cast-in-place concrete slabs.
   b. Joints between plant-precast architectural concrete paving units.
   c. Joints between different materials listed above.
   d. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Tile control and expansion joints.
   d. Vertical joints on exposed surfaces of interior unit masonry and concrete.
   e. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   g. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:

   a. Isolation joints in cast-in-place concrete slabs.
   b. Control and expansion joints in tile flooring.
   c. Other joints as indicated.

B. Related Sections include the following:

1. Division 2 Section "Pavement Joint Sealants" for sealing joints in pavements, walkways, and curbing.
2. Division 4 Section "Unit Masonry Assemblies" for masonry control and expansion joint fillers and gaskets.
3. Division 8 Section "Glazing" for glazing sealants.
4. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
5. Division 9 Section "Ceramic Tile" for sealing tile joints.
6. Division 9 Section "Acoustical Panel Ceilings" for sealing perimeters of acoustical ceilings.

## 1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

## 1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Warranties: Special warranties specified in this Section.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

## 1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.7 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

## 2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

C. Provide joint sealants that are low VOC (less than 250 g/L) and shall comply with California's South Coast Air Quality Management District (SCAQMD) #1168.

## 2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

B. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

## 2.4 LATEX JOINT SEALANTS

A. Latex Sealant Standard: Comply with ASTM C 834 for each product of this description indicated in the Latex Joint-Sealant Schedule at the end of Part 3.

## 2.5 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Type C: Closed-cell material with a surface skin.
2. Type O: Open-cell material.
3. Type B: Bicellular material with a surface skin.
4. Type: Any material indicated above.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

## 3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 ELASTOMERIC JOINT-SEALANT SCHEDULE

A. Low-Modulus Nonacid-Curing Silicone Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:

    a. 790; Dow Corning.
    b. Silpruf; GE Silicones.
    c. UltraPruf SCS2300; GE Silicones.
    d. HiFlex 331; NUCO Industries, Inc.
    e. NuFlex 309; NUCO Industries, Inc.
    f. VP 275; Ohio Sealants, Inc.
    g. 864; Pecora Corporation.
    h. 890; Pecora Corporation.
    i. PSI-641; Polymeric Systems, Inc.
    j. Omniseal; Sonneborn Building Products Div., ChemRex Inc.
    k. Spectrem 1; Tremco.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
5. Use Related to Exposure: NT (nontraffic).
6. Uses Related to Joint Substrates: A and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Clear anodic aluminum, galvanized steel, brick, and ceramic tile.

7. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
8. Applications: Joints in exterior insulation and finish systems, joints between metal panels, exterior perimeter joints between materials listed above and frames of doors and windows.

B. Medium-Modulus Neutral-Curing Silicone Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:

    a. 791; Dow Corning.
    b. 795; Dow Corning.
    c. HiFlex 393; NUCO Industries, Inc.
    d. PSI-631; Polymeric Systems, Inc.
    e. SM5731 Poly-Glaze; Schnee-Morehead, Inc.
    f. SM5733 Poly-Glaze; Schnee-Morehead, Inc.
    g. Spectrem 2; Tremco.
    h. Tremsil 600; Tremco.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).

5. Uses Related to Joint Substrates: A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Clear anodic aluminum, galvanized steel, brick, and ceramic tile.

6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
7. Applications: Non-structural glazing systems, joints between precast and cast-in-place concrete.

C. Acid-Curing Silicone Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:

    a. Chem-Calk 1200; Bostik Inc.
    b. 999-A; Dow Corning.
    c. Trademate Glazing; Dow Corning.
    d. Construction 1200; GE Silicones.
    e. Contractors SCS1000; GE Silicones.
    f. SCS1702F; GE Silicones.
    g. HiFlex 392; NUCO Industries, Inc.
    h. NuFlex 302; NUCO Industries, Inc.
    i. HM 270; Ohio Sealants, Inc.
    j. 860; Pecora Corporation.
    k. 863; Pecora Corporation.
    l. PSI-601; Polymeric Systems, Inc.
    m. OmniPlus; Sonneborn Building Products Div., ChemRex Inc.
    n. Proglaze; Tremco.
    o. Tremsil 300; Tremco.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Clear anodic aluminum, galvanized steel, brick, and ceramic tile.

6. Applications: Interior woodwork and gypsum drywall.

D. Mildew-Resistant Silicone Sealant: Where joint sealants of this type are indicated, provide products formulated with fungicide that are intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:

1. Products: Available products include the following:

    a. 786 Mildew Resistant; Dow Corning.
    b. Sanitary 1700; GE Silicones.
    c. NuFlex 302; NUCO Industries, Inc.
    d. 898 Silicone Sanitary Sealant; Pecora Corporation.
    e. PSI-611; Polymeric Systems, Inc.
    f. Tremsil 600 White; Tremco.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Ceramic tile.
    b. Applications: Expansion and control joints in ceramic wall tile, joints between plumbing fixtures and adjoining walls, floors, and counters.

E. Multicomponent Nonsag Urethane Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:

   a. Vulkem 227; Mameco International.
   b. Vulkem 922; Mameco International.
   c. NP 2; Sonneborn Building Products Div., ChemRex Inc.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

   a. Use O Joint Substrates: Clear anodic aluminum, galvanized steel, brick, and ceramic tile.

   b. Applications: Horizontal joints in interior concrete slabs.

F. Single-Component Nonsag Urethane Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:

   a. Vulkem 116; Mameco International.
   b. Vulkem 230; Mameco International.
   c. Sikaflex - 1a; Sika Corporation.
   d. NP 1; Sonneborn Building Products Div., ChemRex Inc.

2. Type and Grade: S (single component) and NS (nonsag).
3. Classes: 12-1/2 or 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

   a. Use O Joint Substrates: Clear anodic aluminum, galvanized steel, brick, and ceramic tile.

   b. Applications: Metal roof flashing.

## 3.7 LATEX JOINT-SEALANT SCHEDULE

A. Latex Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:

   a. Chem-Calk 600; Bostik Inc.
   b. NuFlex 330; NUCO Industries, Inc.
   c. LC 160 All Purpose Acrylic Caulk; Ohio Sealants, Inc.
   d. AC-20; Pecora Corporation.
   e. PSI-701; Polymeric Systems, Inc.
   f. Sonolac; Sonneborn Building Products Div., ChemRex, Inc.
   g. Tremflex 834; Tremco.

2. Applications: Perimeter joints between interior wall surfaces, trim, and frames of interior doors and windows.

END OF SECTION 07920

# SECTION 08111 - STANDARD STEEL DOORS AND FRAMES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Standard hollow-metal steel doors.
2. Standard hollow-metal steel frames.

B. Related Sections include the following:

1. Division 4 Section "Reinforced Unit Masonry" for building anchors into and grouting standard steel frames in masonry construction.
2. Division 8 Section "Glazing" for glazed lites in standard steel doors and frames.
3. Division 8 Sections for door hardware for standard steel doors.
4. Division 9 painting Sections for field painting standard steel doors and frames.

### 1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

### 1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of steel door and frame specified.

B. Shop Drawings: In addition to requirements below, provide a schedule of standard steel doors and frames using same reference numbers for details and openings as those on Drawings:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details.
3. Frame details for each frame type, including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Details of glazing frames and stops showing glazing.
8. Details of conduit and preparations for electrified door hardware and controls.

C. Coordination Drawings: Drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations of door hardware, and preparations for power, signal, and control systems.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 125 mm).

E. Qualification Data: For Installer.

F. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

D. Fire-Rated Door Sidelight and Transom Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.

1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.

E. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to UBC Standard 7-4. Label each individual glazed lite.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

## 1.7 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate installation of anchorages for standard steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. CURRIES Company; an ASSA ABLOY Group Company.
   2. Kewanee Corporation (The).
   3. Steelcraft; an Ingersoll-Rand Company.
   4. Tubelite

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

C. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

D. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching standard steel door frames of type indicated.

E. Grout: Comply with Division 4 Section "Reinforced Unit Masonry."

F. Glazing: Comply with requirements in Division 8 Section "Glazing."

2.3 STANDARD STEEL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.

   1. Design: As indicated on Drawings.
   2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.

      a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
      b. Exterior Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 deg F x h x sq. ft./Btu (0.704 K x sq. m/W) when tested according to ASTM C 1363.

   3. Vertical Edges for Single-Acting Doors: Square edge.

   4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch (54-mm) radius.

5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick end closures or channels of same material as face sheets.
6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush) and 2 (Seamless).
2. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 3 (Stile and Rail).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior door requirements. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush) and 2 (Seamless).
2. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 3 (Stile and Rail).

D. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch (3.0 mm) thick by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.
2. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch (1.7 mm) thick.
3. All Other Surface-Mounted Hardware: Minimum 0.067 inch (1.7 mm) thick.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

## 2.4 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped and welded face corners.
2. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
3. Frames for Level 3 Steel Doors: 0.053-inch- (1.3-mm-)

C. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.

1. Fabricate frames with mitered or coped and welded face corners.
2. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
3. Frames for Level 3 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
4. Frames for Wood Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
5. Frames for Borrowed Lights: 0.053-inch- (1.3-mm-) thick steel sheet.

D. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch (3.0 mm) thick by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.
2. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch (1.7 mm) thick.
3. All Other Surface-Mounted Hardware: Minimum 0.067 inch (1.7 mm) thick.

E. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

F. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

G. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

H. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

I. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch- (9.5-mm-thick by 50-mm-) wide steel.

J. Plaster Guards: Formed from same material as frames, not less than 0.016-inch (0.4-mm) thick.

## 2.5 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with standard steel frames, minimum 5/8 inch (16 mm) high, unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

## 2.6 FABRICATION

A. General: Fabricate standard steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Standard Steel Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.

C. Standard Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints; fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
4. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

1) Two anchors per jamb up to 60 inches (1524 mm) in height.
2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) in height.

b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

1) Three anchors per jamb up to 60 inches (1524 mm) in height.
2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) in height.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof more than 96 inches (2438 mm) in height.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."

1. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings such that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of doors and frames.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.7 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish standard steel door and frames after assembly.

B. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

C. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils (0.018 mm).

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel doors and frames.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory.

B. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

### 3.3 INSTALLATION

A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Standard Steel Frames: Install standard steel frames for doors, sidelights and transoms and other openings, of size and profile indicated. Comply with SDI 105.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. At fire-protection-rated openings, install frames according to NFPA 80.
b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable glazing stops located on secure side of opening.
d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.

f. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 4 Section "Unit Masonry Assemblies."
5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
6. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horiz. line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Standard Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

4. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with standard steel door and frame manufacturer's written instructions. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c., and not more than 2 inches (50 mm) o.c. from each corner.

## 3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off standard steel doors and frames immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

END OF SECTION 08111

# SECTION 08361 - SECTIONAL OVERHEAD DOORS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes: Electrically operated sectional doors, operators, controls and accessories.

B. Related Sections:

1. Division 5 Sections: Miscellaneous Metals for steel supports.
2. Division 16 Sections: Electrical connections and service for powered door operators.

### 1.2 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

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

1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

### 1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Wind Loads: Uniform pressure of: 20PSF

B. Spring Cycle Requirements: 100,000 cycles.

### 1.4 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit manufacturer’s product data and installation instructions.

C. Shop Drawings: Provide drawings indicating track details, head and jamb conditions, spring shafts, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.

D. Samples: Submit selection and verification samples of metal finishes.

E. Quality Assurance Submittals: Submit the following:

1. Certificates: Submit manufacturer’s certificate that products meet or exceed specified requirements.
2. Certificates: Submit installer qualifications.

F. Closeout Submittals: Submit the following:

1. Warranty documents specified herein.

### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity, and trained and authorized by the door dealer to perform the work of this section.

1.6 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Section.

B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.7 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: 3 year/20,000 cycles limited on door & operator system

1.8 MAINTENANCE

B. Maintenance Service: Submit for Owner's consideration and acceptance maintenance service agreement for products installed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturer: Overhead Door.

C. Manufacturer Product Designation: Rolling Steel Door Model 610

2.2 DOOR OPERATORS

A. Provide doors designed for electric motor operation.

B. Manufacturer Product Designation: 610 Series (configuration as shown on drawings):

1. Type: Continuous sheet rolling door.
2. Motor Horsepower Rating: Continuous 1/2 HP.
3. Electrical Requirements: 115 volt single phase.
4. Duty Cycle: 30 cycles/hour.
5. Control Wiring: 24 volt control with provisions for connection of safety edge to reverse and external radio control hook-up. Three button momentary contact "open-close-stop"

C. Safety and Control Equipment: Provide safety and Control equipment as listed below (and all associated electrical)

1. Electric Safety edge
2. Thru-Beam Photo Eyes
3. Three button surface mounted control station

4. Radio controls with 2 transmitters per door.

**Curtain**
18 ga. galvanized steel up to 30'4" (9246 mm) width
20 ga. galvanized steel
up to 25'4" (7722 mm) width
22 ga. galvanized steel
up to 18'4" (5588 mm) width
24 ga. galvanized steel
up to 15'4" (4674 mm) width

**Slat profile**
Flat, insulated, type F-265

**Finish**
As selected from full Overhead Door powder coat chart (Tiger Drylac PowderGuard finish - special colors in addition to standard grey, brown, white, black)

**Interior Hood**
24 ga. galvanized steel

**Wind load**
20 psf

**Mounting**
Inside face of wall

**Operation**
Electric operator plus chain hoist, see below

**Standard springs**
20,000 cycle

**Weatherseals**
Bottom bar astragal
Guides and hood baffle

**Guides**
Three structural steel angles PowderGuard™weathered finish with black powder coate

**Bottom bar**
Extruded aluminum with weatherseal
up to 15'4" (4674 mm)
Back-to-back steel angles with weatherseal
more than 15'4" (>4674 mm)

**Finish**
**Powder coated**

**Lock**
Interior slide bolt on push-up
Chain keeper on chain hoist

**Warranty**
3 year/20,000 cycles limited on door & operator system

2.5 COUNTERBALANCE SYSTEM

B. Provide heavy-duty manual chain to lift doors when electric system is not operational. Chain should come down to max. 3' above finished floor. This is in addition to the standard emergency disconnect/hand operated chain and sprocket (also required)

2.6 HARDWARE

C. Perimeter Seal: Furnish doors with perimeter seal.

D. Provide chain, end of chain within 3' of the floor, to open and close the door in case of a power failure.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions and recommendations of door manufacturer.

3.2 ACCEPTABLE INSTALLERS

A. Installation to be completed by An IDEA Accredited Company using IDEA Certified Technicians.

3.3 EXAMINATION

A. Site Verification of Conditions: Verify through direct observation and field measurement that site conditions are acceptable for installation of doors, operators, controls and accessories. Ensure that openings square, flush and plumb.

B. Do not proceed with installation of doors, operators, controls and accessories until unacceptable conditions are corrected.

3.4 INSTALLATION

A. General: Install door, track and operating equipment complete with all necessary accessories and hardware according to shop drawings, manufacturer's instructions.

C. Related Products Installation: Refer to Related Sections paragraph for related products installation.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: At Owner's request, provide manufacturer's field service consisting of product installation and use recommendations, and periodic site visits to observe and ensure product installation is done in accordance with manufacturer's recommendations.

3.6 ADJUSTING

A. General: Lubricate bearings and sliding parts, assure weathertight fit around door perimeter and adjust doors for proper operation, balance, clearance and similar requirements.

3.7 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.

B. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from project site.

END OF SECTION 08361

# SECTION 08510 - STEEL WINDOWS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Standard intermediate steel windows from hot-rolled sections.
2. Cold-formed, welded steel windows.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for sealing perimeter joints between windows and adjacent materials.
2. Division 8 Section "Glazing" for glazing requirements for steel windows, including those specified to be factory glazed.
3. Division 9 Section "Painting" for field painting of factory prime-coated windows.

### 1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide steel windows capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated:

1. Wind Loads: Determine loads based on the following minimum uniform design wind pressures as determined from [testing windows representative of those indicated for Project according to ASTM E 330] [or] [structural calculations]:

a. Uniform pressure of 30 lbf/sq. ft. (1436 Pa) acting inward or outward.
b. Uniform pressure as indicated on Drawings.
c. Provide window framing that limits lateral deflection of glass edges to 1/175 of glass-edge length at uniform design pressures.

B. Air Infiltration for Weather-Stripped Ventilators: Not more than 0.37 cfm/ft. (0.18 L/s per m) of ventilator crack length at an inward test pressure of [6.24 lbf/sq. ft. (298 Pa) when tested according to ASTM E 283.

C. Water Penetration: No leakage for 15 minutes when window is subjected to a rate of flow of 5 gal./h per sq. ft. (0.005 L/s) with a differential pressure across the window when tested according to ASTM E 331.

D. Crack Tolerances: Test each type and size of required window unit, with ventilators closed and locked, for compliance with the following tolerances:

1. Casement Windows: It shall not be possible to freely insert a steel feeler gage 2 inches (51 mm) wide by 0.020 inch (0.5 mm) thick between more than 40 percent of the inside metal-to-metal contacts between frames and ventilators without forcing.

## 1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for steel windows.

B. Shop Drawings: Include plans, elevations, sections, details, attachments to other work, and the following:

1. Layout and installation details, including anchors.
2. Elevations of continuous work at 1/4 inch = 1 foot (1:50) scale and typical window unit elevations at 3/4 inch = 1 foot (1:20) scale.
3. Full-size section details of typical composite members, including reinforcement.
4. Hardware, including operators.
5. Accessories.
6. Glazing details.
7. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of steel window required, prepared on Samples of size indicated below.
1. Architect reserves the right to require additional Samples that show fabrication techniques, workmanship, and design of hardware and accessories.

D. Field quality-control test reports.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for steel window manufacturer's standard products to determine compliance with performance requirements.

F. Maintenance Data: For operable window sash and finishes to include in maintenance manuals.

G. Warranties: Special warranty specified in this Section.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to steel window manufacturer for installation of units required for this Project.

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

C. SWI Publication: Comply with applicable requirements in SWI's "The Specifier's Guide to Steel Windows" except where more stringent requirements are indicated.

D. Fire-Test-Response Characteristics: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to the test method indicated.

1. Positive-Pressure Test: [ASTM E 2010] [NFPA 257, conducted so that within the first 10 minutes of test, furnace pressure is adjusted to place at least two-thirds of the test specimen above the neutral-pressure plane and to maintain this plane for the balance of test].
2. Neutral-Pressure Test: UL 9.
3. Fire-Protection Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
4. Provide steel windows labeled with appropriate markings of applicable testing and inspecting agency.

## 1.6 PROJECT CONDITIONS

A. Field Measurements: Verify steel window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating steel windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

## 1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of steel windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Failure to meet performance requirements.
   b. Structural failures including excessive deflection.
   c. Water leakage or air infiltration.
   d. Faulty operation of operable sash and hardware.
   e. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   f. Insulating-glass failure.

2. Warranty Period: One year from date of Substantial Completion.
3. Warranty Period for Metal Finishes: Five years from date of Substantial Completion.
4. Warranty Period for Glass: Five years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hot-Rolled Steel Windows:

   a. A & S Window Associates, Inc.
   b. William Bayley Company (The).
   c. Bliss-Nor Am Windows & Doors.

d. Crittall Windows North America; Fox Steel Co. (The).
e. Hope's Windows, Inc.
f. Torrance Steel Window Co., Inc.

2. Cold-Formed Steel Windows:

a. DV Fyre-Tec, Inc.
b. Optimum Window Manufacturing Corp.

## 2.2 MATERIALS

A. Hot-Rolled Steel Window Members: Provide frame and ventilator members formed from hot-rolled, new billet steel sections. For combined weight of frame and ventilator members and front-to-back depth of frame or ventilator members, comply with the following requirements:

1. Light Intermediate Windows: Not less than 2.0 lb/ft. (2.98 kg/m) in combined weight, and not less than 1 inch (25.4 mm) deep.
2. Standard Intermediate Windows: Not less than 3.0 lb/ft. (4.46 kg/m) in combined weight, and not less than 1-1/4 inches (32 mm) deep.
3. Heavy Intermediate Windows: Not less than 3.5 lb/ft. (5.21 kg/m) in combined weight, and not less than 1-5/16 inches (33.34 mm) deep.
4. Heavy Custom Windows: Not less than 4.2 lb/ft. (6.25 kg/m) in combined weight, and not less than 1-1/2 inches (38.1 mm) deep.

a. Dimensions of Projected Frame and Ventilator Members: Nominally 1/8 inch (3 mm) thick by 1-3/8 inches (35 mm) deep, except members nominally 1-1/4 inches (32 mm) deep may be used provided corners are welded and ground.
b. Applied Weather Stripping: Where indicated, shall be [0.074-inch (1.9-mm)] [0.060-inch (1.5-mm)] minimum thickness.

B. Cold-Formed Steel Window Members: Provide frame and ventilator members mechanically formed from metallic-coated, low-carbon, cold-rolled steel sheet complying with ASTM A 653. For combined weight of frame and ventilator members and front-to-back depth of frame or ventilator members, comply with the following requirements:

1. Commercial and Industrial Windows: Not less than 2.75 lb/ft. (4.09 kg/m) in combined weight, and not less than 1-1/4 inches (32 mm) deep.

C. Trim members, screen frames, retainers for weather stripping, flashing, and similar items shall be manufacturer's standard.

D. Glazing beads shall manufacturer's standard.

E. Fasteners: Provide fasteners of bronze, brass, stainless steel, or other metal, that are warranted by manufacturer to be noncorrosive and compatible with trim, hardware, anchors, and other components of steel windows.

1. Exposed Fasteners: If exposed fasteners are used, provide Phillips flat-head machined screws that match finish of member or hardware being fastened, as appropriate.

F. Anchors, Clips, and Window Accessories: Provide units of stainless steel, hot-dip zinc-coated steel, bronze, brass, or iron complying with ASTM A 123. Provide units with sufficient strength to withstand design pressure indicated.

G. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and to be completely concealed when steel window is closed.

1. Weather-Stripping Material: Elastomeric cellular preformed gaskets complying with ASTM C 509.
2. Weather-Stripping Material: Dense elastomeric gaskets complying with ASTM C 864.
3. Weather-Stripping Material: Manufacturer's standard material.

H. Sealant: For sealants required within fabricated windows, provide manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

## 2.3 GLAZING

A. Glass and Glazing Materials: Refer to Division 8 Section "Glazing" for glass units and glazing requirements for steel windows.

## 2.4 HARDWARE

A. General: Provide manufacturer's standard hardware, with operating components of stainless steel, carbon steel complying with AAMA 907, brass, bronze, or other corrosion-resistant material designed to operate smoothly, to close tightly, and to lock steel window ventilators securely. Provide hardware of sufficient strength to accommodate size and weight of ventilator for which it is intended.

B. Hinges: Four-bar friction hinges complying with AAMA 904.1.

C. Friction Shoes: Adjustable friction shoes of bronze, brass, nylon, or other nonabrasive, nonstaining, noncorrosive, durable material.

D. Pivots: Drop-forged steel pivot leaves with brass pins.

E. Limit Device: Concealed support arms with adjustable, limited hold-open device designed to restrict ventilator opening.

F. Gear-Type Rotary Operators: Comply with ASTM E 405, Method A.

1. Operator shall operate all ventilators simultaneously, securely closing them at both jambs without use of additional manually controlled locking devices.

G. Casement Windows: Provide the following operating hardware:

1. Operating Device: Gear-type rotary operator located on the jamb at the sill.
2. Hinges: Concealed, four-bar friction hinges with adjustable slide shoes (two per ventilator).

    a. Provide ventilator operation that provides access for cleaning.

3. Lock: Lift-type, cam-action lock.
4. Limit Device: Stay bar with an adjustable hold-open device.

## 2.5 INSECT SCREENS

A. Insect Screens: Provide insect screens for each operable exterior ventilator. Locate screens on the inside or the outside of the ventilator, depending on window type. Design windows and hardware to accommodate screens in a tight-fitting removable arrangement with a minimum of exposed fasteners and latches.

## 2.6 ACCESSORIES

A. General: Provide manufacturer's standard accessories that comply with indicated standards.

## 2.7 FABRICATION

A. General: Fabricate steel windows of type and in sizes indicated to comply with SWI standards. Include a complete system for assembly of components and anchorage of window units.

1. Provide units that are reglazable without dismantling ventilator framing.

B. Window Types: Provide the following types of steel windows:

1. Fixed windows.
2. Casement windows.

C. Provide weep holes and internal water passages to conduct infiltrating water to the exterior.

D. Provide mullions and cover plates formed of [hot-rolled] [cold-formed] steel matching window units, with anchors for support to structure and for installation of window units. Provide mullions of profile indicated. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections.

E. Glazing Beads: Provide snap-o] glazing beads; coordinate with glass selection and glazing system as indicated. Finish glazing beads to match window units if fabricated of steel; otherwise, provide manufacturer's standard finish.

F. Glazing Clips: Where face glazing (without glazing beads) is indicated, furnish glazing clips for concealment in glazing compound.

## 2.8 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Surface Preparation: Clean surfaces of dirt, oil, grease, scale, and other contaminants; follow with a pretreatment applied according to window manufacturer's written recommendations.

C. Shop Prime Coat Finish: After fabrication, provide manufacturer's standard epoxy prime coat of [1.0-mil (0.03-mm)] dry film thickness, and oven dry for 30 minutes at 300 deg F (150 deg C).

D. Baked-Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard 2-coat baked-enamel finish consisting of prime coat and thermosetting topcoat, with not less than 1.0-mil (0.03-mm) dry film thickness for topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils (0.05 mm).

1. Color and Gloss: Match Architect's sample.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances, rough opening dimensions, levelness of sill plate, coordination with wall flashings and vapor retarders, and other conditions affecting performance of work.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, operators, accessories, and other components.

B. Install windows level, plumb, and true to line, without distortion. Anchor securely to surrounding construction with approved fasteners.

1. Separate corrodible surfaces subject to electrolytic action at points of contact with other materials.

C. Set sill members in a bed of sealant or with gaskets, as indicated, for weathertight construction.

1. Seal exterior joints between window frame and opening substrate with sealant.

D. Repair abraded areas of factory-applied finishes.

### 3.3 FIELD QUALITY CONTROL

A. Remove and replace steel windows where test results indicate that they do not comply with specified requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.4 ADJUSTING

A. Adjust operating sashes and ventilators, screens, hardware, operators, and accessories for a tight fit at contact points and weather stripping, for smooth operation and a weathertight closure. Lubricate hardware and moving parts.

## 3.5 CLEANING AND PROTECTION

A. Clean factory-finished steel surfaces immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

B. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. Remove contaminants immediately according to manufacturer's written recommendations.

## 3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain steel windows. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 08510

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Commercial door hardware for the following:

a. Swinging doors.

B. Related Sections include the following:

1. Division 8 Section "Steel Doors and Frames" and “Aluminum Framed Entrances and Storefronts” for accessories provided as part of the frame.

1.3 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of door hardware indicated.

C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.

h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

D. Keying Schedule: Prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

E. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.

1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current products comply with requirements.

G. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.

H. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1. **Key cores and keying to be supplied and installed by Territorial Safe and Lock, Santa Fe as part of the Contractor's contract (paid for by the contractor). The Contractor shall schedule, coordinate and pay for Territorial/cores/keying**.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Electrified Door Hardware Supplier Qualifications: An experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.

a. Engineering Responsibility: Prepare data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.

D. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1.

    a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
    b. Door Closers: Comply with the following maximum opening-force requirements indicated:

        1) Interior Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
        2) Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
        3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

    c. Thresholds: Not more than 1/2 inch (13 mm) high. Bevel raised thresholds with a slope of not more than 1:2.

2. NFPA 101: Comply with the following for means of egress doors:

    a. Latches, Locks, and Exit Devices: Not more than 15 lbf (67 N) to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
    b. Door Closers: Not more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
    c. Thresholds: Not more than 1/2 inch (13 mm) high.

E. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test at atmospheric pressure.

F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.
5. Key all doors to County master key system

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

1. Deliver permanent keys and cores to owner via registered mail direct from manufacturer.

## 1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

C. Warranty Period for Manual Closers: 10 years from date of Substantial Completion.

D. Warranty Period for Exit Devices: 5 years from date of Substantial Completion.

E. Warranty for Cylindrical Locksets: 7 years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section, the door schedule and the Door Hardware Schedule at the end of Part 3.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

2. BHMA Standards.

2.2 HINGES AND PIVOTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hinges:
   a. McKinney Products Company
   b. Bommer

C. Standards: Comply with the following:

1. Butts and Hinges: BHMA A156.1.
2. Template Hinge Dimensions: BHMA A156.7.

D. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches (1524 mm).
2. Three Hinges: For doors with heights 61 to 90 inches (1549 to 2286 mm).
3. Four Hinges: For doors with heights 91 to 120 inches (2311 to 3048 mm).

E. Size: 4 ½" x 4 ½" for doors up to 36". 5" x 4 1/2" for doors over 36".

F. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

G. Available Product: McKinney T4A3786, TA2714

H. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

## 2.3 LOCKS AND LATCHES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mechanical Locks and Latches:
   a. Sargent Manufacturing (SA)
   b. Schlage

C. Standards: Comply with the following:

1. Bored Locks and Latches: BHMA A156.2.
2. Push-Button Combination Locks: BHMA A156.2.
3. Electromagnetic Locks: BHMA A156.23.

D. Availalble products and finishes: See Door Hardware Schedule, 3.8.

1. Finish: Brushed chrome 26D (626)

E. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:

1. Bored Locks: BHMA A156.2.

F. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:

1. Bored Locks: Minimum 1/2-inch (12.7-mm) latchbolt throw.
2. Deadbolts: Minimum 1-inch (25-mm) bolt throw.

G. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.

## 2.4 EXIT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Sargent Manufacturing (SA)
2. DORMA

B. Standard: BHMA A156.3.

C. Certified Products: Provide exit devices listed in BHMA's "Directory of Certified Exit Devices."

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

E. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

## 2.5 CYLINDERS AND KEYING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cylinders and Cores:
   a. Provide Sargent Levers compatible with Schlage key system or provide Schlage levers
   b. Provide patent protected system against unauthorized duplication. Cylinders shall be constructed with unique signature pattern controlled geographically. A letter of authorization from Owner to Manufacturer shall be required within system to obtain cylinders, cores and keys.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Sargent Manufacturing (SA)

C. Standards: Comply with the following:

1. Cylinders: BHMA A156.5.

2. Lockset - to accept Schlage core, fixed type (not figure eight reconfigurable) - 6 pin

D. Construction Keying: Comply with the following:

1. Construction Master Keys Provide 10 construction master keys.
2. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction cores.

   a. Replace construction cores with permanent cores, as directed by Owner.

b. Furnish permanent cores to Owner for installation.

E. Keying System: Unless otherwise indicated, provide a factory-registered keying system complying with the following requirements:
1. Master Key System: Provide Schlage Key System.

F. Keys: Provide nickel-silver keys complying with the following:

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

a. Notation: "DO NOT DUPLICATE."

2. Quantity: In addition to one extra blank key for each lock, provide the following:

a. Cylinder Change Keys: Two change keys per lock.
b. Master Keys: Five.

## 2.6 STRIKES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Trimco

B. Standards: Comply with the following:

1. Strikes for Bored Locks and Latches: BHMA A156.2.
2. Strikes for Auxiliary Deadlocks: BHMA A156.5.
3. Dustproof Strikes: BHMA A156.16.

C. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated.

D. Dustproof Strikes: BHMA Grade 1.

## 2.7 OPERATING TRIM

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Trimco

B. Standard: Comply with BHMA A156.6.

C. Finish: Stainless steel, unless otherwise indicated.

D. Push-Pull Design: As illustrated on Drawings.

## 2.8 ACCESSORIES FOR PAIRS OF DOORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2.9 CLOSERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Surface-Mounted Closers:
   a. Sargent Manufacturing (SA)
   b. Norton Door Controls; Div. of Yale Security Inc. (NDC).
   c. DORMA

B. Standards: Comply with the following:

1. Closers: BHMA A156.4.

C. Surface Closers: BHMA [Grade 1]

D. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."

E. Power-Assist Closers: As specified in this section for the disabled or where listed in the Door Hardware Schedule. Provide electrohydraulic, electromechanical, and pneumatic types as indicated.

F. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.10 STOPS AND HOLDERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Sargent Manufacturing Company
2. Rixson

B. Standards: Comply with the following:

1. Stops and Bumpers: BHMA A156.16.
2. Electromagnetic Door Holders: BHMA A156.15.
3. Combination Overhead Holders and Stops: BHMA A156.8.
4. Door Silencers: BHMA A156.16.

C. Stops and Bumpers: BHMA [Grade 1]

D. Floor Stops: Do not mount floor stops where they will impede traffic.

E. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame.

2.11 DOOR GASKETING (WEATHERSTRIPPING)

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Door Gasketing:
   a. Pemko (PE)
   b. McKinney (MK)
   c. National Guard Products, Inc. (NGP).

2. Door Bottoms:
   a. Pemko (PE)
   b. McKinney (MK)
   c. National Guard Products, Inc. (NGP).

B. Standard: Comply with BHMA A156.22.

C. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

D. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.

E. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.

1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.

F. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL 10B or NFPA 252.

G. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

H. Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702.

## 2.12 THRESHOLDS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pemko (PE)
   b. McKinney (MK)
2. National Guard Products, Inc. (NGP).

B. Standard: Comply with BHMA A156.21.

## 2.13 KICKPLATES

A. Available manufacturer: Trimco., McKinney

B. Height: 10” high

## 2.14 KEYPAD LOCKS

1. Availalbe manufacturer: Simplex.

2.15 FABRICATION

A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Steel Machine or Wood Screws: For the following fire-rated applications:

    a. Mortise hinges to doors.
    b. Strike plates to frames.
    c. Closers to doors and frames.

3. Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:

    a. Surface hinges to doors.
    b. Closers to doors and frames.
    c. Surface-mounted exit devices.

4. Spacers or Sex Bolts: For through bolting of hollow metal doors.
5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.16 FINISHES

A. Standard: Comply with BHMA A156.18.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. BHMA Designations: Comply with base material and finish requirements indicated by the following:
1. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
2. BHMA 630: Satin stainless steel, over stainless-steel base metal.
3. BHMA 652: Satin chromium plated over nickel, over steel base metal.
4. BHMA 718: Satin aluminum, uncoated; aluminum base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

B. Wood Doors: Comply with DHI A115-W series.

C. Aluminum Doors and Frames: Comply with DHI standards.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

## 3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

## 3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:

1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

## 3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

## 3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

## 3.8 MASTER/SUBMASTER/INDIVIDUAL SCHEDULE

A. Master keying: a master key for all doors

B. Submaster 1: per Owner instructions

C. Submaster 2: per Owner instructions

D. Individual keying: per Owner instructions

3.9 DOOR HARDWARE SCHEDULE

**Hardware Set 1 (Exterior – Single, with Keypad Lock, HM Frame - HM Doors 104, 106, 108**

Each to Receive:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | Hinge | BB5004 450N | 652 | BOMMER |
| 1 | EA | Key Pad | 5010-R-WL-26D-41 | US26D | KABA |
| 1 | EA | Exit Device | 9300 series less outside trim | US32D | DORMA |
| 1 | EA | Closer | 8916 x AF89J | ALUM | DORMA |
| 1 | EA | Floor Stop | 1209 | Black | TRIMCO |
| 1 | EA | Threshold | 270 | ALUM | PEMKO |
| 1 | EA | Door Bottom | By Door Supplier | | |
| 1 | EA | Weatherseal | By Door Supplier | | |

**Hardware Set 2 (Exterior – Single, with Keypad Lock (no panic hardware, HM frame) – HM Doors 112**

Each to Receive:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | Hinge | BB5004 450N | 652 | BOMMER |
| 1 | EA | Key Pad | 5010-R-WL-26D-41 | US26D | KABA |
| 1 | EA | Inside Trim | to match keypad | | |
| 1 | EA | Closer | 8916 x AF89J | ALUM | DORMA |
| 1 | EA | Floor Stop | 1209 | Black | TRIMCO |
| 1 | EA | Threshold | 270 | ALUM | PEMKO |
| 1 | EA | Door Bottom | By Door Supplier | | |
| 1 | EA | Weatherseal | By Door Supplier | | |

**Hardware Set 3 (Apparatus Bay Doors – see Spec. Section 08361) – Door 100, 101, 102, 103, 105, 107, 109, 110, 111**

**Hardware Set 4 (Interior – Single, latch only, no lock HM Frame) – HM Door 113, 114**

Each to Receive:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | Hinge | BB5004 450N | 652 | BOMMER |
| 1 | EA | Latchset | CL810 LRC | 26D | DORMA |
| 1 | EA | Mop Plate | MP0050 4" x 1" LDW | US32D | TRIMCO |
| 1 | EA | Kickplate | K0050 10" x 2" LDW | US32D | TRIMCO |
| 1 | EA | Wall Stop | 1270CV | 630 | TRIMCO |
| 3 | EA | Silencer | 1229A | Gray | TRIMCO |

**Hardware Set 5 (Interior – Single, Mechanical/Storage Door – latch only, no lock, HM frame) – HM Doors 116, 119, 120**

Each to Receive:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | Hinge | BB5000 450N | 652 | BOMMER |
| 1 | EA | Latchset | CL810 LRC | 26D | DORMA |
| 1 | EA | Mop Plate | MP0050 4" x 1" LDW | US32D | TRIMCO |
| 1 | EA | Kickplate | K0050 10" x 2" LDW | US32D | TRIMCO |
| 1 | EA | O.H. Stop | 902S (Door 1118, 120, 129) | 652 | DORMA |

| | | | | | |
|---|---|---|---|---|---|
| 1 | EA | Stop | 1270CV (Door 119) | 630 | TRIMCO |
| 3 | EA | Silencer | 1229A | Gray | TRIMCO |

**Hardware Set 6 (Interior Restroom – Single Occupancy, Thumbturn inside, lock outside, HM frame) – HM Door 117, 118**

Each to Receive:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | Hinge | BB5004 450N | 652 | BOMMER |
| 1 | EA | Privacy | CL840 LRC | 26D | DORMA |
| 1 | EA | Kickplate | K0050 10" x 2" LDW | US32D | TRIMCO |
| 1 | EA | Mop Plate | MP0050 4" x 1" LDW | US32D | TRIMCO |
| 1 | EA | Stop | 1270CV | 626 | TRIMCO |
| 1 | EA | Gasket | 5050 | Gray | NGP |

**Hardware Set 7 (Interior – Single, in 1 hour wall, Latch only, Rated HM frame, passage set ) – HM Door 115,121**

Each to Receive:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | Hinge | BB5004 450N | 652 | BOMMER |
| 1 | EA | Latchset | CL810 LRC | 26D | DORMA |
| 1 | EA | Closer | 8916 x AF89P | ALUM | DORMA |
| 1 | EA | Kickplate | K0050 10" x 2" LDW | US32D | TRIMCO |
| 1 | EA | Mop Plate | MP0050 4" x 1" LDW | US32D | TRIMCO |
| 1 | EA | Floor Stop | 1209 | Black | TRIMCO |
| 1 | SET | Gasket | S773D | DK BRZ | PEMKO |

END OF SECTION 08710

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness

designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
   a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

   b. Specified Design Snow Loads: Not less than snow loads applicable to Project as required by ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 7.0, "Snow Loads."
   c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

      1) Load Duration: 60 seconds or less.

   d. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.

      1) For monolithic-glass lites heat treated to resist wind loads.
      2) For insulating glass.
      3) For laminated-glass lites.

   e. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
   f. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
   2. For laminated-glass lites, properties are based on products of construction indicated.
   3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
   4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:

      a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
      b. Solar Heat Gain Coefficient: NFRC 200.
      c. Solar Optical Properties: NFRC 300.

## 1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass.

1. Each color and type of glass.

C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

D. Qualification Data: For installers.

E. Product Test Reports: For each of the following types of glazing products:
1. Coated float glass.
2. Insulating glass.
3. Glazing sealants.
4. Glazing gaskets.

F. Warranties: Special warranties specified in this Section.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, coated float glass, laminated glass and insulating glass.

C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

E. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
2. Glass Testing Agency Qualifications: An independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

F. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

G. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

H. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

I. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. (0.84 sq. m) in area, provide glazing products that comply with Category II materials, and for lites 9 sq. ft. (0.84 sq. m) or less in area, provide glazing products that comply with Category I or II materials.

J. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

K. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
1. Associated Laboratories, Inc.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

## 1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

## 1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in

"Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

### 2.2 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
3. For uncoated glass, comply with requirements for Condition A.
4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

C. Wired Glass: ASTM C 1036, Type II (patterned and wired flat glass), Class 1 (clear), Quality-Q-6; and of form and mesh pattern specified.

D. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:

1. Interlayer: Polyvinyl butyral or cured resin of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.
b. For cured-resin interlayers, laminate lites with laminated-glass manufacturer's standard cast-in-place and cured-transparent-resin interlayer.

2. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

## 2.3 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

## 2.4 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

## 2.5 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
1. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

## 2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

## 3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm) as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

## 3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

## 3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

## 3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

## 3.7 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

## 3.8 MONOLITHIC FLOAT-GLASS SCHEDULE

A. Uncoated Clear Float Glass FG-1: Where glass as designated below is indicated, provide glass lites complying with the following:

1. Class: Class 1 (clear) float glass.
2. Nominal Performance Characteristics are as indicated below:
   a. Visible Light Transmittance: 89%
   b. Shading Coefficient: 0.95
   c. Outdoor Visible Reflectance: 8%
3. Tempered where required.

## 3.9 WIRED GLASS SCHEDULE

A. Wired Glass WG-1: Where glass as designated below is indicated, provide glass lites complying with the following:

1. Class: Class 1 (clear), Form 1 (wired, polished both sides.)
2. Kind: Type II glass.
3. Mesh: $m^2$ (square.)

## 3.10 INSULATING-GLASS SCHEDULE

A. Insulating Glass IG-1: Where glass of this designation is indicated, provide uncoated insulating-glass units complying with the following:

1. Products: Available products include the following:

2. Class: Class 1 clear float class

3. Overall Unit Thickness and Thickness of Each Lite: Minimum 6 mm – thickness based on size of glazing.
4. Indoor Lite: Class 1 (clear) float glass. Tempered where required.
   a. Kind HS (heat strengthened).

5. Coated Outdoor Lite: Condition C (other coated glass) float glass, Low-E coating, Tempered where required.
   a. Visible Light Transmittance: 89%
   b. Shading Coefficient: 0.95
   c. Outdoor Visible Reflectance: 8%
6. SHGC - .28
7. Tempered where required.

## 3.11 GLAZING SEALANT SCHEDULE

A. All glazing sealants must be below 100 gram/liter VOC content.

B. Low-Modulus Nonacid-Curing Silicone Glazing Sealant: Where glazing sealants of this designation are indicated, provide products complying with the following:

1. Products: Available products include the following:
   a. 790; Dow Corning.
   b. Silpruf; GE Silicones.
   c. UltraPruf SCS2300; GE Silicones.
   d. HiFlex 331; NUCO Industries, Inc.
   e. NuFlex 309; NUCO Industries, Inc.
   f. VP 275; Ohio Sealants, Inc.
   g. 864; Pecora Corporation.
   h. PSI-641; Polymeric Systems, Inc.
   i. Omniseal; Sonneborn, Div of ChemRex, Inc.
   j. Spectrem 1; Tremco.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Additional Movement Capability: 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.
5. Use Related to Exposure: NT (nontraffic).
6. Uses Related to Glazing Substrates: A, and, as applicable to glazing substrates indicated, O.
   a. Use O Glazing Substrates: Coated glass and clear anodic aluminum.

C. Medium-Modulus Neutral-Curing Silicone Glazing Sealant: Where glazing sealants of this designation are indicated, provide products complying with the following:

1. Products: Available products include the following:
   a. 791; Dow Corning.
   b. 795; Dow Corning.
   c. HiFlex 393; NUCO Industries, Inc.
   d. PSI-631; Polymeric Systems, Inc.
   e. SM5731 Poly-Glaze; Schnee-Morehead, Inc.
   f. SM5733 Poly-Glaze; Schnee-Morehead, Inc.
   g. Spectrem 2; Tremco.
   h. Tremsil 600; Tremco.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Glazing Substrates: A, and, as applicable to glazing substrates indicated, O.
   a. Use O Glazing Substrates: Coated glass and clear anodic aluminum.

D. Medium-Modulus Neutral-Curing Silicone Glazing Sealant: Where glazing sealants of this designation are indicated, provide products complying with the following:

1. Products: Available products include the following:
   a. 756 H.P.; Dow Corning.
   b. Silglaze II; GE Silicones.
   c. 895; Pecora Corporation.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
5. Use Related to Exposure: NT (nontraffic)
6. Uses Related to Glazing Substrates: A, and, as applicable to glazing substrates indicated, O.
   a. Use O Glazing Substrates: Coated glass and clear anodic aluminum.

END OF SECTION 08800

# SECTION 09260 - GYPSUM BOARD ASSEMBLIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum wallboard.
2. Tile backing panels.
3. Non-load-bearing steel framing.
4. Exterior gypsum sheathing for walls and soffits.

B. Related Sections include the following:

1. Division 5 Section "Structural Steel" for load-bearing steel framing.
2. Division 6 Section "Rough Carpentry" for wood furring.
3. Division 7 Section "Building Insulation" for insulation installed in gypsum board assemblies.
4. Division 9 Section "Gypsum Sheathing" for installations over steel framing.
5. Division 9 Section “Acoustical Panel Ceilings” for vinyl faced gypsum panels used in a ceiling grid.

### 1.3 DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For the following products:
1. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

### 1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."

B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

C. Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 4 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and qualities of materials and execution for surfaces with texture finishes.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Framing and Furring:

    a. Clark Steel Framing Systems.
    b. Consolidated Systems, Inc.
    c. Dale Industries, Inc. - Dale/Incor.
    d. Dietrich Industries, Inc.
    e. MarinoWare; Division of Ware Ind.
    f. National Gypsum Company.
    g. Scafco Corporation.
    h. Unimast, Inc.
    i. Western Metal Lath & Steel Framing Systems.

2. Gypsum Board and Related Products:

    a. American Gypsum Co.
    b. United States Gypsum Co.

## 2.2 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Components, General: Comply with ASTM C 754 for conditions indicated.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

C. Hanger Attachments to Concrete: As follows:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.

   a. Type: Cast-in-place anchor, designed for attachment to concrete forms or Postinstalled, chemical anchor or Postinstalled, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.

D. Hangers: As follows:

1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.
2. Rod Hangers: ASTM A 510 (ASTM A 510M), mild carbon steel.
   a. Protective Coating: [ASTM A 153/A 153M, hot-dip galvanized] [Corrosion-resistant paint].

3. Flat Hangers: Commercial-steel sheet, ASTM A 366/A 366M, with corrosion-resistant paint finish.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch (1.37 mm), a minimum 1/2-inch- (12.7-mm-) wide flange, with manufacturer's standard corrosion-resistant zinc coating and ASTM A653 hot-dip galvanized coating for framing for exterior soffits.

F. Furring Channels (Furring Members): Commercial-steel sheet with manufacturer's standard corrosion-resistant zinc coating and ASTM A653 hot-dip galvanized coating for framing for exterior soffits and ceiling suspension me bers in areas within 10 feet of exterior walls.

1. Cold Rolled Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange, 3/4 inch (19.1 mm) deep.
2. Steel Studs: ASTM C 645 26 gage unless otherwise indicated.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep, 16 gage.

G. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

   a. Armstrong World Industries, Inc.; Furring Systems/Drywall.

## 2.3 STEEL PARTITION AND SOFFIT FRAMING

A. Components, General: As follows:

1. Comply with ASTM C 754 for conditions indicated.
2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized for raming members atached to and within 10 feet of exterior walls, manufacturer's standard corrosion-resistant zinc coating elsewhere.

B. Steel Studs and Runners: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm) and .0329 for head runner, sill runner, jamb and cripple studs at door and other openings and in locations to receiv cementious backer units.

2. Depth: As indicated.

C. Deflection Track: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).

E. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange.

1. Depth: 1-1/2 inches (38.1 mm).
2. Clip Angle: 1-1/2 by 1-1/2 inch (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
2. Depth: 1-1/2 inches (38.1 mm).

G. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

## 2.4 EXTERIOR GYPSUM SHEATHING FOR CEILINGS AND SOFFITS

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Exterior Gypsum Soffit Board: ASTM C 931/C 931M, with manufacturer's standard edges.

1. Core: 5/8 inch (15.9 mm), Type X.

C. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M.

1. Available Product: Subject to compliance with requirements, a product that may be incorporated into the Work includes, but is not limited to, "Dens-Glass Gold" by G-P Gypsum Corp.
2. Core: 5/8 inch (15.9 mm), Type X.

## 2.5 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

1. Regular Type:

a. Thickness: 5/8 inch (15.9 mm)].
b. Long Edges: Tapered.
c. Location: As indicated.

2. Type X:

a. Thickness: 5/8 inch (15.9 mm).
b. Long Edges: Tapered.
c. Location: As indicated

C. Proprietary Abuse-Resistant Gypsum Wallboard: ASTM C 36, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. United States Gypsum Co.; SHEETROCK Brand Abuse-Resistant Gypsum Panels.

2. Core: As indicated.
3. Long Edges: Tapered.
4. Location: As indicated.

## 2.6 TILE BACKING PANELS

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Cementitious Backer Units: ANSI A118.9.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. United States Gypsum Co.; DUROCK Cement Board.

2. Thickness: 1/2 inch (12.7 mm).

## 2.7 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Plastic.
2. Shapes:

   a. Cornerbead: Use at outside corners.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
   c. L-Bead: L-shaped; exposed long leg receives joint compound; use where indicated.
   d. Expansion (Control) Joint: Use where indicated.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet or rolled zinc.
2. Shapes:

   a. Cornerbead: Use at outside corners.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges
   c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening. Use where indicated.

## 2.8 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Exterior Gypsum Soffit Board: Paper.

3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound or drying-type, all-purpose compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Other Coats: For second coat and third coats, use setting-type, sandable topping compound drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:
1. Cementitious Backer Units: As recommended by manufacturer.

## 2.9 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

B. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

## 2.10 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Isolation Strip at Exterior Walls:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

F. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

G. Polyethylene Vapor Retarder: As specified in Division 7 Section "Building Insulation."

2.11 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Aggregate Finish: Water-based, job-mixed, aggregated, drying-type texture finish for spray application.

1. Texture: Very light-spatter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

1. Furnish concrete inserts and other devises indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.

1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.

a. Use deflection track where indicated.

D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

## 3.4 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Suspend ceiling hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member and transversely between parallel members.

C. Sway-brace suspended steel framing with hangers used for support.

D. For exterior soffits, install cross bracing and framing to resist wind uplift.

E. Wire-tie furring channels to supports, as required to comply with requirements for assemblies indicated.

F. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.

1. Hangers: 48 inches (1219 mm) 1200 mm o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) 1200 mm o.c.
3. Furring Channels (Furring Members): 24 inches (610 mm) 600 mm o.c.

G. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

## 3.5 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.

1. Where studs are installed directly against exterior walls, install asphalt-felt or foam-gasket isolation strip between studs and wall.

B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief. Do not fasten studs to top track to allow independent movement of studs and track.
2. For fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.

    a. Terminate partition framing at suspended ceilings where indicated.

D. Install steel studs and furring at the following spacings:

1. Single-Layer Construction: 16 inches (406 mm) 400 mm o.c., unless otherwise indicated.
2. Multilayer Construction: 24 inches (610 mm) 600 mm o.c., unless otherwise indicated.
3. Cementitious Backer Units: 16 inches (406 mm) 400 mm o.c., unless otherwise indicated.

E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

F. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Install two studs at each jamb, unless otherwise indicated.
2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint.
3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

G. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

H. Polyethylene Vapor Retarder: Install to comply with requirements specified in Division 7 Section "Building Insulation."

## 3.6 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members using resilient channels, or provide control joints to counteract wood shrinkage.

I. Form control and expansion joints with space between edges of adjoining gypsum panels.

J. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

K. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

M. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

## 3.7 PANEL APPLICATION METHODS

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of board.
b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

B. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

C. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

D. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

E. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.

F. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

G. Tile Backing Panels:
1. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
2. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.

## 3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings.

## 3.9 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
2. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

## 3.10 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture finish manufacturer's written recommendations.

## 3.11 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:

    a. Installation of 80 percent of lighting fixtures, powered for operation.
    b. Installation, insulation, and leak and pressure testing of water piping systems.
    c. Installation of air-duct systems.
    d. Installation of air devices.
    e. Installation of mechanical system control-air tubing.
    f. Installation of ceiling support framing.

END OF SECTION 09260

# SECTION 09310 - CERAMIC TILE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Owner supplied ceramic wall tile.
2. Waterproof membrane for **thin-set** tile installations.
3. Crack-suppression membrane for thin-set tile installations.

B. Related Sections include the following:
1. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

### 1.3 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.
2. Step Treads: Minimum 0.6.
3. Ramp Surfaces: Minimum 0.8.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches (300 mm) square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.

D. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Qualification Data: For Installer.

G. Material Test Reports: For each tile-setting and -grouting product[ **and special-purpose tile**].

## 1.5 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all **tile** from one source or producer.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## 1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: **Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.**

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

### 2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. **Match Architect's sample**.

D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.

F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

### 2.3 TILE PRODUCTS

A. Owner supplied ceramic wall tile

1. Crossville - Manoir Porcelain Stone

2. Color: AV 254 Hermitage
3. Module Size: 24"x24"
4. Nominal Thickness: 3/8"
5. Trim: 4x12 single bullnose base; align with tile on floor T2
6. Grout joint: 3/16" (grout color as selected by Architect from full range)

2.4 **WATERPROOFING MEMBRANES** FOR THIN-SET TILE INSTALLATIONS

A. General: Manufacturer's standard product that complies with ANSI A118..

B. Use only if recommended by manufacturer. Test concrete to determine whether or not this is required.

2.5 SETTING AND GROUTING MATERIALS

A. **Available** Manufacturers:

1. Atlas Minerals & Chemicals, Inc.
2. Boiardi Products Corporation.
3. Bonsal, W. R., Company.
4. Bostik.
5. C-Cure.
6. Custom Building Products.
7. DAP, Inc.
8. Jamo Inc.
9. LATICRETE International Inc.
10. MAPEI Corporation.

B. Portland Cement Mortar (Thin Set): ANSI A118.1 and A118.4 - Per manufacturer instructions

C. Standard Sanded Cement Grout: ANSI A118.6, color as selected from full range of manufacturer colors (standard and premium).

2.6 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

C. Grout Sealer: Manufacturer's standard product for sealing grout joints that does not change color or appearance of grout. Seal grout only; do not seal tile.

1. **Available** Products:

a. Bonsal, W. R., Company; Grout Sealer.

b. Bostik; CeramaSeal Grout Sealer.
c. C-Cure; Penetrating Sealer 978.
d. Custom Building Products; **Grout** Sealer.
e. MAPEI Corporation

## 2.7 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors installed with **thin-set mortar** that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

## 3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
3. NO WALL EXPANSION JOINTS; THEY SHOULD NOT BE NECESSARY IN WALL SURFACES THIS SIZE.

H. Grout tile to comply with requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.

## 3.4 **WATERPROOFING MEMBRANE** INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

## 3.5 WALL TILE INSTALLATION

A. Joint Widths: Install tile on floors with the following joint widths:
   1. 1/16"

B. Grout Sealer: Apply grout sealer to **cementitious** grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

C. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

D. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.

## 3.6 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

   1. Remove grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
   3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09310

# SECTION 09511 - ACOUSTICAL PANEL CEILINGS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes acoustical panels, gypsum panels and exposed suspension systems for ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

### 1.3 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch- (150-mm-) square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- (300-mm-) long Samples of each type, finish, and color.

C. Qualification Data: For testing agency.

D. Field quality-control test reports.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

F. Research/Evaluation Reports: For each acoustical panel ceiling and components.

G. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
b. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

a. Smoke-Developed Index: 450 or less.

D. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:

1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."
3. UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
2. Hold-Down Clips: Equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.3 MINERAL-BASE ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING C1

A. Products:

1. “Fine Fissured Beveled Tegular” tiles by Armstrong #1734
2. Classification: Tiles fitting ASTM E 1264 for Type III, Form 2, Pattern CE

B. Surface Finish: Factory applied latex paint, color: white.

C. Fire resistance: Class A

D. Edge Detail: Beveled tegular.

E. Size: 24”x24”x5/8”.

F. Grid: Suprafine 9/16” Exposed Tee grid systems.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

H. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILINGS

A. Products:

1. “Suprafine” grid system (9/16” wide) by Armstrong for C1, C4

B. Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, hot-dip galvanized according to ASTM A 653/653M, not less than G30 (Z90) coating designation, with prefinished metal caps on flanges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

## 3.3 INSTALLATION, GENERAL

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.66 m). Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

## 3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

# SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Wall base.
2. Reducer/transition strips.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

### 1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide resilient stair accessories with a critical radiant flux classification of Class I, not less than 0.45 W/sq. cm, as determined by testing identical products per ASTM E 648 by a testing and inspecting agency acceptable to authorities having jurisdiction.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

### 1.6 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 COLORS AND PATTERNS

A. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 RESILIENT WALL BASE

A. Wall Base: ASTM F 1861.
1. Johnsonite Wall Base Rubber
2. Color: from full range of manufacturer colors (Standard and Premium)

B. Type (Material Requirement): TS (rubber, vulcanized thermoset).

C. Group (Manufacturing Method): I (solid, homogeneous).

D. Style: Cove (with top-set toe)

E. Minimum Thickness: [0.125 inch (3.2 mm)] [0.080 inch (2.0 mm)] <Insert thickness>.

F. Height: 4 inches (102 mm)

G. Lengths: Coils in manufacturer's standard length.

H. Outside Corners: Job formed.

I. Inside Corners: Job formed.

J. Surface: Smooth.

2.4 RESILIENT MOLDING ACCESSORIES

A. Description: Reducer strips.
1. Johnsonite

B. Material: Rubber.

C. Color: as selected by Architect from full manufacturer range (standard and premium) to match adjacent floor color.

D. Profile and Dimensions:
   1. Reducer strips for transitions from/to other materials: Johnsonite products as selected by Architect

## 2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated. Adhesives shall be low-VOC and Green-Seal certified to GS-36.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates for Stair Accessories: Prepare according to ASTM F 710.

   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   3. Moisture Testing:

      a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
      b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

   1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.3 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

## 3.4 RESILIENT ACCESSORY INSTALLATION

A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

## 3.5 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

    a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

END OF SECTION 09653

SECTION 09912 - PAINTING (PROFESSIONAL LINE PRODUCTS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

2. Sealing of floors

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

D. Related Sections include the following:
1. Division 5 Section "Structural Steel" for shop priming structural steel.
2. Division 8 Section "Steel Doors and Frames" for factory priming steel doors and frames.
3. Division 9 Section "Gypsum Board Assemblies" for surface preparation of gypsum board.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.

C. Qualification Data: For Applicator.

## 1.5 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

## 1.7 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Furnish Owner with an additional 5 percent, but not less than 1 gal. (3.8 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Dunn Edwards – Ethylene Glycol Free

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Match Architect's samples; see Finish Schedule.

D. All interior paint is Zero VOC

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.

1. Dunn Edwards, W6329 Block Filler, smooth, mil thickness according to manufacturer’s recommendations. E-G Free

2.4 EXTERIOR PRIMERS

A. Exterior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex primer for exterior application. One coat.

1. Dunn Edwards, ESPROO Eff-sttop premium, mil thickness according to manufacturer's recommendations. E-G Free

B. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application. One coat.
1. Dunn Edwards, GAPROO Galv-Alum Premium, rust-inhibiting primer.

C. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application. One coat.
1. Dunn Edwards, GAPROO Galv-Alum Premium Aluminum Primer

D. Exterior wood Primer: Factory-formulated wood primer for exterior application. One coat.
1. Dunn Edwards EZPROO E-Z Prime Premium, Exterior Acrylic Wood Primer. E-G Free

## 2.5 INTERIOR PRIMERS

A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application. One coat.
1. Dunn Edwards block filler Block Filler W6329, smooth, E-G Free

B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application. One coat.
1. Dunn Edwards, EcoShield latex primer W600. E-G Free

C. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer (not for handrails). One coat.
1. Dunn Edwards, UGPROO-1 Ultra-Grip Premium

D. Interior Non-Ferrous Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer. One coat.
1. Dunn Edwards, UGPROO-1 Ultra-Grip Premium r. E-G Free

E. Interior Wood Primer. One coat.
1. Dunn Edwards, W600 EcoShield Primer, E-G Free

## 2.6 EXTERIOR FINISH COATS

A. Exterior Flat Acrylic: Factory-formulated waterborne acrylic-latex for exterior application (concrete, masonry). Two coats.
1. Dunn Edwards, SSHLIO Spartashield, 100% Acrylic Exterior Flat Factory Formula. E-G Free

B. Exterior Semigloss Acrylic Enamel: Factory-formulated semigloss waterborne acrylic-latex enamel for exterior application (ferrous metals, galvanized and other non-ferrous metal). Two coats.
1. Dunn Edwards, EVSH50-1 Evershield. E-G Free

## 2.7 INTERIOR FINISH COATS

A. Interior Acrylic Enamel: Factory-formulated semigloss or flat (as noted on Drawings) acrylic-latex enamel for interior application. Two coats. All substrates.
1. Dunn Edwards, EcoShield zero-VOC, W603 E-G Free
2. Ducts, deck and structure – flat paint
3. Exposed duct color: paint exposed ducts to match structure and deck
4. Exposed Deck/Structure color: see drawings

2.8 INTERIOR AND EXTERIOR HANDRAIL PAINT COATS

A. Two-component epoxy system, 3 coats.
   1. Prime Coat – Carboline CarboMastic 90 primer (1 coat)
   2. Top Coat – Carboline Carbothane (2 coats)
   3. Color: to be determined by Architect from full range of manufacturer colors

2.9 FLOOR SEALERS

A. Sealer for Concrete floors - low-odor, low VOC (<70 grams/liter), water-based clear sealer to all exposed concrete floors (integral color or polished), 2 coats, matte satin; available product: Enviroseal Duraseal or approved equal. Deep penetrating sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

   1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

   1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

   1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

   1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

   1. Provide barrier coats over incompatible primers or remove and reprime.
   2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and

release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.

a. Blast steel surfaces clean as recommended by paint system manufacturer.
b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

## 3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.

7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.
11. Not to exceed manufacturer's recommendation for square foot coverage.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

G. Electrical items to be painted include, but are not limited to, the following:

1. Switchgear.
2. Panelboards.
3. Electrical equipment that is indicated to have a factory-primed finish for field painting.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

## 3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
2. Testing agency will perform appropriate tests for the following characteristics as required by Owner:

3. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

## 3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

## 3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION 09912

# SECTION 10265 - IMPACT-RESISTANT WALL PROTECTION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:
   1. Cornerguards.

### 1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall-protection unit.

B. Shop Drawings: For each impact-resistant wall-protection unit showing locations and extent. Include sections, details, and attachments to other work.

   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated.

   1. Include similar Samples of accent strips and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

   1. Corner Guards: 12 inches (300 mm) long. Include examples of joinery, corners, and field splices.

E. Qualification Data: For testing agency.

F. Material Test Reports: For each impact-resistant plastic material.

G. Maintenance Data: For each impact-resistant wall-protection unit to include in maintenance manuals.

   1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

H. Warranty: Special warranty specified in this Section.

### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain impact-resistant wall-protection units through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall-protection units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Fire-Test-Response Characteristics: Provide impact-resistant, plastic wall-protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall-protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).

a. Store corner-guard covers in a vertical position.

## 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall-protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

B. Field Measurements: Verify actual locations of walls, columns, and other construction contiguous with impact-resistant wall-protection units by field measurements before fabrication and indicate measurements on Shop Drawings.

## 1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall-protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Deterioration of plastic and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than four, 4-foot- (1.2-m-) long units.

B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Basis-of-Design Product: The design for each impact-resistant wall-protection unit is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 MATERIALS

A. Extruded Rigid Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; thickness as indicated.

   1. Impact Resistance: Minimum 25.4 ft-lbf/in. (1356 J/m) of notch when tested according to ASTM D 256, Test Method A.
   2. Chemical and Stain Resistance: Tested according to ASTM D 543.
   3. Self-extinguishing when tested according to ASTM D 635.
   4. Flame-Spread Index: 25 or less.
   5. Smoke-Developed Index: 450 or less.

B. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated but with not less than strength and durability properties specified in ASTM B 221 (ASTM B 221M) for Alloy 6063-T5.

C. Adhesive: Type recommended by manufacturer for use with material being adhered to substrate indicated, low VOC

2.3 CORNER GUARDS

A. Surface-Mounted, Opaque-Plastic Corner Guards 10265-A: Fabricated from PVC plastic, acrylic-modified vinyl sheet or opaque polycarbonate sheet; with formed edges; fabricated with 90- or 135-degree turn to match wall condition.
      a. Basis-of-Design Product: IPC Door and Wall Protection Systems; Division of InPro Corporation or C/S Group (Construction Specialties) Acrovyn

   2. Location: ALL drywall outside corners

   3. Wing Size: Nominal 1 ½ inch by 1 ½ inch.
   4. Mounting: Adhesive
   5. Color and Texture: Color and texture selected by architect from manufacturer’s full range of colors textures.

2.4 FABRICATION

A. Fabricate impact-resistant wall-protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall-protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Provide mounting hardware, anchors, and other accessories required for a complete installation.

a. Provide anchoring devices to withstand imposed loads.
b. No splices.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10265

SECTION 10431 - SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Panel signs and accessories.

B. Related Sections include the following:
1. Division 15 for labels, tags, and nameplates for mechanical equipment.
2. Division 16 for labels, tags, and nameplates for electrical equipment.
3. Division 16 Section "Interior Lighting" for illuminated exit signs.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.

1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and braille layout.

C. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for initial selection of color, pattern, and texture: MP Plastic consisting of actual sections of material including specified color

2. Samples for verification of color, pattern, and texture selected and compliance with requirements:
   a. Provide a sample panel not less than 8 inches by 4 inches for each material, color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, and other graphic devices.

D. Qualification Data: For Installer.

E. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by signage manufacturer.

B. Source Limitations: Obtain each sign type through one source from a single manufacturer.

C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
1. Basis-of-Design Product: The design for each sign is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 PANEL SIGNS

A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally.

B. Available Manufacturers include but are not limited to:
1. Best Manufacturing Co.

C. MP Plastic, 1/8” thick.

D. Fastening Material: Use concealed fastening material that are not corrosive to the sign material and mounting surface.

E. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

F. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:

1. Edge Condition: Square cut.
2. Corner Condition: Square.

G. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.
2. Panel Type: To match Best Sign Systems room identification sign.
2. Panel Color: From full range (standard and premium) of manufacturer colors

H. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:

1. Edge Condition: Square cut.
2. Corner Condition: Square corners.
3. One piece construction; added-on and/or engraved characters are unacceptable.
4. Size: 8”x8”x1/8” (except as noted in Schedule).

I. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.

J. Raised Copy: Machine-cut copy characters from matte-finished opaque acrylic sheet and chemically weld onto the acrylic sheet forming sign panel face. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Raised Copy Thickness: Not less than 1/32 inch (for ADA compliance).
2. Text on signes needing to comply with ADA shall be accompanied by Grade 2 braille.
3. All letters, numbers and/or symbols shall be #950 White, matte finish.
4. Futura, upper case.
5. Room numbers (if any) shall be 5/8” high.
6. Lettering for room usage identifaction shall be 5/8” high.
7. Symbols for restroom identification shall be 3” high.
8. Letters and numbers shall be centered on sign.
9. Grade 2 braille shall be placed directly below room names/numbers and shall match background color.

## 2.3 PANEL SIGN TYPES

A. Room Signs:

1. Material: MP Plastic.
2. Perimeter: Unframed.
3. Copy: Tactile and braille.
4. Character Style: Futura.
5. Text: As indicated in the Sign Schedule.
6. Size: 8x8

B. Accessible Entrance Signs:

1. Material: MP Plastic.
2. Perimeter: Unframed.
3. Copy: Tactile and braille.
4. Character Style: Futura.
5. Text: As indicated in the Sign Schedule.
6. Size: 8x8

C. Occupancy Signs:

1. Material: MP Plastic.
2. Perimeter: Unframed.
3. Copy: Raised.
4. Text: As indicated in the Sign Schedule
5. Size: 4x8

D. Toilet Room Signs:

1. Material: MP Plastic
2. Perimeter: Unframed.
3. Copy: Raised.
4. Text: For female restroom, use ADA symbol and female symbol; for male restroom, use ADA symbol and male symbol; for unisex use ADA symbol, female symbol and male symbol
5. Sizes: 8x8

E. Accessible Parking Signs:

1. Material: 0.080-inch (2-mm) stainless steel, aluminum or other noncorrosive material.
2. Background Color: Blue.
3. Copy Material: White silk-screen or vinyl film.
4. Mounting: Flush mounted to building with fasteners to suit building substrate.

F. Mechanical Room Signs:

1. Material: MP Plastic.
2. Perimeter: Unframed.
3. Copy: Tactile and braill.
4. Character Style: Futura.
5. Text: As indicated in the Sign Schedule.
6. Sizes: 4x8

## 2.4 ACCESSORIES

A. Vinyl Film: Provide opaque reflective vinyl film, 0.0035-inch (0.089-mm) minimum thickness, with pressure-sensitive adhesive backing suitable for both exterior and interior applications.

B. Mounting Methods: Use double-sided vinyl tape or silicone adhesive fabricated from materials that are not corrosive to sign material and mounting surface.

## 2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

D.

## 2.6 ROAD SIGNS

A. 10431- G: "DO NOT ENTER COUNTY VEHICLES ONLY" - mount on unistrut (height per Owner), .080 aluminum sign, high intensity prismatic reflective, 2'x3' - quantity: 2 - colors per Owner

B. 10431-H: "COLLECTION CENTER AHEAD" - mount on unistrut (height per Owner), .080 aluminum sign, high intensity prismatic reflective, 2'x3' - quantity: 2 - colors per Owner

C. 10431-I: STOP SIGN - 24" Octagon, Aluminum .080 alumium, engineering grade reflective, mount at height per Owner on unistrut- quantity: 1

## 2.7 EXECUTION

A. EXAMINATION
1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
2. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

B. INSTALLATION
1. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions and as indicated on the Drawings.
2. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
3. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.
4. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
   a. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
   b. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.

- CLEANING AND PROTECTION
  - After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

- SIGN SCHEDULE
  - Accessible Entrance Signs

| Location | Text |
|---|---|
| outside Door #112 | Accessible Entrance |

  - Room Signs

| Location | Text |
|---|---|
| on Door 115 | Storage |
| on Door 116 | Storage |
| on Door 121 | Staff |
| Door 113 | Office |
| Door 114 | Break Room |

- Occupancy Load Signs

none

- Toilet Room Signs
  - Male

| Location | Text |
|---|---|
| Door 117 | Men |

  - Female

| Location | Text |
|---|---|
| Door 118 | Women |

- Mechanical Room Signs

| Location | Text |
|---|---|
| on Door #120 | Mechanical Room<br>No Storage |
| on Door #119 | Electrical Room<br>No Storage |

END OF SECTION 10431

# SECTION 10520 - FIRE-PROTECTION SPECIALTIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Portable fire extinguishers.

2. Mounting brackets for fire extinguishers.

### 1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.

1. Fire Extinguishers: Include rating and classification.
2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Samples for Initial Selection: For fire-protection cabinets with factory-applied color finishes.

C. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

### 1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

D. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Basis-of-Design Product: The design for each product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 PORTABLE FIRE EXTINGUISHERS

A. Available Manufacturers:
1. JL Industries, Inc.
2. Larsen’s Manufacturing

B. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Valves: Manufacturer's standard
2. Handles and Levers: Manufacturer's standard
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B

C. Multi-Purpose Dry-Chemical Type 10520-C: UL-rated 5 lb. nominal capacity, with sodium bicarbonate-based dry chemical in manufacturer's standard enameled container.
1. Available product: JL Industries Cosmic 5E (2A10BC extinguisher)

2.3 MOUNTING BRACKETS – For all Fire Extinguishers.

A. Available Manufacturers:
1. JL Industries, Inc.

B. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

1. For 10520-C – Bracket MB 818 (JL Industries)

2.4 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights indicated below:

1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.
2. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.

B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, coordinate alternate location for cabinets.
2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10520

# SECTION 10801 - TOILET AND BATH ACCESSORIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Toilet and bath accessories.

B. Related Sections include the following:
1. Division 15 for underlavatory guards.

### 1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.

D. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

### 1.4 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

B. ONE BATHROOM ACCESSORY SUPPLIER (ALL SURFACE MOUNTED) FOR ALL ACCESSORIES. SEE COUNTY APPROVED VENDOR LIST.

C. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.

1. Products of other manufacturers with equal characteristics, as judged solely by Architect, may be provided.
2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.

1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:

1. Toilet and Bath Accessories:
   a. SEE INDIVIDUAL SECTIONS FOR MANUFACTURERS

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Toilet and Bath Accessory Schedule at the end of Part 3.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9-mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.

C. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.

D. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.

E. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

F. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

A. General: One, maximum 1-1/2-inch- (38-mm-) diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

C. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

D. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:

1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

E. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

A. Toilet Tissue Dispenser 10801-A: Where this designation is indicated, provide toilet tissue dispenser complying with the following:

1. Products: Contractor to obtain from selected county-approved vendor and contractor to install

2. Double roll, 10"
3. Mounting: Surface- mounted with concealed anchorage
4. Operation: Noncontrol delivery with manufacturer's standard spindle.
5. Capacity: double roll.

B. Paper Towel Dispenser 10801-B: Where this designation is indicated, provide paper towel dispenser complying with the following:

1. Products: Contractor to obtain from selected county-approved vendor and contractor to install

2. Paper towel type - Coordinate with owner.

C. Mirror Unit 10801-C: Where this designation is indicated, provide mirror unit complying with the following:

1. Products: Available products include the following: ASI 0600, Bradley 780-2436

2. Stainless-Steel Angle-Framed Mirror Unit: Fabricate frame from minimum nominal 0.0375-inch- (0.95-mm-) thick stainless steel, with all joints mitered, welded, and ground smooth and constructed so frame tapers not less than 3 inches (75 mm) from top to bottom.

3. Size: 24x36

D. Soap Dispenser 10801-D
1. Kimberly Clark Professional MOD electronic cassette dispenser (brushed metallic) or equivalent.

E. Vertical Grab Bar 10801-E: Where this designation is indicated, provide stainless-steel grab bar complying with the following:

1. Products: Available products include the following: ASI 3100 series, Bradley 832-001-18"
2. Stainless-Steel Nominal Thickness: Minimum 0.05 inch (1.3 mm).
3. Mounting: Concealed with manufacturer's standard flanges and anchors.
4. Gripping Surfaces: Smooth, satin finish.
5. Outside Diameter: 1-1/4 inches.
6. Length: 18"

F. Grab Bar 10801-F: Where this designation is indicated, provide stainless-steel grab bar complying with the following:

1. Products: Available products include the following: ASI 3100 series, Bradley 832-001-42"
2. Stainless-Steel Nominal Thickness: Minimum 0.05 inch (1.3 mm).
3. Mounting: Concealed with manufacturer's standard flanges and anchors.
4. Gripping Surfaces: Smooth, satin finish.
5. Outside Diameter: 1-1/4 inches.
6. Length: 42"

G. Grab Bar 10801-G: Where this designation is indicated, provide stainless-steel grab bar complying with the following:

1. Products: Available products include the following: ASI 3100 series, Bradley 832-001-36"
2. Stainless-Steel Nominal Thickness: Minimum 0.05 inch (1.3 mm).
3. Mounting: Concealed with manufacturer's standard flanges and anchors.

4. Gripping Surfaces: Smooth, satin finish.
5. Outside Diameter: 1-1/4 inches.
6. Length: 36”

END OF SECTION 10801

# SECTION 133419 - METAL BUILDING SYSTEMS

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Shop Drawings and structural analysis data signed and sealed by a qualified professional engineer registered in the state of New Mexico.

1. Indicate name and location of Project, name of manufacturer, order number, name of contractor, governing building code and standards including year of edition, design loads and load combinations, building use category, and load importance factors.

B. Comply with AISC 360, "Specification for Structural Steel Buildings," and with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

## PART 2 - PRODUCTS

### 2.1 METAL BUILDINGS

A. Available Manufacturers: Foundation design is based on the metal building design provided by RIGID Global Buildings, 10 Inverness Dr. East, Suite 220, Englewood, CO 80112. Contact: Ken Olsen, Senior District Manager Western Region. Phone: 720-931-2991 or 303-845-0662. Email: KenO@rigidbuilding.com.
1. The RIGID Global Buildings specification (included in this section) shall be used as a performance specification for the metal building system.
2. Cost of additional field and office work necessitated by requests by the contractor for other metal building designs that require foundation revisions shall be borne by the contractor. Options are for contractor's convenience, he shall be responsible for all changes necessary if he chooses an option and he shall coordinate all details.

B. Metal Building System Description: Rigid clear span with endwall columns.

1. Eave Height: As required to provide clear height indicated on Drawings.
2. Dimensions and Bay Spacings: As indicated on Drawings.
3. Roof Slope: 2 inches per 12 inches.
4. Design Loads: As indicated on Drawings.

C. Structural-Framing Materials:

1. W-Shapes: ASTM A 992; Grade 50.
2. Angles ASTM A 36.
3. Plate and Bar: ASTM A 36.
4. Steel Joists: Comply with SJI's "Standard Specifications, with steel-angle top and bottom chord members.

D. Wall Panels:
1. Lap-Seam Wall Panels: Metal panels factory formed to provide 36-inch (914-mm) coverage, with raised trapezoidal major ribs at 12 inches (305 mm) o.c., and intermediate stiffening ribs

symmetrically spaced between major ribs. Design panels for mechanical attachment to structure using exposed fasteners, lapping major ribs at panel edges.

2. Metal Panel Finish: Fluoropolymer two-coat system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat. Verify with Architectural finish requirements.

E. Flashing and Trim: Form from 0.022-inch nominal-thickness, zinc-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Finish flashing and trim same as adjacent roof or wall panels.

F. Gutters and Downspouts: Form from 0.022-inch nominal-thickness, galvanizedsteel sheet prepainted with coil coating. Match gutters to profile of gable trim and finish gutters to match roof fascia and rake trim. Finish downspouts to match wall panels.

G. Metal Building Insulation: ASTM C 991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 2-inch-wide, continuous, vapor-tight edge tabs; and with a flame-spread index of 25 or less.

1. Vapor-Retarder Facing: Fiber-reinforced white polypropylene or vinyl film complying with ASTM C 1136.

H. Accessories:

1. Personnel Doors: Prepare and reinforce doors and frames to receive hardware according to DHI A115 Series.
2. Horizontal-Sliding Doors: Manufacturer's standard horizontal-sliding door assembly including structural frame, door panels matching wall panels, brackets, guides, tracks, hardware, and installation accessories.
3. Aluminum Windows: As specified in Division 08 Section "Aluminum Windows."

4. Glazing: Comply with requirements specified in Division 08 Section "Glazing."

I. Miscellaneous Materials:

1. Grout: ASTM C 1107, factory-packaged, nonmetallic grout, noncorrosive, and nonstaining.
2. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing; of manufacturer's standard size.
3. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

## PART 3 - EXECUTION

### 3.1 ERECTION

A. Setting Base and Bearing Plates: Clean concrete and masonry of bond-reducing materials and roughen surfaces before setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts.
2. Tighten anchor rods after supported members have been positioned and plumbed.
3. Pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.

B. Erect framing true to line, level, plumb, rigid, and secure. Comply with AISC specifications referenced in this Section.

1. Make field connections for primary framing using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts," snug tightened or pretensioned.
2. Fasten secondary framing to primary framing using clips and non-high-strength bolts. Hold rigidly to a straight line by sag rods.
3. Install joists/girders**,** and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications.
4. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
5. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

C. Wall Panel Installation: Provide panels full height of building unless otherwise indicated.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints.
2. When two rows of panels are required, lap panels 4 inches (100 mm) minimum. Locate panel splices over structural supports.
3. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
4. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as necessary for waterproofing.
5. Install screws with power tools having controlled torque to compress neoprene washer without damage to washer, screw threads, or panels. Install screws in predrilled holes.
6. Use aluminum or stainless-steel fasteners for exterior and galvanized fasteners for interior.

D. Insulation Installation: Install insulation concurrently with panel installation. Set vapor-retarder-faced units with vapor retarder to warm side of construction. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

1. Over-Framing Installation: Extend over and perpendicular to top flange of secondary framing members. Hold in place by panels fastened to secondary framing.
2. Between-Purlin Installation: Extend between purlins. Carry facing up and over purlin, overlapping adjoining facing. Hold in place with bands and crossbands below insulation.
3. Over-Purlin-with-Spacer-Block Installation: Extend over and perpendicular to top flange of secondary framing members. Install layer of unfaced insulation over first layer to fill space formed by roof panel standoffs. Hold in place by panels fastened to standoffs.
4. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend between purlins. Carry facing up and over purlin, overlapping adjoining facing. Install layer of unfaced insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.

E. Accessory Installation:

1. Seal perimeter of door window frames with elastomeric sealant used for panels.
2. Install personnel doors and frames straight, level, and plumb. Securely anchor frames to building structure. Set units with maximum 1/8-inch (3-mm) clearance between door and frame at jambs and head and maximum 3/4-inch (19-mm) clearance between door and floor.
3. Sliding Service Door Installation: Bolt support angles to opening head members. Bolt door tracks to support angles at maximum 24 inches (610 mm) o.c. Set doors and operating equipment with necessary hardware, stops, and continuous hood flashing.
4. Install windows level, plumb, and true to line, without warp or rack, anchored securely in place. Set sill members in a bed of sealant and seal perimeter of each unit.
5. Pipe Flashing: Form flashing around pipe penetrations. Fasten and seal to panels.
6. Adjust and check each operating item of hardware to ensure proper operation and function. Replace units that cannot be adjusted to operate freely and smoothly.

F. Gutters, Downspouts, Flashing, and Trim Installation: Comply with SMACNA's "Architectural Sheet Metal Manual." Provide for thermal expansion; conceal fasteners where possible, and set units true to line and level. Install work with laps and seams that will be permanently watertight.

END OF SECTION 133419

## SECTION 1 – GENERAL

**1.1** THIS SPECIFICATION designates the quality, design criteria and workmanship used in metal building systems designed, manufactured and furnished by Rigid Global Buildings, hereinafter referred to as RIGID.

**1.2** SPECIFICATIONS herein are to be used as a guide of the performance requirements for the materials used in the design and manufacture of RIGID's product line. They are intended to insure that the architect, engineer, builder and/or owner understand the basis for the design and manufacture of RIGID's pre-engineered building systems.

**1.3** RIGID utilizes the standard specifications of industry recognized organizations, such as: AISC, AWS, ASTM, AISI, MBMA etc., as the basis for establishing it's own design, fabrication and quality criteria, standards, practices, methods and tolerances. For convenience, one or more provisions of a particular group or agency may be referenced in RIGID documents where appropriate. In all events, however, unless stipulated otherwise in the Final Quotation and Contract Form, RIGID's design, fabrication and quality criteria, standards, practices, methods and tolerances will govern the work; any other interpretations to the contrary notwithstanding.

**1.4** MECHANICAL PROPERTIES of materials utilized by RIGID in the manufacture of its product line are referenced within these specifications. Applications of these materials are covered under their pertinent sections. Industry specification standards have been referenced where applicable within these specifications.

**1.5** BUILDING NOMENCLATURE

**1.5.1** THE BUILDING "WIDTH" AND "LENGTH" shall be measured from the inside face to the inside face of the wall covering.

**1.5.2** THE BUILDING "EAVE HEIGHT" shall be measured from the bottom of the base plate of the frame columns to the intersection of lines representing the inside of the wall covering and the inside of the roof covering.

**1.5.3** THE "BAY SPACING" shall be measured center line to center line of the main frames, except at end bays where "Bay Spacing" is measured from the inside of the wall covering to the center line of the first interior frame.

## SECTION 2 - STRUCTURAL FRAMING

**2.1** PRIMARY FRAMING shall be the main load carrying structural members. These members shall support secondary structural members.

**2.1.1** RIGID FRAME "RF" shall normally be manufactured of solid web members having tapered or uniform depth rafters, rigidly connected to tapered or uniform depth columns. This system provides a clear span, single gable, or single sloped rigid frame designed to support the specified loads.

**2.1.2** STRAIGHT COLUMN "SC" shall normally be manufactured of solid web members having tapered or uniform depth rafters, rigidly connected to uniform depth columns. This system provides clear span, single gable or single sloped rigid frame, straight column designed to support the specified loads.

**2.1.3** BEAM and COLUMN "BC" shall normally be manufactured of solid web members having tapered and/or uniform depth rafters, rigidly connected to tapered or uniform depth exterior columns, and uniform depth or round section interior columns. This system provides a single gable, or single slope rigid frame having interior columns designed to support the specified loads.

**2.1.4** MATERIALS used in the fabrication of primary framing systems shall be designed utilizing RIGID's standard practices, generally in compliance with the A.I.S.C. code.

**2.1.4.1** STRUCTURAL FLAT PLATE, STRIP and/or BAR STOCK generally shall conform to the physical requirements of ASTM A529 or ASTM A572 as applicable, and shall have minimum yield strength of 50,000 psi for web plates and 55,000 psi for flange bars.

**2.1.4.2** W, M and S SHAPES, ANGLE RODS, CHANNELS and OTHER HOT ROLLED SHAPES shall be of material conforming to the physical requirements of ASTM A572 or ASTM A992, and shall have a minimum yield strength of 50,000 psi.

**2.1.4.3** ROUND PIPE SECTIONS shall be of material conforming to the physical requirements of ASTM A500 Grade B and shall have minimum yield strength of 42,000 psi.

**2.1.4.4** STRUCTURAL TUBING shall be of material conforming to the physical requirements of ASTM500 Grade B and shall have a minimum yield strength of 46,000 psi.

**2.1.4.5** OTHER YIELD STRENGTH MATERIALS may be used based on the particular building design requirements.

**2.1.4.6** MEMBERS fabricated from plate or bar stock materials shall have flanges and webs joined on one side of the web by a submerged arc continuous weld process.

**2.2** PRIMARY ENDWALL FRAMING shall be the main load carrying members of the building endwall. They shall include the corner columns, endwall columns and endwall rafters, and shall be manufactured of cold-formed light gage sections and/or structural sections.

**2.2.1** BEARING FRAME "BF" shall be a system having a continuous rafter beam supported by corner columns and endwall columns, and shall be designed to support the specified loads. This is a non-expandable endwall.

**2.2.2** HALF LOAD MAIN FRAMES shall be a system similar to the 'RF', 'SC' and 'BC' mainframes described in section 2.1, except that these main-frames are designed as non - expandable endwalls.

**2.2.3** MATERIALS used in the fabrication of primary endwall framing systems shall be designed utilizing RIGID's standard practices, generally in compliance with the applicable sections of A.I.S.C. and A.I.S.I.

**2.2.3.1** COLD-FORMED MEMBERS shall be fabricated from material conforming to the physical requirements of ASTM A653, structural steel Grade 50 or ASTM A1011 structural steel or high strength low alloy steel Grade 55. Either material shall be required to have a minimum yield strength of 57,000 psi.

**2.2.3.2** STRUCTURAL SHAPES shall be of material conforming to the physical requirements of ASTM A572 or ASTM A992, and shall have a minimum yield strength of 50,000 psi.

**2.2.3.3** OTHER YIELD STRENGTH MATERIALS may be used based on the particular building design requirements.

**2.2.3.4** MEMBERS fabricated from plate or bar stock materials shall have flanges and web joined by a submerged are continuous weld process on one side only.

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**2.3** SECONDARY FRAMING shall be the structural members which distribute the loads to the primary framing systems, and shall include the eave struts, purlins, girts, wind bracing and other miscellaneous structural members. They shall be manufactured of cold-formed light gage sections, welded plate sections and/or structural sections.

**2.3.1** EAVE STRUTS shall be nominal 4", 6", 8", 9", 10" or 12" deep "cee" shape members of unequal flange manufactured of cold-formed light gage steel and shall be designed as simple span for the specified loads.

**2.3.2** PURLINS AND GIRTS shall be nominal 4", 6", 8", 9", 10" or 12" deep "zee" shaped or "cee" shaped members, and shall be manufactured of cold-formed light gage steel designed as simple span, partially continuous or continuous for the specific loads.

**2.3.3** WIND BRACING shall be a system of bracing designed for the specified loads in accordance with RIGID's design practices. They normally utilize rods, cables, diaphragm action, angles and/or welded plate or structural members.

**2.3.4** MISCELLANEOUS FRAMING shall normally be those members which work in conjunction with primary, primary endwall and secondary framing systems. They shall include members such as: base angles, flange braces, jambs, headers, bridging, or sag members, and shall be designed to be supportive of the framing systems.

**2.3.5** MATERIALS using in the fabrication of secondary framing systems shall be designed utilizing RIGID's standard practices, generally in compliance with the applicable sections of A.I.S.C. and A.I.S.I.

**2.3.5.1** COLD-FORMED MEMBERS shall be fabricated from material conforming to the physical requirements of ASTM A653, structural steel Grade 50 or ASTM A1011 structural steel or high strength low alloy steel Grade 55. Either material shall be required to have a minimum yield strength of 57,000 psi.

**2.3.5.2** CABLE BRACING shall be fabricated of material conforming to the physical requirements of ASTM A475, 7-Strands, Extra High Strength grade.

**2.3.5.3** ROD BRACING shall be fabricated of material conforming to the physical requirements of ASTM A36 and shall have a minimum yield strength of 36,000 psi.

**2.3.5.4** OTHER YIELD STRENGTH MATERIALS shall be used based on the particular building design requirements.

**2.3.5.5** MEMBERS fabricated from plate or bar stock materials shall have flanges and webs joined on one side of the web by submerged arc continuous weld process.

## SECTION 3- ROOF AND WALL COVERINGS

**3.1** ROOF COVERING shall consist of the roof panels, their attachments, trim and sealant for use on the exterior of the roof. They shall be either RIGID's "PBR", "R", "PBM", "M", "CHOICE RIB", "HI-TECH" or "PLATINUM" roof panels.

**3.1.1** RIGID's commercial "PBR" shall be a system of roof panels providing a 36" wide net coverage having 1 1/4" high major ribs at 12" centers and two minor ribs between the major ribs. Side laps shall be one full major rib and shall utilize the bearing edge of the underlying major rib for support. RIGID's "PBR" Panels shall be continuous from ridge to eave until panel length exceeds 40' and/or the panel becomes prohibitive of handling in which case endlaps are provided. Endlaps shall be 6" and occur over a supporting member. For materials and properties, see section 3.1.7.

**3.1.2** RIGID's commercial "R" shall be a system of roof panels providing a 36" wide net coverage having 1 1/4" high major ribs at 12" centers and two minor ribs between the major ribs. Sidelaps shall be one full major rib. RIGID's "R" Panels shall be continuous from ridge to eave until panel length exceeds 40' and/or the panel becomes prohibitive of handling, in which case endlaps are provided. Endlaps shall be 6" and occur over a supporting member. For materials and properties, see section 3.1.8.

**3.1.3** RIGID's commercial "PBM" shall be a system roof panels providing a 36" wide net coverage having 3/4" high major ribs at 6" centers. Sidelaps shall be one full major rib and shall utilize the bearing edge of the underlying major rib for support. RIGID's "PBM" Panels shall be continuous from ridge to eave until panel length exceeds 40' and/or the panel becomes prohibitive of handling, in which case endlaps are provided. Endlaps shall be 6" and occur over a supporting member. For materials and properties, see section 3.1.7.

**3.1.4** RIGID's commercial "M" shall be a system of roof panels providing a 36" wide net coverage having 3/4" high major ribs at 6" centers. Sidelaps shall be one full major rib. RIGID's "M" Panels shall be continuous from ridge to eave until panel length exceeds 40' and/or the panel becomes prohibitive of handling, in which case endlaps are provided. Endlaps shall be 6" and occur over a supporting member. For materials and properties, see section 3.1.8.

**3.1.5** RIGID's agricultural "CHOICE RIB" shall be a system of roof panels providing a 36" wide net coverage having ¾" high major ribs at 9" centers and two minor ribs between the major ribs. Sidelaps shall be one full major rib. RIGID's "CHOICE RIB" shall be continuous from ridge to eave until panel length exceeds 40' and/or the panel becomes prohibitive of handling, in which case endlaps are provided. Endlaps shall be 6" and occur over a supporting member. For material and properties, see section 3.1.9.

**3.1.6** RIGID's commercial roof covering systems are designed for 4" maximum blanket insulation thickness over the purlins. RIGID acknowledges that there are proprietary methods of insulating where insulation of greater than 4" between the purlins may be utilized.

**3.1.7** MATERIALS used in the fabrication of RIGID's "PBR" and "PBM" commercial roof panels shall normally be unfinished Aluminum-Zinc alloy-coated (Galvalume) steel substrate or a pre-finished Silicon Polyester Polar White finish over Aluminum-Zinc alloy-coated or G90 zinc-coated galvanized steel substrate in accordance with ASTM A792, Grade 80 (26 gage) or Grade 50 (24 gage) or ASTM A653, Grade 80 (26 gage).

**3.1.8** MATERIALS used in the fabrication of RIGID's "R" and "M" commercial roof panels shall normally be a pre-finished Modified Silicon Polyester finish over Aluminum-Zinc alloy-coated or G90 galvanized steel substrate in accordance with ASTM A792, Grade 80 (26 gage) and Grade 50 (24 gage) or ASTM A653, Grade 80 (26 gage). Reference RIGID's Spectralite 2000 color chart for color availability.

**3.1.9** MATERIALS used in the fabrication of RIGID's "CHOICE RIB" agricultural roof panels shall normally be a pre-finished Modified Silicon Polyester finish over G90 galvanized steel substrate in accordance with ASTM A653, Grade 80 (29 gage). Reference RIGID's "CHOICE RIB" Spectralite 2000 color chart for color availability.

**3.1.10** RIGID's architectural "HI-TECH" shall be a system of standing seam roof panels with floating clip system to provide for thermal movement of the panel. The 24" wide net coverage has 3" high major ribs at 24" centers, and either 2 minor ribs between the major ribs or a striated pan with no minor ribs. RIGID's "HI-TECH" roof system shall be installed utilizing concealed galvanized 16 gage steel panel clips. RIGID's "HI-TECH" roof system has a factory applied sealant. "HI-TECH" panels shall be continuous from ridge to eave until the panel length exceeds 40' and/or the panels become prohibitive for handling, in which case endlaps are provided. Endlaps shall be 2" and occur 5" above a supporting member, utilizing galvanized 16 gage back-up plates and 18 gage stainless steel cinch straps for roof slopes less than 1:12. The minimum recommended roof slope for RIGID's "HI-TECH" roof system is 1/2 on 12. Roof slopes ¼ on 12 and less could cause severe ponding and will void material warranties. The maximum recommended roof slope is 4 on 12. For materials and properties, see section 3.1.11.

RIGID's "HI-TECH" standing seam roof system shall be available for 2 different insulation conditions. The "LOW CLIP" system shall be for buildings without insulation up to 3" of blanket insulation, requiring 3/8" thermal blocks only for the non-insulated condition, and will provide 3/8" of clearance over the purlins. The "HIGH CLIP" system shall be for buildings with 4" and 6" of blanket insulation. For 4" of blanket insulation a 5/8" thermal block is required, and for 6" of blanket insulation a 3/8" thermal block is required. The "HIGH CLIP" system provides 1 3/8" clearance over the purlins.

RIGID's "HI-TECH" system provides three types of sidelap conditions as follows:

**3.1.10.1** RIGID's "EZ-Lok" sidelap condition is suitable on roof conditions with normal uplift resistance. No mechanical seaming is required.

**3.1.10.2** RIGID's "Triple-Lok" sidelap condition is mechanically seamed on roof areas that call for increased wind uplift resistance.

**3.1.10.3** RIGID's "Quad-Lok" sidelap condition is mechanically seamed on roof areas that call for the highest wind uplift conditions such as building corners and building ends.

**3.1.11** MATERIALS used in the fabrication of RIGID's "HI-TECH" roof panels shall normally be non-painted zinc-aluminum alloy-coated steel substrate, a pre-finished Silicon Polyester Polar White finish or a pre-finished Fluoropon 70% Kynar 500 / Hylar 5000 Snow White over 24 gage, Grade 50 Aluminum-Zinc alloy-coated steel substrate, ASTM A792, coating designation AZ50 or AZ55.

**3.1.12** RIGID's architectural "PLATINUM" shall be a system of standing seam roof panels with either a fixed clip system for rigid construction, or a floating clip system to provide for thermal movement of the panel. The 16" or 18" wide net coverage has 2" high major ribs at 16" or 18" centers, and a striated pan. RIGID's "PLATINUM" roof system shall be installed utilizing concealed galvanized 16 gage steel panel clips. RIGID's "PLATINUM" roof system has a factory applied sealant. "PLATINUM" panels shall be continuous from ridge to eave until the panel length exceeds 40' and/or the panels become prohibitive for handling, in which case endlaps are provided. Endlaps shall be 2" and occur 7" above a supporting member, utilizing galvanized 16 gage back-up channels and 18 gage stainless steel cinch straps for roof slopes less than 1:12. The minimum recommended roof slope for RIGID's "PLATINUM" roof system is 1/2 on 12. Roof slopes less that ½ on 12 and less could cause severe ponding and will void material warranties. The maximum recommended roof slope is 6 on 12. For materials and properties, see section 3.1.13.

RIGID's "PLATINUM" standing seam roof system shall be available for 3 different conditions. The "UTILITY" system shall be for buildings without insulation, rigid board insulation or plywood decking. The "LOW CLIP" system shall be for buildings without insulation up to 3" of blanket insulation, requiring 3/8" thermal blocks only for the non-insulated condition, and will provide 3/8" of clearance over the purlins. The "HIGH CLIP" system shall be for buildings with 4" and 6" of blanket insulation. For 4" of blanket insulation a 5/8" thermal block is required, and for 6" of blanket insulation a 3/8" thermal block is required. The "HIGH CLIP" system provides 1 3/8" clearance over the purlins.

RIGID's "PLATINUM" system provides two types of sidelap conditions as follows:

**3.1.12.1** RIGID's "Triple-Lok" sidelap condition is mechanically seamed on roof areas that call for normal and increased wind uplift resistance.

**3.1.12.2** RIGID's "Quad-Lok" sidelap condition is mechanically seamed on roof areas that call for the highest wind uplift conditions.

**3.1.13** MATERIALS used in the fabrication of RIGID's "PLATINUM" roof panels shall normally be a pre-finished Fluoropon 70% Kynar 500 / Hylar 5000 over 24 gage, Grade 50 zinc-aluminum alloy-coated steel substrate, ASTM A792, coating designation AZ50 or AZ55. Reference RIGID's Spectralite 3000 color chart for color availability.

**3.2** WALL COVERING shall consist of the wall panels, their attachments, and trim for use on the exterior of the walls. They shall be either RIGID's "AW", "R", "R-VEE", "M" or "CHOICE RIB" wall panels.

**3.2.1** RIGID'S commercial "AW" shall be a system of wall panels providing a 36" wide net coverage having 1 1/4" deep major ribs at 12" centers and a 5" wide sculptured "valley" shape between major ribs. Member and stitch screws are located in the "valley" of the major ribs, therefore screw lines are not as noticeable. Sidelaps shall be one major rib. RIGID's "AW" Panels shall be continuous from eave to sill until the panel length exceeds 35' and/or the panel becomes prohibitive of handling in which case endlaps are provided. Endlaps shall be 4" and occur over a supporting member. For materials and properties, see section 3.2.5.

**3.2.2** RIGID'S commercial "R" shall be a system of wall panels providing a 36" wide net coverage having 1 1/4" high major ribs at 12" centers and two minor ribs between the major ribs. Sidelaps shall be one major rib. RIGID'S "R" Panels shall be continuous from eave to sill until the panel length exceeds 35' and/or the panel becomes prohibitive of handling in which case endlaps are provided. Endlaps shall be 4" and occur over a supporting member. For materials and properties see section 3.2.5.

**3.2.1** RIGID'S commercial "R-VEE" shall be a system of wall panels providing a 36" wide net coverage having 1 1/4" deep major ribs at 12" centers and a 5" wide sculptured "reverse valley" shape between major ribs. Member and stitch screws locations shall match that of RIGID's "R" panel. Sidelaps shall be one major rib. RIGID's "R-VEE" Panels shall be continuous from eave to sill until the panel length exceeds 35' and/or the panel becomes prohibitive of handling in which case endlaps are provided. Endlaps shall be 4" and occur over a supporting member. For materials and properties, see section 3.2.5.

**3.2.3** RIGID'S commercial "M" shall be a system of wall panels providing a 36" wide net coverage having 3/4" high major ribs at 6" centers. Side laps shall be one major rib. RIGID's "M" Panels shall be continuous from eave to sill until the panel length exceeds 35' and/or the panel becomes prohibitive of handling in which case endlaps are provided. Endlaps shall be 4" and occur over a supporting member. For materials and properties see section 3.2.5.

**3.2.4** RIGID's agricultural "CHOICE RIB" shall be a system of wall panels providing a 36" wide net coverage having ¾" high major ribs at 9" centers and two minor ribs between the major ribs. Sidelaps shall be one full major rib. RIGID's "CHOICE RIB" shall be continuous from ridge to eave until panel length exceeds 35' and/or the panel becomes prohibitive of handling, in which case endlaps are provided. Endlaps shall be 4" and occur over a supporting member. For material and properties, see section 3.2.6.

**3.2.5** MATERIALS used in the fabrication of RIGID's "AW", "R", "R-VEE" and "M" commercial wall panels shall normally be a pre-finished Modified Silicon Polyester finish over Aluminum-Zinc alloy-coated or G90 galvanized steel substrate in accordance with ASTM A792, Grade 80 (26 gage) and Grade 50 (24 gage) or ASTM A653, Grade 80 (26 gage). Reference RIGID's commercial Spectralite 2000 color chart for color availability.

If the customer requires a Kynar finish on any of RIGID's commercial wall panels, materials used in the fabrication shall normally be a pre-finished Fluoropon 70% Kynar 500 / Hylar 5000 over 26 gage, Grade 50 Aluminum-Zinc alloy-coated steel substrate, ASTM A792, coating designation AZ50 or AZ55. Reference RIGID's Spectralite 3000 color chart for color availability

**3.2.6** MATERIALS used in the fabrication of RIGID's "CHOICE RIB" agricultural wall panels shall normally be a pre-finished Modified Silicon Polyester finish over AZ50 or AZ55 Galvalume or G90 galvanized steel substrate in accordance with ASTM A653, Grade 80 (29 gage) and ASTM 792, Grade 80 (26 and 29 gage) Aluminum-Zinc alloy-coatedAluminum-Zinc alloy-coatedAluminum-Zinc alloy-coated. Reference RIGID's "CHOICE RIB" Spectralite 2000 color chart for color availability

**3.3** MATERIALS used in the fabrication of RIGID's commercial roof and wall trim and flashing shall normally be a pre-finished Modified Silicon Polyester finish over Aluminum-Zinc alloy-coated or G90 galvanized steel substrate in accordance with ASTM A792, Grade 50 (24 & 26 gage) or ASTM A653, Grade 50 (26 gage). Reference RIGID's commercial Spectralite 2000 color chart for color availability.

**3.4** MATERIALS used in the fabrication of RIGID's architectural roof and wall trim and flashing shall normally be a pre-finished Fluoropon 70% Kynar 500 / Hylar 5000 over 26 gage, Grade 50 Aluminum-Zinc alloy-coated steel substrate, ASTM A792, coating designation AZ50 or AZ55. Reference RIGID's Spectralite 3000 color chart for color availability.

**3.5** PAINTED FINISHES for roof and wall coverings and their flashing shall unless otherwise specified, consists of 0.2 mil baked on primer coat applied to each side. A 0.8 mil baked-on finish coat will be applied on one side, while a 0.3 mil baked-on straight polyester wash coat will be applied on the other. Total thickness of the finish coat side will be nominal 1.0 mil (including the primer coat). Thickness of the backside will be a nominal 0.5 mil (including the primer coat).

**3.6** SYSTEMS COVERING SEALANTS shall normally be roll tape sealant, tube sealant, and closures as required for weather-tightness of the roof.

**3.6.1** TAPE SEALANTS shall be of performed butyl rubber base, and shall normally be supplied as a 3/32" x 1/2" extruded shape. Wide tape sealant, 3/32" x 1" shall be available if specified.

**3.6.2** TUBE SEALANTS shall be of a polyurethane type material for applications where color sealant is required. Clear tube sealants shall be of an acrylic type material.

**3.6.3.** CLOSURES shall be a closed cell polyethylene material of a gray neutral color, and shall be die cut to panel profiles. Closures shall be supplied as required to provide weather tightness.

**3.6** FASTENERS for roof and wall covering systems shall normally be one or more types of self-drilling or self-tapping screws. Blind rivets shall normally be used in trim and accessory attachment and trim splicing.

## SECTION 4- MANUFACTURING

**4.1** STRUCTURAL MEMBERS shall normally be fabricated by shearing, flame cutting, forming, welding, punching, drilling, reaming, etc., as required in accordance with RIGID's standard practices.

**4.1.1** WELDED PLATE MEMBERS fabricated from plate or bar stock materials shall have flanges and webs joined on the one side of the web by a submerged arc continuous weld process.

**4.1.2** SHOP CONNECTIONS for built-up and/or hot-rolled members shall normally be welded using either a submerged or gas metal arc weld process. Welding shall be in accordance with RIGID's standard practices in compliance with the applicable sections, relating to design requirements and allowable stresses of the latest edition of the "AWS Structural Welding Code D1.1".

**4.1.3** FIELD CONNECTIONS shall normally be the bolting of structural members using high strength bolts and machine bolts in shop drilled, punched or reamed holes, in accordance with RIGID standard practices.

**4.1.4** WORKMANSHIP AND TOLERANCES of the manufactured building parts shall be in accordance with RIGID's quality control standards.

**4.2** SHOP PAINTING of members with shop primer paint shall be provided for the purpose of protecting the steel member during transportation, job site storage, and during erection. Shop primer does not provide the appearance, durability and/or protection of an appropriate field applied finish. RIGID is not responsible for any deterioration of the shop primer paint as a result of improper handling and/or storage. RIGID shall not be responsible for any field applied paint and/or coatings.

**4.2.1** CLEANING of steel members shall normally be the removal of oil, dirt, loose scale and/or foreign matter prior to painting in accordance with SSPC-SP2.

**4.2.2** COATING of steel members shall normally be one shop coat of RIGID's standard primer paint in accordance with the standard practices of RIGID, and generally shall equal or exceed the end performance requirements of Federal Specifications SSPC # 15.

**4.3** ALL FRAMING MEMBERS shall carry an easily visible identifying painted or stenciled piece mark.

## SECTION 5- ACCESSORIES

**5.1** TRANSLUCENT ROOF PANELS shall be of nominal 8 oz., fiberglass, white finish, and conform to the configuration of the RIGID "R" roof panel. The packages available are Standard, Fire Retardant, UL 90 and Insulated. The Standard Package includes an 8 oz. general purpose panel conforming to commercial standard CS-214-517. The Fire Retardant Package includes an 8 oz. fire retardant panel with a UL flame spread rating of 25 when tested in accordance with ASTM D635-56T. The UL90 Package includes an 8 oz. panel and the necessary panel straps and side battens required to conform to the UL90 rating. The Insulated Package shall include a sandwich construction whereby a 5 oz. fiberglass panel is bonded to the underside of an 8 oz. translucent roof panel to provide an 1/8 " minimum dead air space. Translucent roof panels are nominally 36" wide and are compatible for use over two 5'-0" purlin spaces. Translucent roof panels SHOULD NOT be used with side to side or end to end installations.

**5.2** TRANSLUCENT WALL PANELS shall be nominal 8 oz. fiberglass, white finish, and conform to the configuration of the RIGID "R" wall panels. The panels are general purpose, non-rated and conform to commercial standard CS-214-517. Translucent wall panels are nominally 36" wide and are generally supplied in lengths required. Translucent wall panels may be used with side to side installations.

**5.3** ROUND GRAVITY VENTILATORS shall have bird screen, interior baffles and exterior wind bands designed to provide maximum air flow. Round ventilators are furnished with dampers. Damper shall be vertical rising, operated by a standard pull chain. Cable that runs from the operator down the wall to a handle can be supplied as an option. Ventilators may be supplied peak mounted or hillside mounted. Peak mounted vent base configuration is normally flat, while hillside mounted vent base configuration normally matches the roof panel configuration. Ventilators are available in aluminum-zinc or white (Other colors are available with additional cost.)

**5.4** CONTINUOUS OR SECTIONAL GRAVITY RIDGE VENTILATORS shall be supplied with a screen, and will be furnished in 10'-0" lengths. Multi-unit splice drains and end cap skirt assemblies, where required, shall be provided to make up the specified length. Continuous or sectional ventilators are furnished with dampers. The damper shall be a spring loaded vertical rising type, operated by a standard pull chain. Cable that runs from the operator down the wall to a handle can be supplied as an option. Ridge ventilators are provided with die-formed skirt bases. Ventilators are available in aluminum-zinc or white. (Other colors are available with additional cost).

**5.5** ROOF FLASHING UNITS shall normally be used for roof mounted mechanical equipment and/or vents. Openings in roof and flashing units shall be field cut to required sizes. Flashing units are not intended to support any type of load. Loads are supported by means of sub frames and/or auxiliary secondary support systems. Flashing base configuration normally matches the panel profile on which it is used.

**5.5.1** ROOF CURB UNITS are available for peak or hillside applications. Base configurations match the roof panel on which it is used. Curbs are at least 18 gage galvanized material with welded construction. Top flanges are turned in as standard and can accommodate rigid installation when specified. All sizes are available in galvanized or with baked-on powder coated finish to match the roof color.

**5.5.2** ROOF JACKS shall be for the flashing of plumbing vent stacks and/or other pipe-like penetrations. They are available in 1/4" to 26" diameters. Jacks have flat, malleable bases and can be field formed to fit any standard panel configurations. Standard jacks have a heat range of -65 degrees centigrade to +250 degrees centigrade. Heat ranges of -100 degrees centigrade to +450 degrees centigrade are also available with additional cost. Jacks are standard black color.

**5.6** PERSONNEL DOORS shall normally be single door 3070 or a double door 6070 available in flush panel (solid) or long vision. Half-glass, vision light and louvered doors are available upon request. Glass and glazing of personnel doors are not supplied by RIGID.

**5.6.1** DOOR LEAF shall be non-handed, 1 3/4" thick, full flush, fabricated from 20 gage roller leveled, galvanized mill bonderized face sheets. Door finishes are white embossed (standard), bronzed embossed, or smooth gray finish. Top and bottom channels shall be welded flush to face sheet. The core materials shall be expanded polystyrene bonded to face sheets with a two component epoxy adhesive. Door edges shall be hemmed to eliminate raw edge metal, beveled on lock side and flat on hinge side. Door shall be prepared for 4 1/2" X 4 1/2" template hinges with 9 gage hinge reinforcements. Lock edges shall be prepared for Government Series 160 and 161 Locksets.

**5.6.2** DOOR FRAMES shall be fabricated from 16 gage galvanized class G-60 or galvalume steel, mill bonderized. Floor and head clips X 4 1/2' template and universal striker plate. Frames are standard finished white with gray primer or bronzed finishes available.

**5.6.3** HARDWARE shall normally consist of: (a) 1 1/2 pair full mortise hinges per leaf (b) one key-in-lever type cylindrical lockset (c) one aluminum threshold (d) one astragal, one filler plug for inactive leaf, one header bolt, one foot bolt, and one pair of surface bolts per double door. Optional weather stripping for jambs, head, and sill may be ordered. Optional Mortise lockset, panic hardware, handicap hardware, and door closers may also be ordered.

**5.7** FRAMES OPENINGS IN WALLS shall normally be an opening framed with 16 gage minimum, cold-formed members, designed to meet the specified loads. Openings shall be trimmed in accordance with RIGID's standard practices.

**5.8** ALUMINUM HORIZONTAL SLIDE WINDOWS shall be fabricated from 6063 alloy, T5 tempered hardness. Finishes are standard mill with bronzed painted on request. All windows shall be furnished with 1/8" double strength clear glass as standard with bronze tinted, obscured, or insulated glass on request. All horizontal slide windows shall be self flashing type with side fins to match either RIGID's "A", "M"' or "R" panel. Nylon rollers will be attached for smooth sliding action. Half screens shall be furnished with all windows.

**5.9** ALUMINUM SINGLE-HUNG WINDOWS shall be fabricated from 6063 alloy, T5 tempered hardness. Standard finish is plain mill with bronzed painted on request. All windows shall be furnished with 1/8" double strength clear glass as standard with bronze tinted, obscured, or insulated glass on request. Single-hung windows require additional trim for a finished appearance. Half screens shall be furnished with all windows.

**5.10** NARROW LITE ACCENT WINDOWS (SLIM LINE) shall be fabricated from 6063 alloy, T5 tempered hardness. Tubular type extruded sections are utilized for strength and rigidity. All accent windows shall be furnished with 1/8" clear tempered glass as standard with bronzed tinted or insulated glass on request. All accent windows shall be sold flashing type with side fins to match either RIGID "A", "R", or "M" panels. Outside trim fins are also provided with all units.

**5.11** FIXED LOUVERS shall be shop fabricated out of 18 gage galvanized steel, self framing, self flashing, and self mulling, welded frames with 20 gage galvanized blades. Louvers shall have blades of the overlapping type, providing maximum weather tightness while allowing free air flow. Louvers are available in galvanized, white or any RIGID standard panel color. A removable insect screen is provided with each louver.

**5.11.1** ADJUSTABLE LOUVERS shall be the same as fixed louvers except after finish is applied, a 3/8" x 1/4" weather stripping is applied to the edge of each blade which makes the louver virtually air tight with the blades in the closed position. The standard operator is by hand crank. An optional chain operator is available upon request.

**5.12** CANOPIES shall normally be an overhang provided with a roof finish and trim finish matching that of the main structure. Soffit panels are optional. Canopies shall be framed of cold-formed light gage shapes, welded built-up section and/or hot rolled sections.

**5.12.1** EAVE CANOPIES shall be the extension of the roof line at the eave. Eave canopies are measured from a structural line to structural line and/or face of side wall girt to face of eave member.

**5.12.2** PURLIN EXTENSION CANOPIES shall be the extension of the roof line at the gable and / or endwall of the structure. Purlin extension are measured from the structural line to structural line and or face of endwall girt to face of purlin rake angle.

**5.12.3** OPEN FASCIA SYSTEMS shall normally be designed to allow water runoff between the fascia and the building and permit use of eave guttering.

**5.12.4** DOOR CANOPIES AND BELOW EAVE CANOPIES shall be below eave and/or rake line canopies designed for use over personnel doors,etc.

**5.13** FASCIAS shall normally be constructed of secondary framing members. Fascia systems are available as parapet (vertical) and mansard (sloped) face. Fascia systems are measured from a structural line to a structural line and/or face of wall girt to face of fascia girt for overhang. Height is measured vertical from structural line to structural line and/or top of fascia rail to bottom of fascia rail.

**5.13.1** FASCIA PANELS shall normally be RIGID "AW", "R" or "M" panels, or other facia material not exceeding a dead load of 2 psf and as specified in the contract documents. Fascia soffit panels are RIGID "M" or "R" panel and are available as an option on closed systems only.

**5.13.2** CLOSED FASCIA SYSTEMS shall normally be designed with internal guttering between fascia and building and closed backing for weather tightness with other code bodies, such as sheer angles and embedment plates, are not normally supplied by RIGID.

## SECTION 6 – MISCELLANEOUS

**6.1** ANCHOR BOLTS are not normally supplied by RIGID. Anchor bolts shall not be less than the size and quantity shown on the RIGID anchor bolt setting drawings. Anchor bolts are unpainted for bonding with concrete, and are of sufficient capacity to properly resist the governing reactions induced by the design loads on the structure. Foundation reactions are furnished by RIGID, however, no responsibility for foundation design will be accepted by RIGID. All anchor bolts are to be set in strict accordance with RIGID drawings. Anchor bolts are designed in accordance with ASTM F1554 and it also meets ASTM A307 Grade C regulations. Additional materials required for compliance.

**6.2** ERECTION of the RIGID building system shall be in accordance with the appropriate erection drawings, erection guides and/or other documents furnished by RIGID. It shall be the erector's responsibility to comply with all appropriate legal and safety requirements. It shall be the erectors responsibility to determine and provide any and all temporary bracing, shoring, blocking, bridging, and/or securing of components, etc., as required during erection of the building.

**6.3** RIGID's STANDARD WARRANTY of production fabricated by RIGID, excluding paint, carry a warranty against failure due to defective material or workmanship for a period of one (1) year from the date of shipment. RIGID's ability under this warranty shall be limited to furnishing , but not dismantling or installing, necessary replacement material F.O.B. RIGID's plant in Houston. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED AND THERE ARE NO WARRANTIES, REPRESENTATIONS OR CONDITIONS OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE, BEYOND THOSE STATED HEREIN. IN NO EVENT SHALL RIGID BE LIABLE FOR LOSS OF PROFITS, OR OTHER INCIDENTAL CONSEQUENTIAL, OR SPECIAL DAMAGES.

*Warranties on color coated panels, roof warranties, or any additional warranties on the building may, at RIGID's sole option, be purchased by builder and if purchased, shall be stated in the warranty certificates so purchased.*

note: The metal building manufacturer will provide details for the metal building as part of the Shop Drawings during the submittal process.

note: sealant in wall panel laps is not required

note: Since the metal building manufacturer will be responsible for selecting all building exterior panels to conform to the project specifications, and the capacity of the paneling (metal roof or wall panels) is a consideration in the design of the metal building, any substitutions will need to be incorporated as part of the overall design of the metal building. Substitutions for any metal building components will not be considered separately.

SPEC SEC 13 34 19
METAL BUILDING SYSTEM

# SECTION 16005 - ELECTRICAL WORK

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Service Entrance Equipment

B. Conduit

C. Wire and Cable

D. Boxes

E. Wiring Devices

F. Enclosures

G. Grounding and Bonding

H. Disconnect Switches

I. Panelboards

J. Motor Control Equipment

K. Light Fixtures

### 1.2 REFERENCES

A. General
1. ANSI/NFPA 70 - National Electrical Code.
2. ANSI C2 - National Electrical Safety Code.
3. Underwriters Laboratories, Inc. (UL)

B. Service Entrance Equipment

1. **p**ublic Service Company of New Mexico

C. Conduit

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

3. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
4. FS WW-C-566 - Specification for flexible metal conduit.
5. NECA "Standard of Installation".

D. Wire and Cable

1. NEMA WC 5 - Thermoplastic-insulated wire and cable for the transmission and distribution of electrical energy.
2. ICEA S-80-576 - Standard for Telecommunications Wire and Cable for Wiring Premises.

E. Boxes

1. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
2. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

F. Wiring Devices

1. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
2. FS W-S-896E - Switch, Toggle.
3. NEMA WD 1 - General-purpose Wiring Devices.
4. NEMA WD 6 - Wiring Device Configurations.
5. REA PE-76 - Modular Telephone Set Hardware.

G. Enclosures

1. NEMA 250 - Enclosures for Electrical Equipment.

H. Disconnect Switches

1. ANSI/UL 198E - Class R Fuses.
2. FS W-F-870 - Fuseholders
3. FS W-S-865 - Switch, Box, Surface-Mounted.
4. NEMA KS 1 - Enclosed Switches.

I. Panelboards

1. FS W-C-375 - Circuit Breakers, Molded Case, Branch Circuit and Service.
2. FS W-P-115 - Power Distribution Panel.
3. NEMA AB 1 - Molded Case Circuit Breakers.
4. NEMA PB 1 - Panelboards.

5. NEMA PB 1.1 - Instructions for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or less.

J. Motor Control Equipment
   1. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
   2. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

K. Light Fixtures

   1. ANSI C82.1 - Specification for Fluorescent Lamp Ballasts.
   2. NEMA LE 2 - H-I-D Lighting System Noise Criterion (LS-NC) Ratings.

1.3 SUBMITTALS

A. Submit in accordance with contract documents.

B. Provide technical data for the following items. Data shall substantiate compliance with the requirements of the Specifications and Drawings and shall include, but not be limited to, ratings, material type, construction, listings and/or certifications, and color. Catalog data or "cut-sheets" which contain information on several products/items should be marked to clearly indicate the specific product or material proposed for this project.
   1. Service entrance equipment.
   2. Disconnect switches including fuses.
   3. Panelboards.
   3. Light fixtures including ballasts and lamps.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable Building Code for the City of Santa Fe and the State of New Mexico.

B. Conform to ANSI/NFPA 70.

C. Obtain permits and request inspections from authority having jurisdiction.

D. Conform to applicable UL requirements for each product indicated.

PART 2 - PRODUCTS

2.1 SERVICE ENTRANCE EQUIPMENT

A. Secondary Metering Enclosure

   1. Description: In accordance with electric metering requirements of the Public

Service Company of New Mexico.

B. Service Disconnect Switch and Overcurrent Protection
   1. Description: As noted on Drawings .
   2. Listing: UL listed Service Entrance Equipment.

2.2 CONDUIT

A. Metal Conduit (RGS) and Fittings

   1. Type: ANSI C80.1, rigid galvanized steel conduit.
   2. Fittings and Conduit Bodies: ANSI/NEMA FB 1, threaded type, steel or malleable steel.
   3. Grounding Bushings: ANSI/NEMA FB 1, insulated lay-in grounding type, steel or malleable iron.
   4. Listing: UL listed.

B. Electrical Metallic Tubing (EMT) and Fittings

   1. Type: ANSI C80.3, galvanized tubing.
   2. Fittings and Conduit Bodies: ANSI/NEMA FB 1, compression type, steel or malleable steel.
   3. Grounding Bushings: ANSI/NEMA FB 1, insulated lay-in grounding type, steel or malleable iron.
   4. Listing: UL listed.

C. Flexible Conduit and Fittings

   1. Conduit: FS WW-C-566, flexible steel.
   2. Fittings and Conduit Bodies: ANSI/NEMA FB 1, steel or malleable iron.
   3. Listing: UL listed.

D. Liquidtight Flexible Conduit and Fittings

   1. Conduit: FS WW-C-566, flexible steel with PVC jacket.
   2. Fittings and Conduit Bodies: ANSI/NEMA FB 1, steel or malleable iron.
   3. Listing: UL listed.

E. Conduit Clamps, Straps, and Supports: Steel or malleable iron.

2.3 WIRE AND CABLE

A. Building Wire and Cable

1. Description: Single conductor insulated wire.
2. Conductor: Copper.
3. Insulation:
   a. Voltage Rating: 600 volt.
   b. Type: NEMA WC 5, Type THHN/THWN.
   c. Color:
      (1) #10 AWG and Smaller: Solid color compound throughout conductor length.
      (2) #8 AWG and Larger: 3M Scotch "35 Vinyl Plastic" electrical color coding tape, 3/4" wide, extended a minimum of 2 inches along conductor insulation.

2.4 BOXES

A. Sheet Metal Boxes: ANSI/NEMA OS 1, galvanized steel; rated for weight of equipment supported; include 1/2 inch male fixture studs where required; grounding terminal.

B. Cast Boxes: ANSI/NEMA FB 1, Type "FD" cast feralloy, threaded hubs, grounding terminal, gasketed cover.

2.5 WIRING DEVICES

A. Wall Switches

1. Type: NEMA WD 1, FS W-S-896E, specification grade toggle switch; ivory handle.
2. Rating: 20 Amperes at 120-277 Volts AC.

B. Receptacles

1. Type: NEMA WD 1, FS W-C-596, specification grade self-grounding receptacle with grounding terminal on body; ivory face.
2. Configuration: NEMA WD 6, Type 5-20R.

C. Device Cover Plates

1. Dry Interior Locations: Type 302 specification grade smooth stainless steel, jumbo size.
2. Exterior or Wet Interior Locations: Gasketed cast metal with hinged gasketed device cover.

2.6 ENCLOSURES

A. NEMA Type 1 Hinged Cover Enclosure

1. Construction: NEMA 250, Type 1, steel, minimum 16 gauge.
2. Finish: Polyester powder coating over phosphatized surface.
3. Cover: Door with continuous steel hinge, held closed by flush latch operable with screwdriver.

## 2.7 GROUNDING AND BONDING

A. Rod Electrode (Ground Rod)

1. Material: Copper.
2. Diameter: 3/4 inch.
3. Length: 10 feet.

B. Raceway Conductor

1. Description:
   a. #10 AWG and Smaller: Single conductor insulated wire.
   b. #8 AWG and Larger: Single conductor bare wire; stranded.
2. Conductor: Copper.
3. #10 AWG and Smaller Conductor Insulation:
   a. Voltage Rating: 600 volt.
   b. Type: NEMA WC 5, Type THHN/THWN.
   c. Color: Green solid color compound throughout conductor length.
   d. Listing: UL listed.

## 2.8 DISCONNECT SWITCHES

A. Switch Assemblies: NEMA KS 1, Type HD, FS W-S-865, heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

B. Fuse clips: FS W-F-870. Designed to accommodate Class R fuses.

C. Fuses: ANSI/UL 198E, Class RK1, dual-element, current limiting, time delay.

D. Enclosures: NEMA KS 1, Type 1 for dry interior locations; Type 3R for exterior or wet interior locations. Provide with factory or field installed equipment grounding kit.

E. Listing: UL listed.

2.9 PANELBOARDS

A. Type: NEMA PB 1, circuit breaker type. FS W-P-115, Type I, Class 1.

B. Enclosure: NEMA PB 1, Type 1 for dry interior locations, Type 3R for exterior or wet interior locations, unless otherwise noted.

C. Bus: Copper.

D. Circuit Breakers: NEMA AB 1, FS W-C-375, molded case, thermal magnetic trip, bolt-on type, full-size, common internal trip for multi-pole breakers, SWD rated for lighting circuits, HID rated for 120/208 volt HID lighting circuits. Tandem breakers are not acceptable.

2.10 MOTOR CONTROL EQUIPMENT

A. Fractional Horsepower Manual Motor Starter: NEMA ICS 2, AC general purpose Class A manually operated, 2 pole, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and toggle operator with lock-off provisions. Enclosure: NEMA ICS 6, Type 1 for dry interior locations, Type 4 for exterior or wet interior locations.

B. Fractional Horsepower Manual Motor Starting Switch: Same as Fractional Horsepower Manual Motor Starter without thermal overload unit.

2.11 LIGHT FIXTURES

A. Light Fixtures: As scheduled on Drawings.
B. Ballasts and drivers:
   1. ANSI C82.1, UL listed, CBM certified, Class P, electronic.

PART 3 - EXECUTION

3.1 GENERAL

A. Perform Work in accordance with ANSI/NFPA 70.

B. Install equipment and products in accordance with manufacturer’s instructions.

3.2 SERVICE ENTRANCE EQUIPMENT

A. Install meter enclosure in accordance with electric metering requirements of the Public Service Company of New Mexico.

## 3.3 CONDUIT

A. Schedule

1. Above Grade Conduit Installations:
   a. Dry Interior Locations:
      (1) Size: 1/2 inch minimum.
      (2) Type:
         (a) 1/2 inch through 2 inch: Electrical metallic tubing (EMT).
         (b) Larger than 2 inch: Metal conduit (RGS).
      (3) Exterior or Wet Interior Locations:
         (a) Size: 1/2 inch minimum.
         (b) Type: Metal conduit (RGS).
2. Flexible Metal Conduit: Use for connection to recessed and pendant mounted light fixtures. Restrict maximum length to 72 inches.
3. Liquidtight Flexible Metal Conduit: Use for connection to dry-type transformers, mechanical equipment, instruments, and devices which produce vibration. Restrict maximum length to 24 inches.
4 Below grade installation:
   a. Type PVC.
   b. Minimum size ¾".

B. Installation

1. General
   a. Install conduit in accordance with NECA "Standard of Installation."
   b. Install no more than the equivalent of four 90 degree bends between conduit terminations for 1/2 inch through 1 inch conduit size, three bends for 1-1/4 inch through 2 inch conduit, and two bends for conduit 2-1/2 inch and larger. Provide pull boxes, if necessary to meet these requirements.
   c. Maintain minimum 6 inch clearance between conduit and piping.
   d. Maintain minimum 12 inch clearance between conduit and surfaces with temperature exceeding 104 degrees F (40 degrees C).
   e. Support conduit at a maximum of 4 feet on center and within one foot of elbow, bend, change of direction, and box.
   f. Use grounding bushings on metallic conduit terminations.
   g. Use conduit hubs to fasten metal conduit (RGS) to sheet metal enclosures.
   h. Install fittings to accommodate expansion where conduit crosses building control and expansion joints.
   i. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
   j. Provide pull string in each empty conduit.

2. Above Grade Conduit

a. Route conduit parallel and perpendicular to walls.
b. Route conduit to maintain headroom and present neat appearance.
c. Route conduit through roof using flashing and sealants.

3. Below Grade Conduit
   a. Install conduit point-to-point.
   b. Install buried conduit a minimum of 24 inches below grade.
   c. Backfill electrical conduit trenches with engineered fill.
   d. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and mot more than 4 inches in loose depth for material compacted by hand=operated tampers.
   e. Compact electrical conduit trenches to 95%.
   f. Install electgrical warning tape 12" above each conduit.

## 3.4 BRANCH CIRCUIT CONDUIT

A. Run wiring for receptacle and lighting circuits in conduit sized in accordance with the National Electrical Code, unless otherwise indicated.

## 3.5 WIRE AND CABLE

A. Run wiring in raceways, unless otherwise indicated on Drawings.

B. Pull all conductors into raceway at same time.

C. Use suitable wiring pulling lubricant for building wire #4 AWG and larger.

D. Install pull string in empty conduits.

E Communication Cables:
1. Route cable in conduit as shown on the Drawings.
2. Cable shall be continuous from outlet jack to connecting blocks in closet.
3. No splicing shall be permitted.
4. Terminate cable at outlet jacks and connecting blocks.

## 3.6 BRANCH CIRCUIT WIRING

A. Provide number of phase and neutral conductors required to implement circuiting shown on Drawings, unless otherwise noted.

B. Size neutral conductor same size as phase conductors, unless otherwise noted.

C. Provide a separate equipment ground conductor in each raceway. Size equipment

ground conductor same size as phase conductors, unless otherwise noted.

D. Place an equal number of conductors for each phase of a circuit in same raceway.

E. Two or three branch circuits of different phases may not share a common neutral, except as otherwise indicated.

F. Use #12 AWG conductors for 20 Amp branch circuits which have not been identified on the Drawings.

3.7 BOXES

A. Schedule:

1. Interior Dry Locations: Sheet Metal Boxes.

2. Exterior of Wet Interior Locations: Cast Boxes.

3.8 WIRING DEVICES

A. Install wall switches 4'-0" inches above finished floor to bottom of box, "OFF" position down, unless otherwise noted.

B. Install receptacles 1'-6" inches above finished floor to bottom of box, grounding pole on top, unless otherwise noted.

C. Install telephone/data outlets in accordance with manufacturer's instructions. Install telephone jack at the bottom of outlet and data jack at the top of outlet.

3.9 GROUNDING AND BONDING

A. Provide separate insulated ground conductor in each raceway. Bond each end of feeder conductor to conduit grounding bushing and extend to box or equipment grounding lug or bus.

B. Use grounding bushings on metallic conduit terminations.

3.10 DISCONNECT SWITCHES

A. Install 5'-0" above finished floor to centerline of disconnect handles in the "ON" position, unless otherwise noted.

3.11 PANELBOARDS

A. Install in accordance with NEMA PB 1.1 and manufacturer's instructions.

B. Install 6'-6" above finished floor to top of panelboard.

C. Provide typed circuit directory.

3.12 MOTOR CONTROL EQUIPMENT

A. Magnetic Motor Starters: Install 5'-0" above finished floor to centerline of enclosure.

END OF SECTION 16005

END OF DIVISION 16